

# **Energy Strategy**

2018 Resubmission of APP/X5210/A/14/2218052

# Gondar Gardens, London Borough of Camden, London

For



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# 1.0 Executive Summary

This document has been prepared to present the revised results of an early stage analysis of potential Low and Zero Carbon (LZC) technologies for the proposed new development at Gondar Gardens, London Borough of Camden, London, NW6 1QF, in order to satisfy the Local and Regional Planning Policy requirements relating to energy and CO<sub>2</sub> emissions as noted in this document.

The site consists of the redevelopment of the reservoir street frontage to provide 28 residential units (Class C3 use) in two blocks from lower ground to third floors with basement parking, following substantial demolition of the roof and internal structure of the reservoir and its subsequent relandscaping. The development is situated in the London Borough of Camden and, as such, should comply with the energy requirement of the Camden Local Plan 2017, London Plan 2016 and Part L1A 2013 of Building Regulations.

Therefore, the following objectives have to be achieved for the development:

#### **Actual Targets:**

- Ensure the site complies with Part L1A 2013 (Amendments published November 2013, in effect April 2014) of the UK Building Regulations including:
  - Ensure the Dwelling Emissions Rate (DER) is less than the Target Emissions Rate (TER) (kg/CO<sub>2</sub>/m<sup>2</sup>)
  - Ensue the Dwelling Fabric Energy Efficiency Standard (DFEE) is less than the Target Fabric Energy Efficiency Standard (kWh/m²)
- A target of 35% reduction in onsite regulated CO₂ emissions over the Part L 2013 baseline (TER with gas as primary fuel) is in place for all major developments
- A cash in lieu payments for residual CO<sub>2</sub> to achieve "zero carbon" (100% regulated) shortfall may be subject to a carbon offset payment
- A desire for 20% reduction in carbon dioxide emissions from on-site renewable energy generation

A target of 35% reduction in regulated CO<sub>2</sub> emissions over the baseline is placed on all major developments by the London Plan. Major Developments are defined in the London Plan as; for dwellings; where 10 or more are to be constructed (or if number not given, area is more than 0.5 hectares).

The analysis in this report has been conducted by utilising an actual SAP 2012 calculation for each new build dwelling and the strategy embraces the London Plan energy hierarchy throughout.

Based on the information available at this stage and the assumptions detailed in Section 3, the following baseline emissions have been calculated:

Table 1.1a: Target emission rate

Target Site wide emissions	Total (tCO <sub>2</sub> /yr)	Equation
Part L1A 2013 Baseline	48.22	А
Site 35% CO₂ Target DER	31.34	B = A x (1-35%)
CO <sub>2</sub> emissions to be offset in total from Part L1A 2013 Baseline	16.88	C = A - B

The development proposes to satisfy the above targets onsite. This strategy embraces the London Plan's energy hierarchy within the constraints of the site as follows:

- <u>Be lean:</u> use less energy. The enhanced building fabric specification outlined in Section 3 will minimise the heat demands of the development through passive design.
- Be clean: supply and use energy efficiently. The development will include high efficiency gas boilers and heat recovery units for the ventilation to further reduce the fossil fuel demands of the development.
- <u>Be green:</u> use Low or Zero Carbon technologies. The development will integrate high efficiency Solar Photovoltaic Panels (PV) to generate renewable energy to further offset the emission of the dwellings.

The outcomes of implementing the preferred option set out in this strategy are detailed below on a site wide basis across the development:

Table 1.1b: New-Build dwellings total tCO<sub>2</sub>/yr for each hierarchy stage

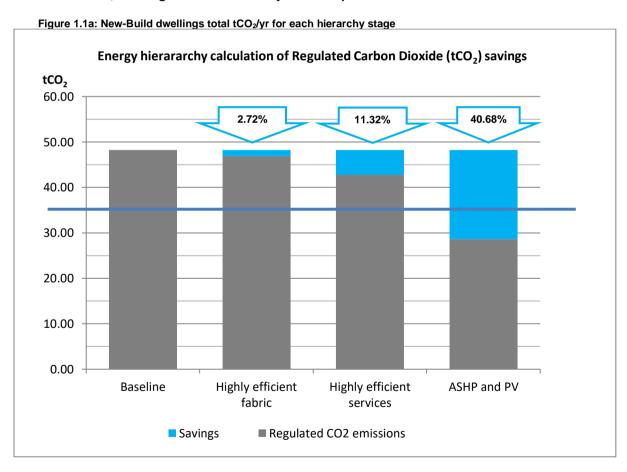
		Be Lean	Be Clean	Be Green
Regulated CO₂ Emissions	Baseline CO <sub>2</sub> Emissions	Proposed Gas baseline Building (DER)	Proposed Gas baseline Building (DER)	Proposed Building (DER)
Total Regulated (tCO <sub>2</sub> /yr)	48.22	46.91	42.76	28.60
%age Reduction over Baseline	N/A	2.72%	11.32%	40.68%
%age Reduction from LZC	N/A	N/A	8.84%	33.11%

As shown in the tables above, the implementation of the proposed solution should ensure an improvement of 40.68% for the development.

In summary, the proposed strategy offers the following savings from enhanced building fabric specifications and Low and Zero Carbon Technologies:

- A **40.68%** reduction in <u>regulated</u> CO<sub>2</sub> emissions over the Part L1A 2013 baseline from fabric specifications, energy efficient services and the implementation of Low & Zero Carbon technologies (LZC).
- A 33.11% reduction in <u>regulated</u> emissions from Low & Zero Carbon technologies (LZC) including the ASHPs and Solar Photovoltaic Panels (PV) in line with the Camden policy
- A **5.75**%% reduction in all site CO<sub>2</sub> (<u>regulated & unregulated</u>) emissions from the Part L1A 2013 from improved fabric specification before any Low & Zero Carbon technologies (LZC).
- A **20.65**%% reduction in all site CO<sub>2</sub> (<u>regulated & unregulated</u>) emissions from improved fabric specifications and Low & Zero Carbon technologies compared to the Baseline emissions.

The scheme has incorporated the GLA's guidance and will deliver the target, as far as is feasible on site, the targets set out for Major Developments in the current London Plan.



#### 2.0 Introduction

The site consists of the redevelopment of the reservoir street frontage to provide 28 residential units (Class C3 use) in two blocks from lower ground to third floors with basement parking, following substantial demolition of the roof and internal structure of the reservoir and its subsequent relandscaping. The development is situated in the London Borough of Camden and, as such, should comply with the energy requirement of the Camden Local Plan 2017, London Plan 2016 and Part L1A 2013 of Building Regulations.

# 2.1 Building Regulations (Part L)

All new buildings constructed in the UK must meet the minimum requirements of the UK Building Regulations. Specifically, with regards to energy and carbon compliance, all buildings must meet the Building Regulations Part L 'Target Emission Rate' (TER) requirements for the Part L revision which is current at the time of initial construction works. In addition the Part L1A 2013 requirement to meet the new Target Fabric Energy Efficiency (TFEE) standards will be need to be achieved.

The analysis in this report has been conducted using SAP 2012 version 9.9.2.1 which is the current version of SAP used to show compliance with Part L1A 2013.

# 2.2 Camden Local Plan 2017 - Sustainability and climate change

#### **Policy CC1 Climate change mitigation**

The Council 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.

- Require all major development to demonstrate how London Plan targets for carbon dioxide emissions reductions have been met;
- 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
- The council will expect Major Developments to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation (which can include sources of site related decentralised renewable energy), unless it can be demonstrated that such provision is not feasible.

# 2.3 Camden Planning Guidance: CPG3 - Sustainability

#### Camden's Sustainable Design and Construction Supplementary Planning Guidance (SPG)

Published in July 2015 and updated March 2018 this document makes reference to the policies and sets out targets as follows:

- Section 3 sets out a clear hierarchy of what is to be analysed in any new development in the borough. This section also sets out 'Best Practice' standards for designing Low Carbon Buildings.
- **Section 5** asks that feasible and viable your development will be required to connect to a decentralised energy network or include CHP.
- Section 6 sets out the Council's expectation that developments of five or more dwellings and/or more than 500 sqm of any gross internal floorspace to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation

## 2.4 Council Planning Meeting

#### **Camden Borough Council Planning Solutions advice**

A meeting was held on the 22/06/2018 at the Council's offices to discuss the resubmission of planning application 2013/7585/P which was allowed at appeal (APP/X5210/A/14/2218052) on the 16/12/2015. The following advice was given regards the scheme:

#### **Energy and Sustainability**

- □ Policy CC1 (Climate change mitigation) now requires all major developments to demonstrate how the London Plan targets for CO₂ have been met in developments.
- Following the steps in the energy hierarchy and optimising resource efficiency.
- Monitoring equipment is also now required by this policy in order to ensure the effectiveness of renewable and low carbon technologies.
- As part of an updated Energy Statement, it will therefore be necessary to demonstrate the residential development is "zero carbon", as defined in the Mayor's Housing SPG. As the former Sustainability/Energy statements are now out of date, they would need to be updated prior to any formal resubmission.
- □ The advice also notes <u>withdrawal</u> of Code for Sustainable Homes and the introduction of extended optional building control requirements in relation to accessible design.

## 2.5 Mayor's Housing SPG

The Mayoral Housing SPG (September 2016) states that all residential developments are to achieve the Mayor's zero carbon standard. This requires a 35% reduction in regulated carbon dioxide emissions (beyond Part L 2013) on-site or as far as feasible. The remaining regulated carbon emissions, to 100%, are to be off-set through a cash in lieu contribution to the relevant borough; ring fenced to secure delivery of carbon dioxide savings elsewhere (in line with London Plan Policy 5.2E).

#### 2.6 The London Plan (2016)

The Mayor of London published the updated London Plan in March 2016 (consolidated with alterations since 2011). Key policies underpinning London's approach to sustainable development include:

- Policy 5.2 Minimising Carbon Dioxide Emissions
- Policy 5.3 Sustainable Design and Construction
- Policy 5.4A Electricity and Gas Supply
- Policy 5.5 Decentralised Energy Networks
- Policy 5.6 Decentralised Energy in Development Proposals
- Policy 5.7 Renewable Energy
- Policy 5.9 Overheating and cooling

The London Plan sets out policy in the London context and identifies a number of objectives to improve the City as a place to work and live. Policy 5.2 sets out the requirements to minimise CO<sub>2</sub> emissions through the application of the energy hierarchy:

- Be lean: use less energy
- Be clean: supply and use energy efficiently
- Be green: use low or zero carbon technologies

The following targets are in effect for all Stage 1 schemes received by the Mayor from 1 October 2016 onwards, as set out in the energy assessment guidance:

Residential developments – "Zero Carbon" (as defined in section 5.2 of the Housing SPG)
 against Part L 2013

The Mayoral London Plan requires an assessment of energy demand that demonstrates the steps taken to apply the Mayor's energy hierarchy. The London Plan includes planning policies both for reducing energy consumption within buildings and the use of renewable energy. These policies cover the role of the boroughs in supporting the Mayor's energy strategy and the requirements of planning applications.

# 2.7 Objectives

The development is situated in London Borough of Camden and will have to comply with the energy requirements of Part L1A 2013. Therefore, the following objectives have to be achieved for the development:

#### **Actual Targets:**

- Ensure the site complies with Part L1A 2013 (Amendments published November 2013, in effect April 2014) of the UK Building Regulations including:
  - Ensure the Dwelling Emissions Rate (DER) is less than the Target Emissions Rate (TER) (kg/CO<sub>2</sub>/m<sup>2</sup>)
  - Ensue the Dwelling Fabric Energy Efficiency Standard (DFEE) is less than the Target Fabric Energy Efficiency Standard (kWh/m²)
- ☐ A target of 35% reduction in onsite regulated CO₂ emissions over the Part L 2013 baseline (TER with gas as primary fuel) is in place for all major developments
- A cash in lieu payments for residual CO<sub>2</sub> to achieve "zero carbon" (100% regulated) shortfall may be subject to a carbon offset payment
- A desire for 20% reduction in carbon dioxide emissions from on-site renewable energy generation

# 3.0 Baseline Energy Demands and CO<sub>2</sub> Emissions

#### 3.1 Context to Approach

The recommendations in this Energy Strategy are proposed to show compliance with the themes outlined in the Mayor's energy hierarchy outlined in the London Plan 2016 (MALP), as well as following the current Zero Carbon trajectory:

- Be lean: use less energy
- Be clean: supply and use energy efficiently
- Be green: use low or zero carbon technologies

This approach consists of reducing the energy demand and CO<sub>2</sub> emissions by improving the energy efficiency of the building envelope and the mechanical and electrical services first. Once the energy demand of the building has been reduced from energy efficiency improvements then Low and Zero Carbon (LZC) technologies can be considered. It is widely accepted that the most effective way to reduce energy consumption (and therefore carbon emissions) is to follow the energy hierarchy (shown below).

This approach is the most appropriate because energy efficiency improvements can be more cost effective than LZC systems and can provide significant energy and CO<sub>2</sub> savings especially over the lifetime of a product. In addition, energy efficiency improvements reduce the energy demand of the building and therefore contribute to reducing the size of LZC systems required to achieve low carbon buildings.

The energy efficiency of the dwellings can be improved by adopting passive design measures, such as enhancing the building fabric or designing the dwellings so as to improve passive solar gains through windows.

#### **Energy Hierarchy:**



Therefore, improving the energy efficiency of the development before implementing Low or Zero Carbon technologies is considered a preferred strategy as this follows the Mayor's energy hierarchy.

# 3.2 Base Specifications

The analysis in this report has been conducted by utilising an actual SAP 2012 calculations for **all** of the new build dwellings as each dwelling is unique in geometry. Once permission has been granted, the findings of this report will be confirmed upon the completion of the detailed design process.

The baseline demands for the New-Build dwellings are represented by the Part L1A 2013 Target Emission Rate (TER), calculated using the specification set out in Appendix R of SAP 2012. Details of the limiting U-Values, Appendix R U Values and the limiting values in Policy CP3 are given in Table 3.1 below:

Table 3.1 U-Values of building elements for all New-Build dwellings

Element	Part L1A 2013 Limiting U-Values (W/m²K)	CP3 Limiting U-Values (W/m²K)	Appendix R Limiting U-Values (W/m²K)
Walls	0.30	0.2	0.18
Floors	0.25	0.2	0.13
Roof	0.20	0.13	0.13
Windows / Doors	2.00	1.5 / 1.0	1.4 / 1.0

For the baseline SAP calculations we have used the following general specifications

Parameter	Assumptions/Values used for the assessment
Design Air Permeability	5.0 m <sup>3</sup> /hr/m <sup>2</sup>
	Condensing combi with automatic ignition (90% efficient)
Heating systems and controls	System with radiators
	Time and temperature zone control
Domestic Hot Water	From main heating system
Domestic not water	Houses – 120L cylinder with 80mm factory fitted insulation
Ventilation	Natural
Electricity Tariff	Standard Electricity Tariff
Secondary Heating	N/A
Low Energy Light Fittings	100%

## 3.3 Setting the targets

As previously noted the strategy in this document shows that the proposed development will comply with all the targets Camden Council and the GLA requires. This corresponds to a 35% regulated CO<sub>2</sub> reduction over Part L1A 2013 Building Regulations and a 20% reduction in carbon dioxide emissions from on-site renewable energy generation.

Based on the SAP calculations undertaken at this stage and the assumptions detailed in Section 3.2 of this report, the baseline emissions shown in Table 3.2 have been calculated.

The tables below collate the results of the SAP calculations, in two blocks, A Block and P Block, then a combined Site Wide with the whole development.

A Block consists of the following apartments: A1, A2, A3, A4, A5, A6, A7, A8, A9, A10 and P4

P Block consists of the following apartments: H1, H2, P1, P2, P3, P5, P6, P8, P9, P10, P11, P12, P13, P14, P15, P16, P17 and P18

Table	3.2: T	argets	for	the	site
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Target Site wide emissions	Total (tCO <sub>2</sub> /yr)	Equation
Part L1A 2013 Baseline (TER)	48.22	А
Site 35% CO₂ Target (DER)	31.34	B = A x (1-35%)
CO <sub>2</sub> emissions to be offset	16.88	C = A - B

#### 3.4 Meeting the targets – Improved fabric

Satisfying the 35% CO<sub>2</sub> reduction target can be achieved by passive design measures, such as building fabric improvements, or through the implementation of on-site Low and Zero Carbon technologies. However to satisfy the Local Plan target 20% of these savings should as far as feasible be offset by the implementation of Low or Zero Carbon technologies.

The calculations set out herein are based on the following specifications, which may be subject to change during detailed design and is therefore provided for illustration to show that compliance with the targets is achievable. The specifications below are those that have been modelled for the dwellings and are shown to illustrate that the scheme can satisfy the Planning requirements.

One of the primary aims of Part L1A 2013 was to reduce the resultant CO<sub>2</sub> emissions of a dwelling by 6% compared to Part L1A 2010, which was expected to roughly reflect a 40% improvement over dwellings built to 2002 standards.

#### Outcomes - Improved Fabric CO<sub>2</sub> Savings

Achieving Part L1A 2013 compliance through an enhanced fabric specification, without the reliance on Low or Zero Carbon Technologies, will ensure that the dwellings have low energy demands, helping towards the protection of occupants from energy price rises in the future.

Adopting the proposed Building Fabric Specifications and Energy Efficiency Measures alone follows the Energy Hierarchy of "being lean". Details of the U-Values used are given in Table 3.3 below.

Table 3.4 shows the outcomes from the Be Lean modelling on a block by block and site wide basis and confirms that this strategy will meet the requirements of Part L of the Building Regulations.

Table 3.3: U-Value comparison for all New-Building elements

Element	New Modelled Values U-Values (W/m2K)	Part L1A 2013 Limiting U- Values (W/m2K)	%age improvement on Part L1A 2013	Camden CP3 Limiting U- Values (W/m²K)	CP3 compliant ?
Walls	0.18	0.3	33%	0.2	Improvement
Floors	0.13	0.25	40%	0.2	Improvement
Exposed Roof	0.13	0.2	35%	0.13	Compliant
Windows / Doors	1.2 / 1.0	2.0	30%	1.5 / 1.0	Improvement

Table 3.4: Outcomes of Be Lean scenario in Tonnes CO2 per year

	TOTAL DER (Tonnes/CO <sub>2</sub> /m <sup>2</sup> )	TOTAL TER (Tonnes/CO <sub>2</sub> /m <sup>2</sup> )	% improvement
A Block	13.05	13.46	3.04%
P Block	33.85	34.76	2.60%
Site wide	46.91	48.22	2.72%

### Outcomes - Fabric Energy Efficiency Standard (FEES)

One of the key criteria we needed to achieve was the Part L requirement for Fabric Energy Efficiency Standard (FEES) compliance i.e. that the Dwelling FEE (DFEE) is lower than the Target FEE (TFEE). The FEES target measures the heating required in the dwelling assuming basic services and is denoted in kWh/m². The following table shows clearly that the FEES Standard is achieved separately in both block by a clear margin using the baseline specifications.

In all scenarios other than the baseline we have modelled the results with an improved air tightness of 3m<sup>3</sup>/hr/m<sup>2</sup> with the inclusion of some form of Mechanical Ventilation. This further improves the DFEE as shown in table 3.5.

Table 3.5: Impact of Be Lean scenario in Fabric Energy Efficiency Standard

	DFEE (kWh/m²)	TFEE (kWh/m²)	% improvement
A Block	47.76	56.13	14.90%
P Block	43.54	50.58	13.93%

# 3.5 Meeting the targets – Efficient Specifications

These U values above have been used for each of the scenarios modelled by Carbon Plan Engineering; each of which are detailed in Table 3.6 below.

Adopting these proposed Energy Efficiency Measures in Scenario 1 delivers the next step in the Energy Hierarchy of "being clean".

Table 3.6: Scenarios modelling in detail

	Scenario 1	Scenario 2	Scenario 3		
	Individual Gas Boilers	Communal Gas Boiler with 6kW(e) CHP	Communal Air Source Heat Pump with Gas Boilers		
Heating System	High efficiency condensing gas boiler (90% efficient)	Combined Heat and Power Heat Eff = 61% Electrical Eff = 28%	Specialist Air Source heat pumps  CoP = 4.25		
Controls	Improved heating system controls - time and temperature zone control by suitable arrangement of plumbing and electrical services				
DHW supply	From main heating system				
Ventilation	High efficiency Mechanical Ventilation with Heat Recovery (MVHR)				
Lighting	100% Low Energy Lighting has been specified				

Indicative drawings for Photovoltaic Layouts can be found in Appendix A of this document while typical plant room layouts can be seen in Appendix B for CHP and C for the ASHP solutions.

#### Outcomes - Scenario 1 - Specifying Efficient Services

In deploying the efficiency services note in Scenario 1 above we deliver to CO<sub>2</sub> savings as noted in table 3.7 below. While providing a significant benefit over Part L compliance this solution is well short of the required targets.

Table 3.7: Outcomes of Be Clean scenario in Tonnes CO<sub>2</sub> per year

	TOTAL DER (Tonnes/CO <sub>2</sub> /m <sup>2</sup> )	TOTAL TER (Tonnes/CO <sub>2</sub> /m <sup>2</sup> )	% improvement
A Block	11.93	13.46	11.36%
P Block	30.83	34.82	11.48%
Site wide	42.76	48.29	11.44%

# 3.6 Meeting the targets – Renewable Energy

To meet the proposed targets in all scenarios it will be necessary to install a Photovoltaic (PV) array using high efficiency panels connected to the landlords supply. A total array size of 21 kWp has been used in our modelling to help achieve the CO<sub>2</sub> emissions reduction targets required as this is the maximum array size that can be accommodated.

Adopting this proposed low and zero carbon technologies follow the next step in the Energy Hierarchy of "being green".

#### Outcomes - Scenario 1 - With 21 kWp Photovoltaic Electricity Generation

Appendix A to this report provides an indicative roof layout showing that a maximum of 70 panels can be accommodated. At 300 watts generation capacity per panel this equates to 21kWp and provides the further savings showing in Table 3.8.

Table 3.8: Outcomes of Be Clean scenario in Tonnes CO2 per year

	TOTAL DER (Tonnes/CO <sub>2</sub> /m <sup>2</sup> )	TOTAL TER (Tonnes/CO <sub>2</sub> /m <sup>2</sup> )	% improvement
A Block	9.73	13.46	27.74%
P Block	24.65	34.82	29.21%
Site wide	34.38	48.29	28.80%

#### Outcomes - Scenario 2 - Communal CHP system with 21kWp PV

The use of a communal heating system would not normally be considered on a project of this scale however because of its density and the lack of roof space we have investigated these option as a way to achieve the targets set out be Camden and GLA.

As noted the first communal heating option is to provide a plant area which will house a small circa 6kW (electrical): 22kW (thermal) Combined Heat and Power (CHP) generator delivering baseload thermal loads. The CHP will sit alongside significant thermal storage and peak load gas boilers to provide a robust and consistent supply of heat and hot water to the building.

The outcomes from this modelling provide the first scenario to achieve the 25% reduction target as shown in table 3.9.

Table 3.8: Outcomes of Be Clean scenario in Tonnes CO<sub>2</sub> per year

	TOTAL DER (Tonnes/CO <sub>2</sub> /m <sup>2</sup> )	TOTAL TER (Tonnes/CO <sub>2</sub> /m <sup>2</sup> )	% improvement
A Block	7.84	13.46	41.75%
P Block	19.88	34.82	42.91%
Site wide	27.72	48.29	42.58%

NOTE that the use of CHP changes the TER baseline slightly

Overall we anticipate that by running for approximately 6,000 hours per year the CHP system will delivering 43% of the thermal loads as calculated in SAP 2012. This solution however is not the preferred option because of the following:

- ☐ The CHP will generate electricity at the same times as the PV system thereby making one of them less economic
- The CHP system has relatively high maintenance costs for a project of this scale and for little financial benefit and these costs will have to be passed on in some form of service charge or unattractively high bills.

#### Outcomes - Scenario 3 - Communal ASHP system with 21kWp PV

The second, and preferred, communal heating option is to provide a plant area which will house a circa 27kW high efficiency, low temperature Air Source Heat Pump to provide pre-heating into a large buffer which would then be taken up to temperature by the Peak Load gas boilers.

This option is preferred because the maintenance on the ASHP systems is significantly lower than that of the CHP system and also the ASHP will be using electricity at the same time as the PV Array is generating electricity, therefore adding value to both.

The outcomes from this modelling also achieve the 25% reduction target as shown in table 3.10.

Table 3.10: Outcomes of Be Clean scenario in Tonnes CO2 per year

	TOTAL DER (Tonnes/CO <sub>2</sub> /m <sup>2</sup> )	TOTAL TER (Tonnes/CO <sub>2</sub> /m <sup>2</sup> )	% improvement
A Block	8.09	13.46	39.90%
P Block	20.51	34.82	41.10%
Site wide	28.60	48.29	40.77%

NOTE when modelling Heat Pumps we utilise the original Gas Boiler baseline as a TER as this allows us to compare the system impacts with the same fuel source

# 4.0 Overview of LZC Technologies

Below is a brief overview of the available LZC Technologies which are commonly used and are accepted as such by DECC and BRE. A traffic light system is used to denote whether the systems are technically appropriate for the development.

Description	Traffic Light
Technology is technically and economically feasible with few barriers to implementation	
Technology is technically and economically feasible, but there are barriers to implementation	
Technology is technically or economically unfeasible and has been discounted	

The table below outlines the justification behind the discounting of technologies. A detailed review of each technology can be found in the Appendices.

# 4.1 Discounted technologies

Below is the rationale for discounting each technology.

Technology	Description	Traffic Light
	In light of the configuration of the site and the character of the location, there is a risk that this technology will not receive consent from Local Planning Authorities because of potential noise, flicker and aesthetical issues.	
Small scale wind	Moreover, field trials have shown that small scale wind turbines often achieve much lower performances than expected in urban areas because of local wind turbulences.	
	As well as the maintenance cost of this system, there is also a risk that implementing small wind turbines on this development will be economically unviable.	
	Therefore, this technology has been discounted at this stage.	
Biomass	The implementation of a biomass heating system requires a large accessible space for fuel storage and the logistics of delivery could pose an issue in such a residential area. In addition to this the size and scale of the development also makes biomass ineffective.  Therefore, this solution has been discounted at this stage.	
Ground Source Heat Pumps (GSHP)	The implementation of a GSHP is more risky than the proposed solutions with the ground conditions being unknown. Moreover, a vertical ground loop will probably be required for this development which will be very capital intensive due to drilling costs.  Therefore it is discounted at this stage.	
Photovoltaic Thermal (PVt)	Hybrid solar systems that combine both photovoltaic cells with solar thermal collectors are an extremely effective technology. PV-t panels can be combined with a water to water heat pump in order to provide additional CO <sub>2</sub> offsets.  However, as this system is more expensive than the proposed solutions that satisfy the targets it has been discounted at this stage.	

# 4.2 LZC Technologies Considered Viable

The table below offers further solutions that are considered as potentially suitable for the development

#### Solar Photovoltaic cells (PV)



Photovoltaic Cells (PV) generate electricity from sunlight using semiconductor cells linked together to form a module. Electricity can still be generated in cloudy and overcast conditions, although more can be generated in direct sunlight.



The conditions that provide optimal generation in the UK are with South facing panels with a 30° elevation and no overshadowing which is possible on this site.

PV is considered a good solution for the development and follows the "be green" element of the London Plan.

A 21 kWp scheme will be installed on the rooftop.

#### **Advantages**

- Costs continue to fall as technology improves
- ☐ Many panels are guaranteed for 20-25 year lifetimes but are expected to last for longer
- Maintenance is low as panels are mostly cleaned by rainwater
- ☐ The technology has been existence for a long time and is well understood
- Low Planning Risk
- Easier and quicker to install compared to other LZCs
- The technology is currently eligible for the Feed in Tariff (FiT) however this is very low and MCS certification and a registration process is required to receive this

#### **Disadvantages**

Any shading can seriously impact the efficiency of the system. Careful consideration has been given to the current and future levels of shading (e.g. trees, service pipes/flues).

#### Air source heat pump (ASHP)



ASHPs extract heat from the surrounding air using a thermodynamic cycle. A wide range of Air Source Heat Pumps are currently available on the market.



ASHPs work better when the temperature of the air is closer to the temperature of the water they are delivering and so are less effective at delivering higher temperatures

An ASHP system can provide significant improvements above the Part L 2013 Baseline and is considered a good solution in combination with the Peak Load gas boiler for a communal heat system. Following this path for the development and would fulfil the "be green" element of the London Plan

For this reason the communal ASHP systems has been recommended A 27 kW communal ASHP is proposed in conjunction with Peak Load gas boiler.

#### **Advantages**

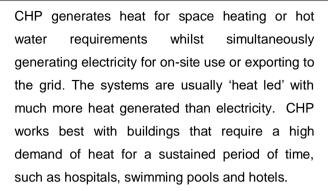
- Costs continue to fall as technology efficiencies improve
- No Local air pollution issues
- Maintenance is lower than that of CHP
- The technology has been existence for a long time and is well understood
- Low Planning Risk
- Easier and quicker to install compared to other LZCs
- As grid electricity decarbonises these systems will come closer to zero carbon than any other.

#### Disadvantages

Noise considerations need to be looked at carefully in both siting and specification

#### **Combined Heat & Power (CHP)**







Based on the SAP calculations it has been concluded that the size of the development and ultimately the heating loads are not ideal for the efficient operation of a CHP plant. Specifically, the loads are minimal and will not ensure that a CHP unit would operate for the optimal number of hours during the year to be financially feasible over its lifetime.

In the option modelled a small 6kW (electrical): 22kW (thermal) Combined Heat and Power (CHP) generator

#### **Advantages**

- Electricity generated from existing heating needs.
- ☐ Fewer transport/distribution losses than electricity from the grid.

#### **Disadvantages**

- Most suited to buildings with a prolonged high heating demand
- Works best when run for long hours to improve efficiency, therefore requiring a constant heat demand. In this instance, the CHP would not have large enough heat loads throughout the year to justify its implementation
- Regular expensive maintenance required and full overhaul after 10 to 15 years depending on yearly hours run
- Local air pollution should be considered in urban areas, even for a small unit such as this.

# 5.0 Proposed Solutions

As noted in Section 3 we have analysed in detail three potential solutions, all of which are technically feasible, and all of which have been measured against the same gas baseline.

### 5.1 Preferred Option – Communal ASHP, Gas Boiler plus PV

Using data from the SAP calculations with the specifications outlined in Section 3 the high efficiency fabric specification has been chosen to reduce the heat demands of the dwellings in the first instance. Further to that we propose that:

- ☐ A high efficient communal ASHPs installed to provide efficient and heat generation in combination with Peak Load gas boilers.
- ☐ The dwellings include MVHR units for ventilation, recovering heat to further reduce space heating demands with integral summer bypass to mitigate summer overheating
- Each unit will include a smart meter to support the growth of demand side response.

The resultant savings from all of measures proposed in the preferred solution are presented in Table 5.1 below:

Table 5.1: Proposed solution for New-Build dwellings - Individual technology CO<sub>2</sub> savings

	Technology	Details	tCO <sub>2</sub> saved
<u>being lean</u>	Enhanced Building Fabric	Highly energy efficient building fabric	1.31
being clean	High efficiency services	High efficiency services and MVHR	4.15
Being green	Low and Zero Carbon Technology  High efficiency ASHP to provide HVAC with time and temperature zonal controls and a 21kWp PV array		13.64
	TOTAL		19.62

Table 5.1 above shows that the enhanced building fabric with ASHP, the installation MVHR and a 21 kWp PV array provide a saving of over 19.62 tCO<sub>2</sub>/yr.

# 5.2 Alternative Option - Communal CHP, Gas Boiler plus PV

In this scenario all fabric specifications remain as with the first, however in this case a Combined Heat and Power (CHP) unit to deliver heat to the communal heating system.

The key issue with the deployment of a CHP system would be the size of the development, 28 units, effectively creating an undersized landlord demand and is therefore not economic. They are also significantly more costly than ASHP systems and would only be pursued where the ASHP system was not shown to be technically feasible.

#### 6.0 Recommendations and Results

At this time and with the information we have to hand our recommendation is the implementation of a communal heating system to distribute heat and hot water to each of the 28 flats.

In order to keep the operational costs for this at a reasonable level we recommend that an 27kW ASHP with Peak Load Gas Boilers is implemented in conjunction with a 21kWp Photovoltaic array.

The following tables set out the results from the analysis and are self-explanatory and show that the project at Gondar Gardens is fully compliant with the policy goals we are seeking to achieve.

Table 6.1: Table to show regulated CO<sub>2</sub> emissions

Regulated CO <sub>2</sub> Emissions	Regulated CO <sub>2</sub> emissions (tCO <sub>2</sub> /yr)	Saved CO <sub>2</sub> emissions (tCO <sub>2</sub> /yr)	% Reduction
Baseline Emissions (Part L 2013)	48.22	0.00	0.00%
Stage 1 Be Lean	46.91	1.31	2.72%
Stage 2 Be Clean	42.76	5.46	11.32%
Stage 3 Be Green	28.60	19.62	40.68%

Table 6.1 shows the overall reduction in regulated emissions achieved is 19.62 tCO<sub>2</sub>/yr.

This is equivalent to a 40.68% reduction, exceeding the GLA London Plan target of 35%

Table 6.2 shows that is equivalent to an 20.65% reduction in regulated and unregulated emissions

Table 6.2: Regulated & Unregulated CO2 emissions after each stage of the Energy Hierarchy

Un-regulated CO <sub>2</sub> Emissions	Regulated CO <sub>2</sub> emissions	Saved CO <sub>2</sub> emissions	% Reduction (Regulated)	Inc. Unregulated CO <sub>2</sub> emissions	% Reduction (Inc Unregulated)
Baseline Emissions (Part L1A 2013)	48.22	0.00	0.00%	94.97	0.00%
Be Lean (BER no LZC)	46.91	1.31	2.72%	93.66	1.38%
Be Clean	42.76	5.46	11.32%	89.52	5.75%
Be Green (LZC)	28.60	19.62	40.68%	75.36	20.65%

The outcomes of implementing the preferred option set out in this strategy are detailed below on a site wide basis across the development:

Table 1.1b: New-Build dwellings total tCO<sub>2</sub>/yr for each hierarchy stage

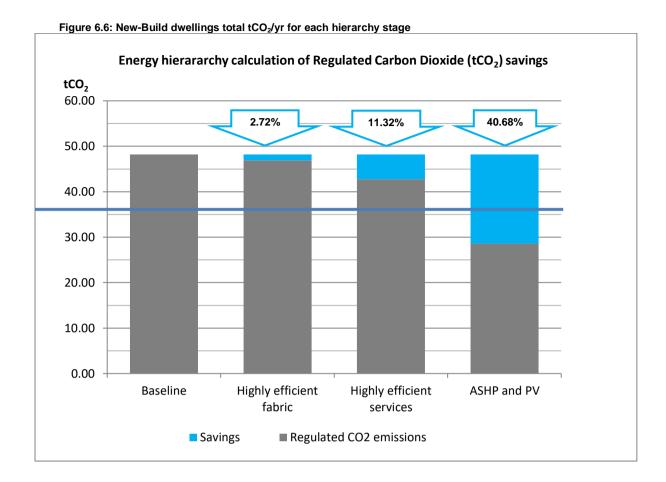
		Be Lean	Be Clean	Be Green
Regulated CO <sub>2</sub> Emissions	Baseline CO <sub>2</sub> Emissions	Proposed Gas baseline Building (DER)	Proposed Gas baseline Building (DER)	Proposed Building (DER)
Total Regulated (tCO <sub>2</sub> /yr)	48.22	46.91	42.76	28.60
%age Reduction over Baseline	N/A	2.72%	11.32%	40.68%
%age Reduction from LZC alone	N/A	N/A	8.84%	33.11%

As shown in the tables above, the implementation of the proposed solution should ensure an improvement of 40.68% for the development.

In summary, the proposed strategy offers the following savings from enhanced building fabric specifications and Low and Zero Carbon Technologies:

- □ A 40.68% reduction in <u>regulated</u> CO<sub>2</sub> emissions over the Part L1A 2013 baseline from fabric specifications, energy efficient services and the implementation of Low & Zero Carbon technologies (LZC).
- A 33.11% reduction in <u>regulated</u> emissions from Low & Zero Carbon technologies (LZC) including the ASHPs and Solar Photovoltaic Panels (PV) in line with the Camden policy
- A **5.75**%% reduction in all site CO<sub>2</sub> (<u>regulated & unregulated</u>) emissions from the Part L1A 2013 from improved fabric specification before any Low & Zero Carbon technologies (LZC).
- A 20.65%% reduction in all site CO<sub>2</sub> (<u>regulated & unregulated</u>) emissions from improved fabric specifications and Low & Zero Carbon technologies compared to the Baseline emissions.

The scheme has incorporated the GLA's guidance and will deliver the target, as far as is feasible on site, the targets set out for Major Developments in the current London Plan.



The scheme also meets all of the Camden policy targets set out in the recently published Minor Modifications to the Draft Camden Local Plan.

Target	Target type	Satisfied
Part L1A 2013	Actual	YES
19% CO <sub>2</sub> reduction over Part L 2013 Building Regulations.	Aspirational	YES
20% reduction in CO <sub>2</sub> from on-site renewable energy generation.	Aspirational	YES

#### 7.0 Cash in-lieu

From October 2016 London Plan policy 5.2 requires major residential developments to achieve zero carbon (with at least 35% reduction achieved through on-site measures). The remaining regulated carbon emissions (to 100%) are to be offset through a cash in lieu contribution.

In view of the Viability Assessment undertaken for the Minor Alterations London Plan the Council considers £1,800 per tonne of carbon (30 years) to be appropriate (both residential and non-residential development).

The scheme has incorporated the GLA's guidance and is to deliver the target as far as feasible on site, beyond this negotiations for a 'cash in lieu' payment for any residual tonnes of CO<sub>2</sub> that cannot be abated onsite if this is deemed necessary by the Council.

This equates to roughly £51,483 for LB Camden to ring fenced to secure delivery of carbon dioxide savings elsewhere (in line with London Plan policy 5.2E)

# 8.0 Part L overheating

Building Regulations (Part L) Overheating Part L of the Building Regulations focuses on levels of solar gain permitted into a space through facade / glazing. Under Part L1A for residential development this is expressed as a range of risk. To note, this criterion of Part L is not mandatory, i.e. it is not a strict requirement but is seen as good design practice.

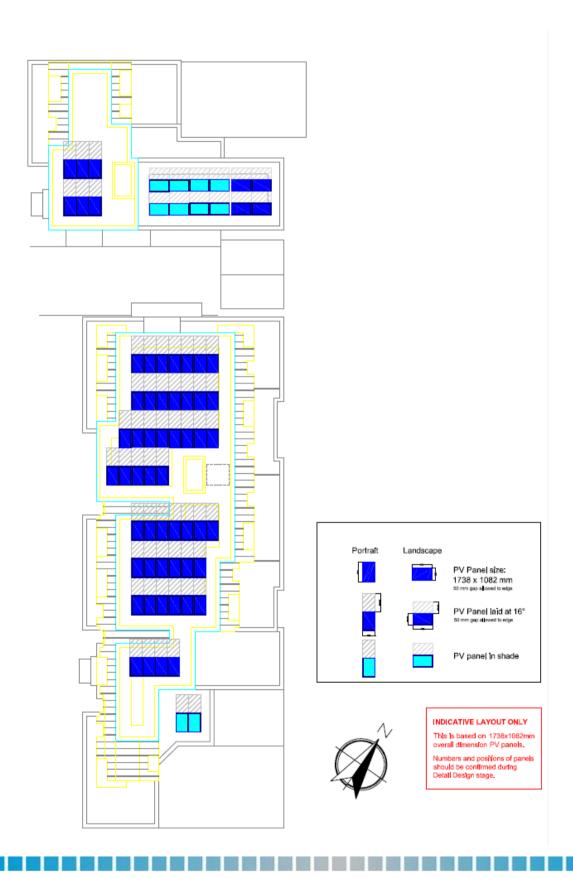
Each apartment is to be mechanically ventilated with Heat recovery. This will be enabled to run in summer bypass at night to create night time cooling.

The window glazing will be installed with this in mind by using a glass with high g-values and Low-E coatings. Purge ventilation through glazing openings is to comply with Building Regulations Part F.

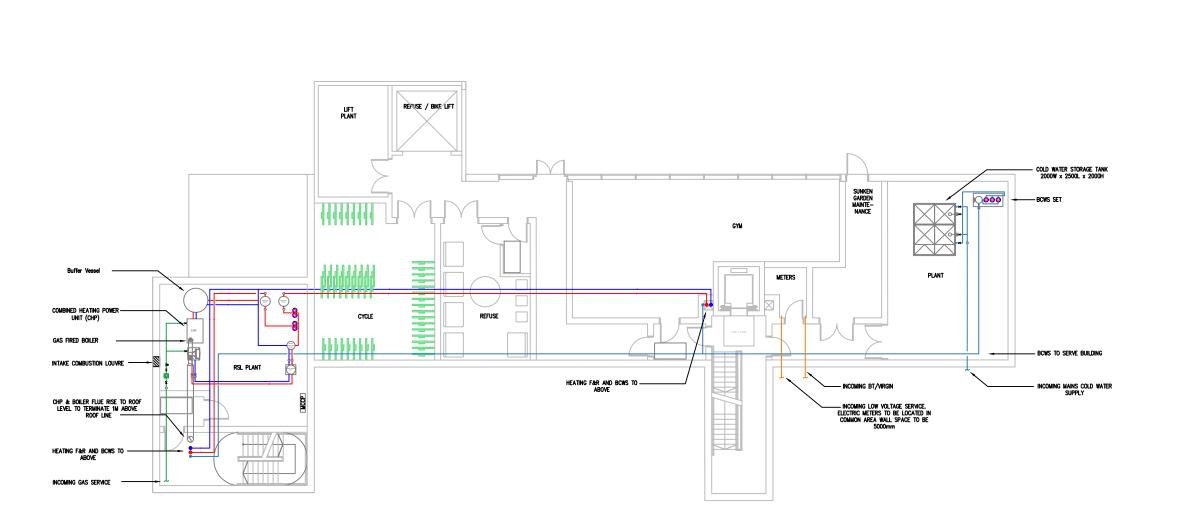
For Building Control and Part L of the Building Regulations the dwellings have a 'slight' to 'medium' overheating risk, this is acceptable to demonstrate compliance. To be demonstrated through the design development stage

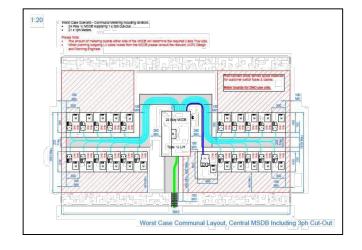
# **Appendix A: PV Layout**

The indicative drawing below identifies the number of PV Panels that could be accommodated on the top roof of the building.



# **Appendix B: CHP Plant room Layout**







Notes:

Woodhead House, Woodhead Road, Birstall, Leeds, West Yorkshire, WF17 9TD Tel: 0113 8155 558 Engineering@carbonplan.co.uk

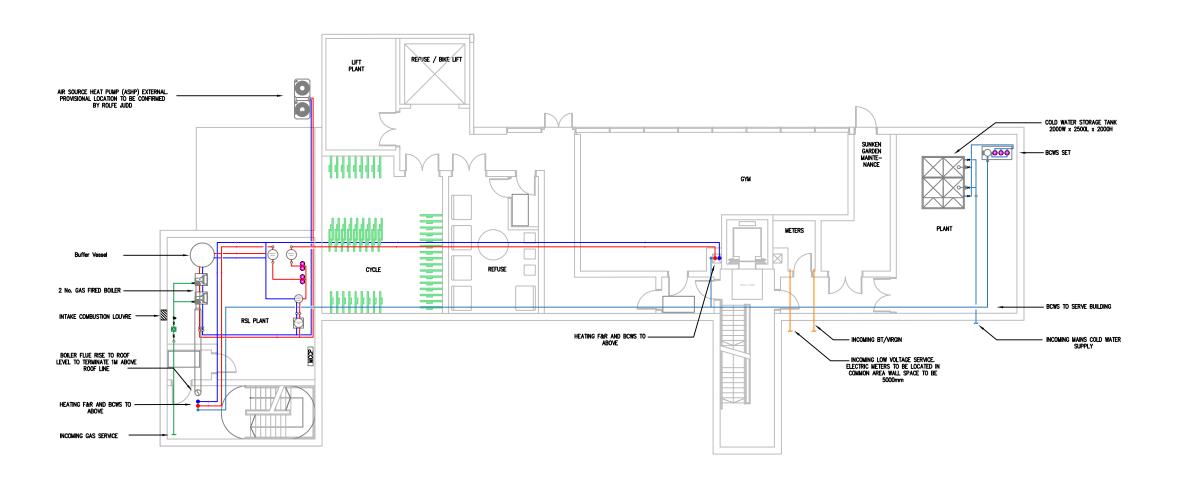
Gondar Gardens

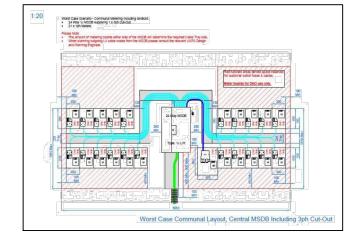
Gondar Gardens Reservoir Gondar Gardens London

Basement Plant Room Layout — CHP option

Scale	19-07-18	MB	DC	
1:100 @A1	GG-01-	SK01	Α	
				-

# **Appendix C: ASHP Plant room Layout**







Notes:

Woodhead House, Woodhead Road, Birstall, Leeds, West Yorkshire, WF17 9TD Tel: 0113 8155 558 Engineering@carbonplan.co.uk

Gondar Gardens

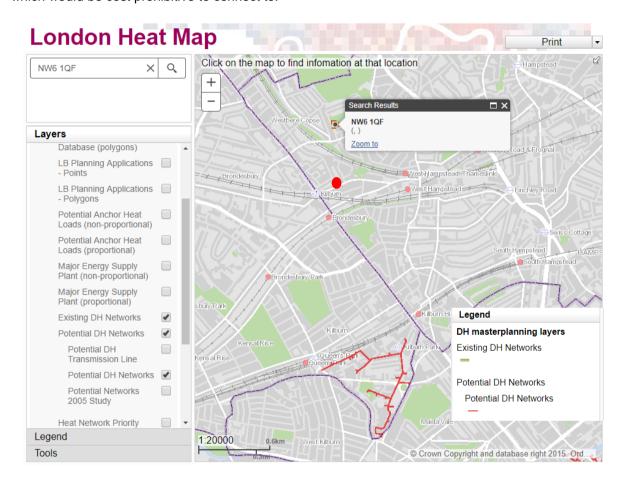
Gondar Gardens Reservoir Gondar Gardens London

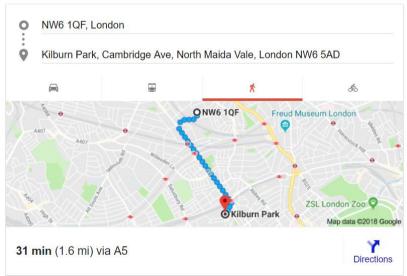
Basement Plant Room Layout — ASHP option

Scale 19-07-18 MB DC 1:100 GG-01-SK02 A

# **Appendix D: Connection to offsite District Heating**

As part of the CHP feasibility the London Heat Map tool was consulted and there are at present no existing CHP networks that can feasibly be connected to, as shown in the screen shot below. The potential (red line) is a potential future DH network not currently in existence and is 1.6miles away which would be cost prohibitive to connect to.





# **Appendix E: SAP summary worksheets**

The following table sets out the details of the SAP calculation based upon the preferred solution of communal ASHP with peak load boilers and Photovoltaic array.

	Total					24
SAP Name	Floor Area	DER	TER	DFEE	TFEE	% improvement
H1	228.12	10.09	16.37	58.70	67.80	38.39%
H2	215.83	8.34	13.84	47.80	54.30	39.71%
P1	119.63	8.92	15.42	38.50	47.10	42.12%
P2	107.83	9.49	16.12	39.70	48.40	41.12%
P3	74.01	10.99	23.82	42.50	81.40	53.86%
P4	94.70	8.51	13.79	32.70	34.00	38.25%
P5	97.60	8.33	13.59	32.20	33.60	38.69%
P6	83.09	9.34	14.72	34.90	35.90	36.54%
A9	88.79	9.43	15.64	37.40	43.70	39.69%
A10	83.09	11.32	18.26	45.00	53.50	38.02%
P7	49.09	11.52	18.26	35.10	39.10	36.92%
P8	54.20	10.83	17.65	33.30	38.50	38.64%
P9	94.22	9.21	15.27	37.50	43.10	39.71%
P10	74.01	10.50	16.53	39.90	43.80	36.49%
P11	119.09	9.02	15.74	40.80	50.80	42.71%
P12	116.15	10.32	17.02	47.20	56.80	39.38%
P13	134.33	9.95	16.60	48.10	58.30	40.08%
P14	115.72	10.87	18.09	50.70	63.10	39.94%
P15	78.35	11.22	18.42	44.70	54.60	39.08%
P16	54.62	14.44	22.12	55.50	63.80	34.71%
A1	85.60	10.83	17.63	43.40	51.60	38.58%
A2	166.62	9.34	15.32	48.80	56.90	39.02%
A3	68.93	11.34	17.85	41.90	47.90	36.45%
A4	93.61	10.09	16.46	42.00	49.50	38.67%
A5	94.43	10.17	16.71	42.40	50.50	39.14%
A6	92.10	10.51	17.13	44.10	52.50	38.67%
A7	77.46	12.26	20.75	49.50	66.10	40.91%
A8	71.04	14.12	22.59	59.10	74.00	37.49%

#### **Appendix F: SAP TER worksheets**

			User D	otaile: -						
Assessor Name:	Joseph Treanor		-userL	Strom:	a Num	her:		STRC	0032062	
Software Name:	Stroma FSAP 20			Softwa					on: 1.0.4.14	
			roperty .	Address		0.0				
Address :	, Gondar Gardens		·							
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m	3)
Basement			8	85.6	(1a) x	2	55	(2a) =	218.28	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(	1e)+(1r	n) = [	85.6	(4)			<b>-</b>		
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	218.28	(5)
2. Ventilation rate:										
	main heating	secondar 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	T + [	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans					3	x -	10 =	30	(7a)
Number of passive vents	5				Ė	0	x ·	10 =	0	(7b)
Number of flueless gas f	ires					0	X 4	40 =	0	(7c)
-					_					`
								Air cl	nanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	7a)+(7b)+(	7c) =		30		÷ (5) =	0.14	(8)
If a pressurisation test has I		nded, procee	d to (17), o	otherwise o	ontinue fr	om (9) to	(16)			_
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration	05 (		0.05 (-				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timbe present, use the value con				•	uction			0	(11)
deducting areas of openi		csporiding to	Tiro groat	or wan are	a (anci					
If suspended wooden	floor, enter 0.2 (unse	ealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter (	)							0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	• • • • • • • • • • • • • • • • • • • •	, , ,	. ,		0	(16)
Air permeability value,	• •		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•								0.39	(18)
Air permeability value applie Number of sides sheltere		nas been doi	ne or a deg	gree air pei	meability	is being u	sed			(19)
Shelter factor	<del>s</del> u			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.33	(21)
Infiltration rate modified	•	ed							0.00	
Jan Feb	Mar Apr Ma	1	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp	peed from Table 7				-				<b>-</b>	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
W. J. F. (22.)	100) 4		•	•			•		_	
Wind Factor (22a)m = $(2^{23})^{m}$	<del>'</del>	0.05	0.05	0.00	4	1.00	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	J	

0.42	0.41	e (allowi	0.36	0.35	0.31	0.31	0.3	0.33	0.35	0.37	0.39		
Calculate effe		_	rate for t	he appli	cable ca	se	ļ			!			
If mechanica											Į	0	(2:
If exhaust air h		0 11		, ,	, ,	. ,	,, .	`	) = (23a)		ļ	0	(2
If balanced with		•		_								0	(2
a) If balance					<b>.</b>	<del>- ` `                                 </del>	<del>- ^ `</del>	<del>```</del>	<del> </del>	<del></del>	<del>- `                                   </del>	÷ 100]	(-
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance					i	<del></del>	<del>- ^ ` ` </del>	<del>í `</del>	<del> </del>	<del>-                                    </del>	1		(0
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h		tract ven ‹ (23b), t		•					5 x (23h	<b>5)</b>			
$\frac{11(220)1}{24c)m} = 0$	0.5 7	0	0	0	0	0	0	0	0	0	0		(2
d) If natural			,		<u> </u>			<u> </u>					`
,		en (24d)		•	•				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		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(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
2 Hoot losse	c and be	oot loog r	paramata	or:									
3. Heat losse					NInt An		Historia		A V I I		l	Δ.	V I.
LEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-k		X k J/K
Vindows Type		,			9.47		/[1/( 1.4 )+	0.04] =	12.55	<u></u>			(2
Vindows Type	e 2				2.39	x1.	/[1/( 1.4 )+	0.04] =	3.17				(2
Vindows Type	3				2.39	x1.	/[1/( 1.4 )+	0.04] =	3.17				(2
loor					85.6	x	0.13	¦	11.128			7 [	(2
Valls Type1	76.1	4	14.2	5	61.89	x	0.18	╡┇	11.14	<b>=</b>		1	` (2
Valls Type2	13.8		0		13.89	=	0.18	╡┇	2.5	<b>=</b>		1	` (2
otal area of e					175.6	=	00						\` (3
arty wall		,			16.77	_	0		0	<b>—</b> [		<b>-</b>	(3
for windows and	l roof wind	ows. use e	ffective wi	ndow U-va						L as aiven in	paragraph	3.2	(~
* include the area								2(	, ]	3	7-3-3-4		
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				43.66	(3
leat capacity	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	14717.45	(3
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium	[	250	(3
or design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
an be used inste				ioina An	ا بنام مم	/					Г		
بملمئه ما امممسما					-	`						10.04	(3
hermal bridge	ai briaging	are not kn	OWII (30) =	= 0.15 X (3	1)			(33) +	(36) =			53.7	(3
details of therma										(25)m x (5)	L )	55.1	
details of therma	at loss	alculated	monthly	/						, , , , , , , , , , , , , , , , , , , ,			
details of therma otal fabric he entilation hea	at loss				Jun	Jul	Aua	<del>-                                    </del>	Oct	Nov			
details of therma	at loss	Mar 41.88	Monthly Apr 40.74	May 40.53	Jun 39.54	Jul 39.54	Aug 39.36	Sep 39.92	Oct 40.53	Nov 40.96	Dec 41.41		(3
details of thermal otal fabric herentilation head sense.    Jan	at loss cat	Mar 41.88	Apr	May			Ť	Sep 39.92	40.53	40.96	Dec		(3
details of therma otal fabric he entilation hea	at loss cat	Mar 41.88	Apr	May			Ť	Sep 39.92		40.96	Dec		(;

Heat loss para	meter (l	-II P) W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.12	1.12	1.12	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.11	1.11		
(13)										Sum(40) <sub>1</sub> .		1.1	(40)
Number of day	s in mo	nth (Tabl	e 1a)						worago	<b>G</b> a(10)1.			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		<u> </u>						<u> </u>	<u>I</u>	l .	<u> </u>		
4 10/2/2012 201	•										130/1./		
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	49 x (TF	FA -13.9)	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		56		(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		.01		(43)
Jan Hot water usage ir	Feb	Mar Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
		· ·					, ,	1	1		<del></del>		
(44)m= 104.52	100.71	96.91	93.11	89.31	85.51	85.51	89.31	93.11	96.91	100.71	104.52		<b></b>
Energy content of	hot water	used - cald	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x D	Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1140.17	(44)
(45)m= 154.99	135.56	139.88	121.95	117.02	100.98	93.57	107.37	108.66	126.63	138.22	150.1		
								-	Total = Su	m(45) <sub>112</sub> =	=	1494.94	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46 <sub>)</sub>	) to (61)					
(46)m= 23.25	20.33	20.98	18.29	17.55	15.15	14.04	16.11	16.3	18.99	20.73	22.52		(46)
Water storage													
Storage volum	e (litres)	) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage		oolorod l	ana fant	ar io kao	(Id\A/k	2/dox4).							(40)
a) If manufact				or is kno	wn (Kvvr	ı/day):					0		(48)
Temperature fa											0		(49)
Energy lost fro		-	-		:		(48) x (49)	) =			0		(50)
<ul><li>b) If manufacte</li><li>Hot water stora</li></ul>			-										(51)
If community h	•			C 2 (KVV)	i/iitiC/GC	·y <i>)</i>					0		(31)
Volume factor	_										0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	. kWh/ve	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (		•	,, ,				`		•		0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41):	m				
	0	0	0	0	0		0	0	0	0	0		(56)
(56)m= 0  If cylinder contains			-		0 x [(50) – (	0 H11)] ÷ (5			-		_	ix H	(30)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	e H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

				<b></b>	<b></b>	(								
Combi loss ca	1		1	<u> </u>	,	· ` `		. <u>.</u> T	45.00	40.00	1 40.00		1	(64)
(61)m= 50.96	46.03	49.39	45.92	45.51	42.17	43.58	45.5		45.92	49.39	49.32	50.96		(61)
<u>.</u>							<del>`</del>	_	i		<del>`</del>	<del>`´</del>	(59)m + (61)m	(22)
(62)m= 205.95	181.59	189.27	167.87	162.53	143.15	137.15	152.		154.57	176.01	187.54	201.06		(62)
Solar DHW input of										r contribu	tion to wate	er heating)		
(add additiona						<del> </del>	<del>i                                      </del>	ix G)		_	<del></del>		1	(20)
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output from w				-							1	1	1	
(64)m= 205.95	181.59	189.27	167.87	162.53	143.15	137.15	152.	!_	154.57	176.01	187.54	201.06		<b>1</b>
											er (annual) <sub>1</sub>		2059.58	(64)
Heat gains from	m water	heating,			5 ´ [0.85	× (45)m	+ (6	1)m]	+ 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m= 64.27	56.58	58.86	52.03	50.29	44.12	42.01	47.0	8	47.61	54.45	58.29	62.65		(65)
include (57)	m in calc	culation of	of (65)m	only if c	ylinder i	s in the	dwelli	ng oi	r hot w	ater is f	rom com	munity h	eating	
5. Internal ga	ains (see	Table 5	and 5a	):										
Metabolic gain	s (Table	5), Wat	ts										_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
(66)m= 128.03	128.03	128.03	128.03	128.03	128.03	128.03	128.	03	128.03	128.03	128.03	128.03		(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	ee Ta	able 5				•	
(67)m= 21.3	18.92	15.38	11.65	8.71	7.35	7.94	10.3	32	13.86	17.59	20.53	21.89		(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	also s	see Tal	ole 5			•	
(68)m= 230.75	233.14	227.11	214.26	198.05	182.81	172.63	170.	23	176.26	189.11	205.33	220.57		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), also	see	Table	5			ı	
(69)m= 35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	_	35.8	35.8	35.8	35.8		(69)
Pumps and far	ns gains	(Table 5	 5a)			1						1	I	
(70)m= 3	3	3	3	3	3	3	3	$\top$	3	3	3	3	]	(70)
Losses e.g. ev	anoratio	n (nega	tive valu	L es) (Tah	le 5)	<u> </u>	<u> </u>				<u> </u>	<u> </u>	I	
(71)m= -102.42		-102.42		-102.42	-102.42	-102.42	-102.	42 -	102.42	-102.42	-102.42	-102.42		(71)
Water heating											1	1	I	` /
(72)m= 86.39	84.2	79.11	72.26	67.59	61.27	56.46	63.2	98	66.12	73.19	80.96	84.21	1	(72)
` '			72.20	07.00			L				71)m + (72)	<u> </u>		()
<b>Total internal</b> (73)m= 402.84	400.66	386.01	362.58	338.75	315.84	301.44	308.		320.65	344.3	371.22	391.07	1	(73)
6. Solar gains		300.01	302.30	330.73	313.04	301.44	300.	24 \	320.03	344.3	37 1.22	391.07		(10)
Solar gains are of		using sola	r flux from	Table 6a	and assoc	iated equa	ations to	o conv	vert to th	e applical	ble orientat	tion.		
Orientation: A		•	Area		Flu	•			9_		FF		Gains	
	Table 6d	aoto.	m <sup>2</sup>			ble 6a			ble 6b	Т	able 6c		(W)	
East 0.9x	1	x	9.4	17	x ·	19.64	] <sub>x</sub> [	(	0.63	7 x [	0.7		56.84	(76)
East 0.9x	1	X	2.3		<b>—</b>	19.64	] x		0.63		0.7	╡ .	14.35	](76)
East 0.9x	1	x	2.3			19.64	] ^		0.63	^ L x [	0.7	=	14.35	](76)
East 0.9x	1	x	9.4			38.42	] ^		0.63	^ x [	0.7	<del>- </del>	111.19	](76)
East 0.9x				==	-		1 7			╡╞		=		-
Last 0.9X	1	Х	2.3	59	x	38.42	X	(	0.63	Х	0.7	=	28.06	(76)

East	0.9x	1		х	2.39	l x		8.42	1 x		0.63	7 x	0.7		28.06	(76)
East	0.9x	1	=	^ X	9.47	^   x		3.27	] ^ ] <sub>x</sub>		0.63	」^! □	0.7	$\dashv $	183.12	(76)
East	0.9x	1		^ x	2.39	] ^   x		3.27	] ^ ] x		0.63	」^¦ ┐	0.7	<del>-</del> -	46.22	(76)
East	0.9x	1	=	x	2.39	] ^   x		3.27	] ^ ] x		0.63	_ ^     x	0.7	╡ -	46.22	(76)
East	0.9x	1	=	x	9.47	] ^ ] <sub>x</sub>		2.28	] ^ ] x		0.63	」 ^	0.7		267.07	(76)
East	0.9x	1	_	^ x		] ^   x			] ^ ] x			」^! □ x !		<del>-</del> -		(76)
East	0.9x	1	=	^ x	2.39	^   x		2.28	] ^ ] x		0.63	」^! □ x !	0.7	╣	67.4	(76)
East	0.9x	1	_	^ x	9.47	] ^ ] x	<b>—</b>	13.09	] ^ ] x		0.63	」^! □	0.7	$\dashv $	327.31	(76)
East	0.9x	1	_	^ x	2.39	] ^   x		13.09	] ^ ] x		0.63	」^┆ ┐ х	0.7	<del>-</del> -	82.6	(76)
East	0.9x	1	=	^ x	2.39	] ^ ] x		13.09	] ^ ] x		0.63	」^! □	0.7	╣	82.6	(76)
East	0.9x	1		x	9.47	] ^ ] <sub>x</sub>	-	15.77	] ^ ] x		0.63	」^! □ x	0.7	= =	335.06	(76)
East	0.9x	1	_	x	2.39	] ^   x		15.77	] ^ ] x		0.63	<b> </b>	0.7	╡ -	84.56	(76)
East	0.9x	1	=	x	2.39	] ^   x	<u> </u>	15.77	] ^ ] <sub>x</sub>		0.63	」 ^	0.7		84.56	(76)
East	0.9x	1		^ x	9.47	] ^ ] <sub>x</sub>	-	10.22	] ^ ] x		0.63	」^! □ x !	0.7	= -	318.99	(76)
East	0.9x	<u>'</u> 1		x	2.39	] ^   x		10.22	] ^ ] x		0.63	」 ^	0.7	╡ -	80.51	(76)
East	0.9x	1	=	^ x	2.39	] ^ ] <sub>x</sub>	<b>—</b>	10.22	] ^ ] x		0.63	」^! □ × !	0.7	╡ -	80.51	(76)
East	0.9x	1		^ x	9.47	] ^ ] <sub>x</sub>		4.68	] ^ ] x		0.63	」^! □ x !	0.7	= -	274.01	(76)
East	0.9x	1	=	^ x	2.39	] ^   x		4.68	] ^ ] x		0.63	」^! □ x	0.7	<del>-</del> -	69.15	(76)
East	0.9x	1		^ x	2.39	] ^ ] <sub>x</sub>	<b>—</b>	4.68	] ^ ] x		0.63	」^! □ × !	0.7	$\dashv $	69.15	(76)
East	0.9x			^ x		) ]			] ^ ] x			」^! □ x i		╡ -		(76)
East	0.9x	1	=	^ x	9.47	l X		3.59	] ^ ] x		0.63	」^! □	0.7	╡ -	212.98	(76)
East	0.9x	1	=		2.39	l X		3.59	] ]		0.63	╡╏	0.7	=	53.75	(76)
East	0.9x C	1		X	2.39	l X		3.59	] X ] v		0.63	_	0.7	╡ -	53.75	╡` (
East	0.9x C	1	=	X	9.47	l X		5.59	] X ] ,		0.63	_	0.7	╡ -	131.94	(76)
East	0.9x C	1	=	X	2.39	l X l		5.59	] X ] ,		0.63	」× ¬∵	0.7	┥ -	33.3	
East	<u> </u>	1		X	2.39	l X	-	5.59	] X ] ,		0.63	」× ¬∵	0.7	_ =	33.3	(76)
East	0.9x 0.9x	1	==	X	9.47	l X		4.49	] X ] ,		0.63	」× ¬ ,	0.7	_ =	70.88	(76) (76)
East	<u> </u>	1		X	2.39	X 		4.49	] X ]		0.63	_ X	0.7	_ =	17.89	= '
East	0.9x 0.9x	1		X	2.39	X I		4.49	X 1		0.63	X   	0.7	=	17.89	(76)
East	<u> </u>	1		X	9.47	X 		6.15	] X ]		0.63	X	0.7	=	46.74	(76)
East	0.9x	1	==	X	2.39	X		6.15	X		0.63	X	0.7	=	11.8	(76)
Lasi	0.9x	1		X	2.39	X	1	6.15	X		0.63	X	0.7	=	11.8	(76)
Color (	raina in	watta a	مامينامد	٠ م <b>ا</b>	for oach man	<b>.</b> h			(02)~		.m.(74)m	(02)~				
(83)m=	85.53	167.32	275.55	_	for each mon 401.88 492.53	$\neg$	504.18	480	412	$\overline{}$	320.48	198.54	106.65	70.34	1	(83)
					(84)m = $(73)$ n				<u> </u>						_	, ,
(84)m=	488.38	567.98	661.56	_	764.46 831.2	_	320.02	781.44	720	.55	641.13	542.84	477.87	461.41	1	(84)
7 Ma	an inter	nal temr	oratur	o (	heating seaso	m)					!					
					eriods in the li		area	from Tal	ole 9	Th1	1 (°C)				21	(85)
•		•	_	•	ving area, h1,	_				,	. ( •)					(22)
2 11100	Jan	Feb	Mar	$\neg$	Apr May	Ť	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	1	
(86)m=	1	1	0.99	$\dagger$	0.96 0.86	$\top$	0.68	0.52	0.5		0.84	0.98	1	1	1	(86)
Mean	interna	temper	ature i	 ∩ li	ving area T1	(foll	ow sto	ns 3 to 7	7 in T	able			1	!	J	
(87)m=	19.77	19.92	20.19	$\neg$	20.54 20.82	Ì	20.96	20.99	20.		20.88	20.5	20.07	19.74	1	(87)
` '			<u> </u>											<u> </u>	1	

_									(0.0)					
			neating p				i		<del>``</del>					(00)
(88)m=	19.98	19.99	19.99	20	20	20.01	20.01	20.01	20.01	20	20	19.99		(88)
	Г		ains for				i		- <u></u>					(00)
(89)m=	1	0.99	0.98	0.94	0.81	0.6	0.4	0.46	0.77	0.97	1	1		(89)
Mean		· ·	i			<del>, ` `</del>	i		7 in Tabl	e 9c)				
(90)m=	18.34	18.56	18.96	19.46	19.83	19.98	20.01	20.01	19.91	19.42	18.79	18.31		(90)
									f	fLA = Livin	g area ÷ (4	4) =	0.36	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	18.86	19.06	19.4	19.85	20.19	20.34	20.36	20.36	20.26	19.81	19.25	18.83		(92)
Apply	adjustn	nent to t	he mear		temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.86	19.06	19.4	19.85	20.19	20.34	20.36	20.36	20.26	19.81	19.25	18.83		(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	
ine ui	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
l Itilies			ains, hm		iviay	Juli	Jui	Aug	Sep	Oct	INOV	Dec		
(94)m=	1	0.99	0.98	0.94	0.82	0.63	0.45	0.5	0.79	0.97	0.99	1		(94)
	L Il gains.		, W = (94											` '
(95)m=	486.93	564.19	648.85	715.52	683.49	513.78	348.07	363.28	507.98	524.15	474.93	460.38		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able 8	<u> </u>							
(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 me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
(97)m=	1398.29	1356.34	1233.3	1034.55	799.75	535.01	350.98	368.67	577.05	867.87	1150.47	1391.19		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
(98)m=	678.05	532.33	434.83	229.7	86.5	0	0	0	0	255.73	486.39	692.53		
								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	3396.06	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								39.67	(99)
9a. En	ergy red	uiremer	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
	e heatir					,	<u>_</u>		/					
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1								93.4	(206)
	•	•	ry/suppl			g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊒ ∍ar
Space			ement (c				l oui	7 tag	ОСР	001	1101	D00	KVVIII y C	·ui
	678.05	532.33	434.83	229.7	86.5	0	0	0	0	255.73	486.39	692.53		
(211)m	) = {[(98	)m x (20	)4)] } x 1	00 ÷ (20	16)	ļ	ļ							(211)
(211)	725.96	569.95	465.55	245.93	92.62	0	0	0	0	273.8	520.76	741.46		(= )
			l .			<u> </u>	<u> </u>	Tota	l (kWh/yea	ar) =Sum(2			3636.04	(211)
Space	e heatin	a fuel (s	econdar	v) kWh/	month							ļ		` ′
•		•	00 ÷ (20	• , .										
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
			•					Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)
0.	-0 A D 004	0.\/===:-	. 4 0 4 4 4 4	(CAD 0 00)	http://w	+							Paga	

Output from water heater (calculated above)  205.95   181.59   189.27   167.87   162.53   1	43.15 137.15	152.89	154.57	176.01	187.54	201.06		
Efficiency of water heater	40.10	102.00	104.07	170.01	107.54	201.00	80.3	(21
	80.3 80.3	80.3	80.3	85.99	87.34	87.91	00.5	'۔' 21)
Fuel for water heating, kWh/month								
219)m = (64)m x 100 ÷ (217)m		, ,						
219)m= 234.5   207.29   217.36   195.56   194.55   1	78.27 170.79	190.39	192.5	204.69	214.72	228.71		1
		lotai	= Sum(2	19a) <sub>112</sub> =			2429.32	(21
Annual totals Space heating fuel used, main system 1				k'	Wh/yeaı	r I	<b>kWh/year</b> 3636.04	1
						l I		] 1
Nater heating fuel used							2429.32	_
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(23
boiler with a fan-assisted flue						45		(23
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(23
Electricity for lighting						ĺ	376.14	(23
40 000 : :						L		
12a. CO2 emissions – Individual heating system	s including m	icro-CHP						
12a. CO2 emissions – Individual heating system		icro-CHP		Emiss	ion fac	tor	Emissions	
12a. CO2 emissions – Individual heating system	Energy kWh/year			<b>Emiss</b> kg CO		tor	Emissions kg CO2/yea	r
12a. CO2 emissions – Individual heating system  Space heating (main system 1)	Energy				2/kWh	tor = [		r ](26
ŭ ,	<b>Energy</b> kWh/year			kg CO	2/kWh		kg CO2/yea	,
Space heating (main system 1)	Energy kWh/year			kg CO	2/kWh	= [	kg CO2/yea	(26
Space heating (main system 1) Space heating (secondary) Vater heating	Energy kWh/year (211) x (215) x		264) =	0.2 0.5	2/kWh	= [	kg CO2/yea 785.38 0 524.73	](26 ](26
Space heating (main system 1) Space heating (secondary) Vater heating Space and water heating	Energy kWh/year (211) x (215) x (219) x		264) =	0.2 0.5 0.2	2/kWh 16 19	= [	kg CO2/yea 785.38 0 524.73	](26 ](26 ](26
Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x (219) x (261) + (262)		264) =	0.2 0.5	2/kWh 16 19 16	= [ = [ = [	kg CO2/yea 785.38 0 524.73	](26

TER =

(273)

18.04

		llser	Details:				
Assessor Name:	Joseph Treanor	0301	Stroma N	ımher	STRO	032062	
Software Name:	Stroma FSAP 2012		Software			n: 1.0.4.14	
		Propert	y Address: A2				
Address :	, Gondar Gardens, Lo	ndon, NW6	1HG				
1. Overall dwelling dime	nsions:						
		Ar	ea(m²)	Av. Height(	m)	Volume(m³)	)
Basement			87.17 (1a)	x 2.55	(2a) =	222.28	(3a)
Ground floor			79.45 (1b)	х 3	(2b) =	238.35	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+	·(1n)	166.62 (4)				
Dwelling volume			(3a)·	+(3b)+(3c)+(3d)+(3e)	)+(3n) =	460.63	(5)
2. Ventilation rate:							
	heating hea	ondary ating	other	total		m³ per hou	_
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			4	x 10 =	40	(7a)
Number of passive vents				0	x 10 =	0	(7b)
Number of flueless gas fi	res			0	x 40 =	0	(7c)
					Air ch	anges per ho	ur
Infiltration due to chimne	vs, flues and fans = (6a)-	+(6b)+(7a)+(7b)	+(7c) =	40	÷ (5) =	0.09	(8)
•	een carried out or is intended,				( )	0.00	(/
Number of storeys in the	ne dwelling (ns)					0	(9)
Additional infiltration					[(9)-1]x0.1 =	0	(10)
	.25 for steel or timber fra		•			0	(11)
if both types of wall are pi deducting areas of openir	resent, use the value correspo ngs); if equal user 0.35	naing to the gre	eater wall area (afte	er			
=	loor, enter 0.2 (unsealed	d) or 0.1 (sea	aled), else ente	r 0		0	(12)
If no draught lobby, en	ter 0.05, else enter 0				ĺ	0	(13)
Percentage of windows	s and doors draught strip	ped				0	(14)
Window infiltration			0.25 - [0.2 x (14	) ÷ 100] =		0	(15)
Infiltration rate			(8) + (10) + (11)	+ (12) + (13) + (15)	=	0	(16)
•	q50, expressed in cubic	•		e metre of envelo	ope area	5	(17)
If based on air permeabil						0.34	(18)
	s if a pressurisation test has b	een done or a c	legree air permeal	oility is being used	ı		7(40)
Number of sides sheltere Shelter factor	eu		(20) = 1 - [0.075	5 x (19)] =		0.85	(19)
Infiltration rate incorporat	ing shelter factor		$(21) = (18) \times (20)$		[ [	0.85	(21)
Infiltration rate modified for	-		· / · · · / · · ·	•	l	0.23	(~')
Jan Feb	Mar Apr May	Jun Jul	Aug S	ep Oct N	ov Dec		
l l			<u> </u>	• 1 1			
Monthly average wind sp	eed from Table 7						

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

Wind Factor (22a)m = (22)m ÷ 4									
(22a)m= 1.27 1.25 1.23 1.1	1.08	0.95 0.	.95 0.92	1	1.08	1.12	1.18		
				<u> </u>	<u> </u>				
Adjusted infiltration rate (allowing for s		i_	<del></del>	<del>`</del>		0.00			
0.37   0.36   0.35   0.31  Calculate effective air change rate for	the applica	<b>I</b>	.27 0.26	0.29	0.31	0.32	0.34		
If mechanical ventilation:	шо арриос							0	(23a)
If exhaust air heat pump using Appendix N,	23b) = (23a) :	× Fmv (equat	tion (N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced with heat recovery: efficiency in	% allowing for	in-use factor	(from Table 4h	) =				0	(23c)
a) If balanced mechanical ventilatio	n with heat	recovery (	(MVHR) (24a	a)m = (22)	2b)m + (2	23b) × [1	I – (23c)	÷ 100]	<u>-</u>
(24a)m= 0 0 0 0	0	0 (	0 0	0	0	0	0		(24a)
b) If balanced mechanical ventilation	n without h	eat recove	ery (MV) (24b	o)m = (22	2b)m + (2	23b)			
(24b)m= 0 0 0 0	0	0 (	0 0	0	0	0	0		(24b)
c) If whole house extract ventilation	•	•							
if (22b)m < 0.5 × (23b), then (24	<del>, ` ` ` </del>		<del>`                                    </del>	ŕ	<u> </u>		i		4-11
(24c)m = 0 0 0 0	0		0 0	0	0	0	0		(24c)
d) If natural ventilation or whole hou if (22b)m = 1, then (24d)m = (22b)m					0.51				
11 (225)111 - 11 (11611 (244)111 - (224	0.55	<u> </u>	0.54 + (2)	0.54	0.55	0.55	0.56		(24d)
Effective air change rate - enter (24				<u> </u>	0.00	0.00	0.00		,
(25)m= 0.57 0.56 0.56 0.55	0.55		.54 0.54	0.54	0.55	0.55	0.56		(25)
					l				
3. Heat losses and heat loss parame		Not Area			A V I I		المراجع الما		A V I.
<b>ELEMENT</b> Gross Openi		Net Area A ,m²	U-val W/m2		A X U (W/ł	<b>(</b> )	k-value kJ/m²-ł		A X k kJ/K
<b>ELEMENT</b> Gross Openi	ngs			2K		<) 			
ELEMENT Gross Openiarea (m²)	ngs	A ,m²	W/m2	2K · 0.04] = [	(W/ł	<) 			kJ/K
ELEMENT Gross Openiarea (m²) Windows Type 1	ngs	A ,m <sup>2</sup>	W/m2 x1/[1/( 1.4 )+	$2K$ $0.04 = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	(W/k	<) 			kJ/K (27)
ELEMENT Gross Openiarea (m²) Windows Type 1 Windows Type 2	ngs	A ,m <sup>2</sup> 4.92 4.92	W/m2 x1/[1/( 1.4 )+ x1/[1/( 1.4 )+	2K $0.04] = [$ $0.04] = [$ $0.04] = [$	6.52 6.52	<) 			kJ/K (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3	ngs	A ,m <sup>2</sup> 4.92 4.92 2.39	W/m2 x1/[1/( 1.4 )+ x1/[1/( 1.4 )+ x1/[1/( 1.4 )+	$ \begin{array}{l} 2K \\ 0.04 \\ 0.0$	6.52 6.52 3.17	<)			kJ/K (27) (27) (27)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4	ngs	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32	W/m2 x1/[1/( 1.4 )+ x1/[1/( 1.4 )+ x1/[1/( 1.4 )+ x1/[1/( 1.4 )+	$\begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix}$	6.52 6.52 3.17 9.7	<)			kJ/K (27) (27) (27) (27)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5	ngs	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76	W/m2 x1/[1/( 1.4 )+	$\begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \end{bmatrix} \end{array}$	6.52 6.52 3.17 9.7 6.31	<)			kJ/K (27) (27) (27) (27) (27)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Windows Type 6	ngs	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76 2.39	W/m2 x1/[1/( 1.4 )+	$\begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix}$	(W/F 6.52 6.52 3.17 9.7 6.31 3.17	<)			kJ/K (27) (27) (27) (27) (27) (27) (27)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Windows Type 6  Windows Type 7  Windows Type 8	ngs	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76 2.39 4.76 2.39	W/m2 x1/[1/( 1.4 )+	$\begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \end{bmatrix} \end{array}$	(W/F 6.52 6.52 3.17 9.7 6.31 3.17 6.31 3.17				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Windows Type 6  Windows Type 7  Windows Type 8  Floor Type 1	ngs	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76 2.39 4.76 2.39 87.17	W/m2 x1/[1/( 1.4 )+	$\begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \\ \\ $	(W/F 6.52 6.52 3.17 9.7 6.31 3.17 6.31 3.17				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Windows Type 6  Windows Type 7  Windows Type 8  Floor Type 1  Floor Type 2	ngs n²	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76 2.39 4.76 2.39 87.17 6.96	W/m2 x1/[1/( 1.4 )+	PK  0.04] = [ 0.	(W/F 6.52 6.52 3.17 9.7 6.31 3.17 6.31 3.17 11.3321 0.9048				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Floor Type 1 Floor Type 2 Walls Type 1  86.29  Openia area (m²)  Openia area (m²)	ngs n² [ [ [ [ [	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76 2.39 4.76 2.39 87.17 6.96 71.83	W/m2 x1/[1/( 1.4 )+ x	2K 0.04] = [ 0.04] = [	(W/F 6.52 6.52 3.17 9.7 6.31 3.17 6.31 3.17 11.3321 0.9048 12.93				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 81.09 Openia area (m²)	ngs n² [ [ [ [ 46 ]	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76 2.39 4.76 2.39 87.17 6.96 71.83 56.92	W/m2 x1/[1/( 1.4 )+ x	2K 0.04] = [ 0.04] = [	(W/F 6.52 6.52 3.17 9.7 6.31 3.17 6.31 3.17 11.3321 0.9048 12.93				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 43.85 Openia Ope	ngs n² [ [ [ [ [ 46]	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76 2.39 4.76 2.39 87.17 6.96 71.83 56.92 43.85	W/m2 x1/[1/( 1.4 )+ x	2K • 0.04] = [ • 0.04] = [ = 0.04] = [	(W/F 6.52 6.52 3.17 9.7 6.31 3.17 6.31 3.17 11.3321 0.9048 12.93 10.25 7.89				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Roof Type1 15.5 Openia	ngs n² [ [ [ [ 46 ]	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76 2.39 4.76 2.39 87.17 6.96 71.83 56.92 43.85 15.5	W/m2 x1/[1/( 1.4 )+ x	RK  0.04] = [ 0.	(W/F 6.52 6.52 3.17 9.7 6.31 3.17 6.31 3.17 11.3321 0.9048 12.93 10.25 7.89				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 7 Windows Type 1 Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Roof Type1 15.5 Roof Type2 6.22	ngs n² [ [ [ [ 46 ]	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76 2.39 4.76 2.39 87.17 6.96 71.83 56.92 43.85 15.5 6.22	W/m2 x1/[1/( 1.4 )+ x	2K 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = 0.04] = [ = = [ = = [ = = [	(W/F 6.52 6.52 3.17 9.7 6.31 3.17 6.31 3.17 11.3321 0.9048 12.93 10.25 7.89				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Roof Type1 15.5 Openia	ngs n² [ [ [ [ 46 ]	A ,m <sup>2</sup> 4.92 4.92 2.39 7.32 4.76 2.39 4.76 2.39 87.17 6.96 71.83 56.92 43.85 15.5	W/m2 x1/[1/( 1.4 )+ x	RK  0.04] = [ 0.	(W/F 6.52 6.52 3.17 9.7 6.31 3.17 6.31 3.17 11.3321 0.9048 12.93 10.25 7.89				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)

\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S (A \times U)$ (33)97.34 Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =21850.18 (34)Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Medium (35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K 17.66 (36)if details of thermal bridging are not known (36) =  $0.15 \times (31)$ Total fabric heat loss (33) + (36) =(37)115 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Jan Feb Mar Apr Mav Jun Jul Oct Nov Dec Aug Sen (38)86.13 85.74 85.35 83.54 81.63 81.63 81.34 82.23 83.89 (38)m =83.2 83.2 84.61 Heat transfer coefficient, W/K (39)m = (37) + (38)m 197.23 198.2 201.13 200.74 200.35 198.54 198 2 196.63 196.63 196 33 198.89 (39)m =199.6 (39)Average =  $Sum(39)_{1...12}/12=$ 198.54 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.21 1.2 1.2 1.19 1.19 1.18 1.18 1.18 1.18 1.19 1.19 (40)m =12 (40)Average =  $Sum(40)_{1...12}/12=$ 1.19 Number of days in month (Table 1a) Feb Mar May Jan Jun .lul Aug Sep Oct Nov Dec Apr 31 30 (41)(41)m =31 4. Water heating energy requirement: kWh/vear: Assumed occupancy, N 2.96 (42)if TFA > 13.9, N = 1 + 1.76 x [1 -  $exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 104.45 (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) Oct Jan Feb Mar Apr May Jun Jul Aug Sep Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =114.9 110.72 106.54 102.36 98.19 94.01 94.01 98.19 102.36 106.54 110.72 114.9 (44)Total =  $Sum(44)_{1...12}$  = 1253.44 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 =170.39 149.02 153.78 134.07 128.64 111.01 102.87 118.04 119.45 139.21 151.96 165.01 1643.45 (45)Total =  $Sum(45)_{1...12}$  = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 22.35 (46)(46)m =25.56 23.07 20.11 19.3 16.65 15.43 17.71 17.92 20.88 22.79 24.75 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (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): (48)0 Temperature factor from Table 2b 0 (49)

Energy lost from v	ater storage	e, kWh/y	ear			(48) x (49)	) =			0		(50)
b) If manufacture		•										
Hot water storage If community heat			le 2 (KVV	h/litre/da	ay)					0		(51)
Volume factor from	•	1011 4.3								0	1	(52)
Temperature factor		e 2b								0		(53)
Energy lost from v	ater storage	e. kWh/v	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (54)	_	z,	· ·			· / (- )	, (- , (	,		0		(55)
Water storage los	calculated	for each	month			((56)m = (	55) × (41)ı	m			ı	
(56)m= 0	0 0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains de	icated solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit los	s (annual) fr	om Table	e 3							0		(58)
Primary circuit los	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by fac	tor from Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calcul	ated for each	n month	(61)m =	(60) ÷ 36	65 × (41)	)m	<u>-</u>	-	-	-		
(61)m= 50.96 40	.03 50.96	49.32	50.03	46.36	47.91	50.03	49.32	50.96	49.32	50.96		(61)
Total heat require	d for water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
<del></del>	5.05 204.74	183.38	178.68	157.37	150.77	168.07	168.77	190.17	201.27	215.97		(62)
Solar DHW input calcu	ated using Apr	endix G o	r Appendix	H (negati	ı ve quantity	) (enter '0	' if no sola	r contributi	ion to wate	r heating)	l	
(add additional lin										3,		
(63)m= 0	0 0	0	0	0	0	0	0	0	0	0		(63)
Output from water	heater			ļ.			!	Į.	ļ.			
(64)m= 221.35 19	5.05 204.74	183.38	178.68	157.37	150.77	168.07	168.77	190.17	201.27	215.97		
				!		Outp	out from wa	ater heate	r (annual)₁	12	2235.6	(64)
Heat gains from w	ater heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	1	_
	.06 63.87	56.91	55.28	48.5	46.18	51.76	52.05	59.03	62.85	67.61		(65)
include (57)m ir	calculation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	i leating	
5. Internal gains	(see Table	5 and 5a	):	•		-				·		
Metabolic gains (	`		,									
	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 147.9 14	7.9 147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9		(66)
Lighting gains (ca	culated in A	ppendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		I.		l	
(67)m= 30.14 20	.77 21.77	16.48	12.32	10.4	11.24	14.61	19.61	24.9	29.06	30.98		(67)
Appliances gains	calculated i	n Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5	•	•	•	
(68)m= 338.09 34	1.59 332.75	313.93	290.18	267.85	252.93	249.42	258.26	277.08	300.84	323.17		(68)
Cooking gains (ca	culated in A	ppendix	L, equat	tion L15	or L15a)	), also se	ee Table	5		•	•	
(69)m= 37.79 3°	.79 37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79		(69)
Pumps and fans (	ains (Table	5a)		•							•	
(70)m= 3					3	3	,	3	3	3		(70)
Losses e.g. evapo	3 3	3	3	3			3					
0 1		ļ				<u> </u>	3					
(71)m= -118.32 -11	ration (nega	ıtive valu			-118.32	-118.32		-118.32	-118.32	-118.32		(71)

Water	heating	gains (T	able 5)												
(72)m=	93.27	90.86	85.85	79.04	74.3	67.3	62.07	69.	57 72.29	79.3	87.3	90.	87		(72)
Total i	nternal	gains =					(66)m + (67)n	n + (68	3)m + (69)m	+ (70)m	+ (71)m + (7	'2)m		'	
(73)m=	531.87	529.6	510.74	479.82	447.17	415.	98 396.61	403	.97 420.5	3 451.	69 487.57	7 515	.39		(73)
6. So	ar gains	S:													
Solar g	ains are c	alculated	using sola	r flux from	Table 6a	and as	sociated equa	ations	to convert to	the appl	icable orient	tation.			
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  Table 6d m² Table 6a Table 6b Table 6c												Gains (W)			
East	0.9x	1	х	4.7	76	х	19.64	x	0.63	х	0.7		=	28.57	(76)
East	0.9x	1	X	2.3	39	х	19.64	X	0.63	х	0.7		=	14.35	(76)
East	0.9x	1	X	4.7	76	x	19.64	X	0.63	х	0.7		=	28.57	(76)
East	0.9x	1	X	2.3	39	x	19.64	X	0.63	X	0.7		=	14.35	(76)
East	0.9x	1	X	4.7	<b>7</b> 6	x	38.42	X	0.63	X	0.7		=	55.89	(76)
East	0.9x	1	X	2.3	39	x	38.42	X	0.63	X	0.7		=	28.06	(76)
East	0.9x	1	X	4.7	<b>'</b> 6	x	38.42	X	0.63	X	0.7		=	55.89	(76)

38.42

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134.24

67.4

164.52

82.6

164.52

82.6

168.41

84.56

168.41

84.56

160.34

80.51

160.34

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137.73

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137.73

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	_		_						ı				_
East	0.9x	1	X	4.76	X	73.59	X	0.63	X	0.7	=	107.05	(76)
East	0.9x	1	X	2.39	X	73.59	X	0.63	X	0.7	=	53.75	(76)
East	0.9x	1	X	4.76	X	73.59	X	0.63	X	0.7	=	107.05	(76)
East	0.9x	1	X	2.39	X	73.59	X	0.63	X	0.7	=	53.75	(76)
East	0.9x	1	X	4.76	X	45.59	X	0.63	X	0.7	=	66.32	(76)
East	0.9x	1	X	2.39	X	45.59	X	0.63	X	0.7	=	33.3	(76)
East	0.9x	1	X	4.76	X	45.59	X	0.63	x	0.7	=	66.32	(76)
East	0.9x	1	X	2.39	X	45.59	X	0.63	X	0.7	=	33.3	(76)
East	0.9x	1	X	4.76	X	24.49	X	0.63	X	0.7	=	35.62	(76)
East	0.9x	1	X	2.39	x	24.49	X	0.63	X	0.7	=	17.89	(76)
East	0.9x	1	x	4.76	x	24.49	X	0.63	x	0.7	=	35.62	(76)
East	0.9x	1	X	2.39	x	24.49	X	0.63	x	0.7	] =	17.89	(76)
East	0.9x	1	x	4.76	x	16.15	X	0.63	x	0.7	=	23.5	(76)
East	0.9x	1	X	2.39	x	16.15	X	0.63	x	0.7	=	11.8	(76)
East	0.9x	1	X	4.76	x	16.15	X	0.63	x	0.7	] =	23.5	(76)
East	0.9x	1	X	2.39	x	16.15	x	0.63	x	0.7	=	11.8	(76)
South	0.9x	0.77	X	7.32	x	46.75	x	0.63	x	0.7	=	104.59	(78)
South	0.9x	0.77	X	7.32	x	76.57	X	0.63	x	0.7	] =	171.29	(78)
South	0.9x	0.77	x	7.32	x	97.53	x	0.63	x	0.7	] =	218.19	(78)
South	0.9x	0.77	X	7.32	x	110.23	X	0.63	x	0.7	=	246.6	(78)
South	0.9x	0.77	X	7.32	x	114.87	X	0.63	X	0.7	=	256.98	(78)
South	0.9x	0.77	X	7.32	x	110.55	x	0.63	x	0.7	=	247.31	(78)
South	0.9x	0.77	X	7.32	x	108.01	x	0.63	x	0.7	] =	241.63	(78)
South	0.9x	0.77	x	7.32	x	104.89	x	0.63	x	0.7	=	234.66	(78)
South	0.9x	0.77	x	7.32	x	101.89	X	0.63	x	0.7	=	227.93	(78)
South	0.9x	0.77	X	7.32	X	82.59	X	0.63	X	0.7	=	184.75	(78)
South	0.9x	0.77	x	7.32	x	55.42	X	0.63	X	0.7	=	123.97	(78)
South	0.9x	0.77	X	7.32	x	40.4	X	0.63	X	0.7	=	90.37	(78)
West	0.9x	0.77	X	4.92	x	19.64	X	0.63	x	0.7	=	29.53	(80)
West	0.9x	0.77	X	4.92	x	19.64	X	0.63	x	0.7	] =	29.53	(80)
West	0.9x	0.77	x	2.39	x	19.64	X	0.63	x	0.7	=	43.04	(80)
West	0.9x	0.77	X	4.92	x	38.42	X	0.63	x	0.7	=	57.77	(80)
West	0.9x	0.77	X	4.92	x	38.42	X	0.63	x	0.7	] =	57.77	(80)
West	0.9x	0.77	x	2.39	x	38.42	X	0.63	x	0.7	=	84.19	(80)
West	0.9x	0.77	x	4.92	x	63.27	X	0.63	x	0.7	=	95.14	(80)
West	0.9x	0.77	x	4.92	x	63.27	X	0.63	x	0.7	=	95.14	(80)
West	0.9x	0.77	x	2.39	x	63.27	x	0.63	x	0.7	=	138.65	(80)
West	0.9x	0.77	x	4.92	x	92.28	x	0.63	x	0.7	=	138.75	(80)
West	0.9x	0.77	x	4.92	x	92.28	x	0.63	x	0.7	=	138.75	(80)
West	0.9x	0.77	×	2.39	x	92.28	x	0.63	x	0.7	=	202.21	(80)
West	0.9x	0.77	x	4.92	x	113.09	x	0.63	x	0.7	] =	170.05	(80)

\\/a=+			_						1								٦
West	0.9x	0.77	×	4.9		X		13.09	X 1		0.63	×	0.7	<b>-</b>	<u> </u>	170.05	(80)
West	0.9x	0.77	X	2.3	9	X	1	13.09	X		0.63	X	0.7	<u></u>		247.81	(80)
West	0.9x	0.77	X	4.9	2	X	1	15.77	X		0.63	X	0.7	'	=	174.07	(80)
West	0.9x	0.77	X	4.9	2	X	1	15.77	X		0.63	X	0.7	:		174.07	(80)
West	0.9x	0.77	X	2.3	9	X	1	15.77	X		0.63	X	0.7	:		253.68	(80)
West	0.9x	0.77	X	4.9	2	X	1	10.22	X		0.63	X	0.7	:		165.73	(80)
West	0.9x	0.77	X	4.9	2	X	1	10.22	X		0.63	X	0.7		=	165.73	(80)
West	0.9x	0.77	X	2.3	9	X	1	10.22	X		0.63	X	0.7	-	-	241.52	(80)
West	0.9x	0.77	X	4.9	2	X	9	4.68	X		0.63	X	0.7	-	-	142.36	(80)
West	0.9x	0.77	X	4.9	2	X	9	4.68	X		0.63	X	0.7	:	-	142.36	(80)
West	0.9x	0.77	X	2.3	9	X	9	4.68	X		0.63	x	0.7		=	207.46	(80)
West	0.9x	0.77	X	4.9	2	X	7	3.59	x		0.63	x	0.7		=	110.65	(80)
West	0.9x	0.77	x	4.9	2	X	7	3.59	x		0.63	x	0.7	-	-	110.65	(80)
West	0.9x	0.77	x	2.3	9	X	7	3.59	x		0.63	x	0.7	-	-	161.25	(80)
West	0.9x	0.77	x	4.9	2	X	4	5.59	x		0.63	x	0.7		-	68.55	(80)
West	0.9x	0.77	x	4.9	2	X	4	5.59	x		0.63	x	0.7		- 🗀	68.55	(80)
West	0.9x	0.77	x	2.3	9	X	4	5.59	x		0.63	x	0.7		- 🔚	99.9	(80)
West	0.9x	0.77	x	4.9	2	X	2	4.49	x		0.63	x	0.7		-	36.82	(80)
West	0.9x	0.77	x	4.9	2	X	2	4.49	x		0.63	x	0.7		- 🔚	36.82	(80)
West	0.9x	0.77	x	2.3	9	X	2	4.49	х		0.63	x	0.7		-	53.66	(80)
West	0.9x	0.77	x	4.9	2	X	1	6.15	x		0.63	x	0.7		- 💳	24.29	(80)
West	0.9x	0.77	x	4.9	2	X	1	6.15	X		0.63	×	0.7	<b>=</b>	-	24.29	(80)
West	0.9x	0.77	x	2.3	9	Х	1	6.15	X		0.63	x	0.7			35.39	(80)
	L	-					<u> </u>		1								<b>」</b> ` '
Solar o	ains in	watts, cald	culated	for each	n montl	า			(83)m	ı = Sı	um(74)m .	(82)m					
(83)m=	292.52		823.64	1129.61	1339.13	$\overline{}$	355.08	1296.28	1140	0.59	932.08	620.98	358.3	244.9	2		(83)
Total g	ains – i	nternal an	d solar	(84)m =	(73)m	+ (	83)m	, watts	•	•	•		•	•	_		
(84)m=	824.39	1068.52 1	1334.38	1609.43	1786.3	17	771.06	1692.89	1544	1.55	1352.61	1072.6	7 845.87	760.3	1		(84)
7. Me	an inter	nal tempe	rature	(heating	seaso	n)											
		during he					area f	rom Tab	ole 9,	, Th′	1 (°C)				П	21	(85)
•		tor for gai	•			_					, ,						
	Jan	Feb	Mar	Apr	May	T	Jun	Jul	A	ug	Sep	Oct	Nov	De	С		
(86)m=	1	1	0.99	0.95	0.84	1	0.67	0.5	0.5	_	0.83	0.98	1	1			(86)
Mean	interna	l temperat	ture in I	living are	ea T1 (	follo	w ste	ns 3 to 7	7 in T	ahle	9c)		Į.	1	_		
(87)m=	19.59	<del></del>	20.11	20.51	20.81	$\overline{}$	20.96	20.99	20.		20.87	20.43	19.93	19.55	5		(87)
									<u> </u>								
(88)m=	19.91	during he	19.92	19.93	19.93	_	9.94	19.94	19.	$\overline{}$	12 (°C) 19.93	19.93	19.93	19.92			(88)
									L	94	19.93	19.93	19.93	19.92			(00)
		tor for gai				$\overline{}$			<del>–</del>	<del></del> i			<u> </u>	1	_		(0.0)
(89)m=	1	1	0.98	0.93	0.79		0.57	0.39	0.4	14	0.76	0.97	1	1			(89)
Mean	interna	l temperat	ture in t	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9c)			_		
(90)m=	18.02	18.32	18.79	19.36	19.75	1	9.91	19.93	19.	93	19.83	19.27		17.98	3		(90)
											f	LA = Liv	ing area ÷ (	4) =		0.29	(91)

Managista and the second of Wardham halls of alliance (A. (A. (B.A.), TO.	
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 18.48 18.75 19.18 19.7 20.06 20.22 20.24 20.24 20.14 19.61 18.94 18.44	(92)
	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 18.48 18.75 19.18 19.7 20.06 20.22 20.24 20.24 20.14 19.61 18.94 18.44	(93)
8. Space heating requirement	(00)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate	
the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:  (94)m=	(94)
Useful gains, hmGm , W = (94)m x (84)m	(= -)
(95)m= 822.94 1062.09 1305.83 1488.1 1424.92 1061.01 710.45 742.64 1046.54 1035.41 842.19 759.4	(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= 2852.23 2780.95 2540.58 2143.68 1657.19 1104.27 716.48 754.07 1190.32 1785.61 2354.41 2842.02	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 1509.79 1155.07 918.65 472.02 172.81 0 0 0 558.14 1088.8 1549.47	
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> = 7424.76	(98)
Space heating requirement in kWh/m²/year 44.56	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	
Fraction of space heat from secondary/supplementary system 0	(201)
Fraction of space heat from main system(s) (202) = 1 - (201) = 1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$	(204)
Efficiency of main space heating system 1	(206)
	╡`
Efficiency of secondary/supplementary heating system, % 0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/ye	ear
Space heating requirement (calculated above)  1509.79 1155.07 918.65 472.02 172.81 0 0 0 558.14 1088.8 1549.47	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	(211)
1616.48 1236.7 983.56 505.37 185.02 0 0 0 597.58 1165.74 1658.96	7(044)
Total (kWh/year) =Sum(211) <sub>15,1012</sub> = 7949.42	(211)
Space heating fuel (secondary), kWh/month	
$= \{ [(98)m \times (201)] \} \times 100 \div (208)$ $(215)m =                                   $	
Total (kWh/year) =Sum(215) <sub>15,1012</sub> = 0	(215)
	(210)
Water heating Output from water heater (calculated above)	
221.35 195.05 204.74 183.38 178.68 157.37 150.77 168.07 168.77 190.17 201.27 215.97	
Efficiency of water heater 80.3	(216)
(217)m= 88.97 88.79 88.37 87.33 84.97 80.3 80.3 80.3 87.6 88.66 89.03	<b>—</b>
	(217)
Fuel for water heating, kWh/month	(217)
$(219)m = (64)m \times 100 \div (217)m$	(217)
•	(217)

Annual totals		kWh/year	kWh/year
Space heating fuel used, main system 1		KVVII/yeai	7949.42
Water heating fuel used			2610.34
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	n)(230g) =	75 (231)
Electricity for lighting			532.29 (232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	1717.08 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	563.83 (264)
Space and water heating	(261) + (262) + (263) + (264) =		2280.91 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	276.26 (268)
Total CO2, kg/year	sum	of (265)(271) =	2596.09 (272)

TER =

(273)

15.58

			User D	) otoilo:						
Assessor Name:	Joseph Treanor		USEI L	Strom:	a Num	ber:		STRC	0032062	
Software Name:	Stroma FSAP 2			Softwa				Versio	on: 1.0.4.14	
		Р	roperty .	Address	А3					
Address :	, Gondar Gardens	s, London,	NW6 1H	HG						
1. Overall dwelling dime	ensions:									
Basement			_	a(m²) 88.93	(1a) x		<b>ight(m)</b> .55	(2a) =	Volume(m <sup>3</sup>	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(	1e)+(1r	າ) ြ	88.93	(4)			J		
Dwelling volume	, , , , , , , ,	, (	′	.0.00		)+(3c)+(3c	d)+(3e)+	.(3n) =	175.77	(5)
2. Ventilation rate:									170.77	
2. Ventuation rate.	main	seconda	у	other		total			m³ per hou	r
Number of chimneys	heating +	heating 0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	Ī + [	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans					2	x ·	10 =	20	(7a)
Number of passive vents	S				F	0	x ·	10 =	0	(7b)
Number of flueless gas f	ires				Ė	0	x	40 =	0	(7c)
<b>G</b>						<u>-</u>				` ′
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	7a)+(7b)+(	7c) =	Γ	20		÷ (5) =	0.11	(8)
If a pressurisation test has l		nded, procee	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			_
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timbe present, use the value con				•	uction			0	(11)
deducting areas of openi		responding to	ine great	er wan are	a (anter					
If suspended wooden	floor, enter 0.2 (unse	ealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter (	)							0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	• • • • • • • • • • • • • • • • • • • •	, , ,	. ,		0	(16)
Air permeability value,			•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•								0.36	(18)
Air permeability value applie Number of sides sheltere		nas been dor	ne or a deg	gree air pei	теарицу	is being u	sea			(19)
Shelter factor	Ju			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.31	(21)
Infiltration rate modified	•	ed							0.0.	` ′
Jan Feb	Mar Apr Ma	1	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp	peed from Table 7	- 1				•			4	
(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	
	100	1	1	1	·	1	1	•	<b>J</b>	
Wind Factor (22a)m = $(2^{23})^{25}$	<del>'</del>	0.05	0.05	0.00	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	J	

0.39	0.39	0.38	0.34	0.33	0.29	0.29	0.29	(22a)m <sub>0.31</sub>	0.33	0.35	0.36			
Calculate effe		-	rate for t		cable ca	se						<u> </u>		ı
If mechanic							.=					C	)	(23
If exhaust air h		0		, ,	,	. `	,, .	`	) = (23a)			0	)	(23
If balanced wit		-	-	_								C	)	(23
a) If balance	1	1					<del>- ^ ` ` - </del>	<del>```</del>	<del> </del>	<del></del>	<del>1 ` ` `</del>	÷ 100] I		(0.4
(24a)m= 0	0	0	0	0	. 0	0	0	0	0	0	0			(24
b) If balance							<u> </u>	<del>``</del>	<del>r Ó T</del>	<del>-                                    </del>		1		(24
(24b)m= 0	0	0	0	0	. ,	0	0	0	0	0	0			(24
c) If whole h	nouse ex n < 0.5 ×				•				5 v (23h	,)				
(24c)m = 0	0.5 7	0	0	0	0	0	0	0	0	0	0	1		(24
d) If natural								<u> </u>				l		
,	n = 1, the			•	•				0.5]					
(24d)m= 0.58	0.57	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57			(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			•	•		
(25)m= 0.58	0.57	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57			(25
3. Heat losse	os and he	oat loce r	aramata	or:										
ELEMENT	S and ne	•	Openin		Net Ar	02	U-valı	IΩ	AXU		k-value	<u></u>	AXI	k
ELEWIENI	area		m		A,r		W/m2		(W/I	<b>〈</b> )	kJ/m²-l		kJ/K	
Nindows Type	e 1				8.96	x1,	/[1/( 1.4 )+	0.04] =	11.88					(27
Windows Type	e 2				2.26	x1,	/[1/( 1.4 )+	0.04] =	3					(27
Nindows Type	•									ı				<b>\-</b> .
71	e 3				2.26	x1,	/[1/( 1.4 )+	0.04] =	3	Ħ				•
• •	e 3 65.3	3	13.48	3	2.26 51.82	=	/[1/( 1.4 )+ 0.18	0.04] = [	3 9.33			7 [		` (27
Walls Type1 Walls Type2			13.48	3		x	- ` /							(27
Walls Type1 Walls Type2	65.3	33		3	51.82	x x	0.18	= [	9.33					(27)
Walls Type1	65.3 15.3 28.1	33	0	3	51.82 15.33	x x x	0.18	= [	9.33					(27 (29 (29 (29
Walls Type1 Walls Type2 Walls Type3 Total area of e	65.3 15.3 28.1	33	0	3	51.82 15.33 28.15	x x x x x x	0.18 0.18 0.18	= = = = = = = = = = = = = = = = = = = =	9.33 2.76 5.07					(27 (29 (29 (29 (31
Walls Type1 Walls Type2 Walls Type3 Fotal area of e	65.3 15.3 28.1 elements	33 15 3, m²	0		51.82 15.33 28.15 108.76	2	0.18 0.18 0.18		9.33 2.76 5.07	[] [	paragraph			(27 (29 (29 (29 (31
Nalls Type1 Nalls Type2 Nalls Type3 Fotal area of e Party wall	15.3 28.1 elements	33 15 15, m <sup>2</sup> ows, use e	0 0	ndow U-va	51.82 15.33 28.15 108.73 8.49	2	0.18 0.18 0.18		9.33 2.76 5.07	[] [	paragraph	] [		(27 (29 (29 (29 (31
Walls Type1 Walls Type2 Walls Type3 Fotal area of 6 Party wall for windows and	15.3 28.1 28.1 elements	33 15 15 17, m <sup>2</sup> 18 ows, use e	0 0 ffective will ternal wall	ndow U-va	51.82 15.33 28.15 108.73 8.49	x x x x x x x x x x x x x x x x x x x	0.18 0.18 0.18	= [ = [ = [ - [(1/U-value	9.33 2.76 5.07	[]	paragraph	35.		(27 (29 (29 (31 (32
Walls Type1 Walls Type2 Walls Type3 Fotal area of e Party wall * for windows and ** include the are Fabric heat los	15.3 28.1 28.1 elements d roof winddas on both	ows, use e sides of in = S (A x	0 0 ffective will ternal wall	ndow U-va	51.82 15.33 28.15 108.73 8.49	x x x x x x x x x x x x x x x x x x x	0.18 0.18 0.18 0.19 0.19	$= \begin{bmatrix} \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \end{bmatrix}$ $+ (32) = \begin{bmatrix} \\ \\ \end{bmatrix}$	9.33 2.76 5.07			Γ	03	(27 (29 (29 (31 (32
Walls Type1 Walls Type2 Walls Type3 Fotal area of e Party wall for windows and include the area Fabric heat los	15.3 28.1 elements d roof winder as on both ss, W/K = Cm = S(	ows, use e sides of in = S (A x (A x k)	0 0 ffective winternal wall	ndow U-va	51.82 15.33 28.15 108.73 8.49 alue calculatitions	x x x x x x x x x x x x x x x x x x x	0.18 0.18 0.18 0.19 0.19		9.33 2.76 5.07 0 ue)+0.04] a	2) + (32a).		35.	03	(27 (29 (29 (31 (32 (34
Walls Type1 Walls Type2 Walls Type3 Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design asses	15.3 28.1 28.1 28.1 droof winder as on both as on both Cm = S( a parame sments wh	ows, use e sides of in = S (A x k) eter (TMF)	0 0 ffective winternal wall U) $P = Cm \div tails of the$	ndow U-va ds and part	51.82 15.33 28.15 108.76 8.49 alue calculatitions	x x x x x x x x x x x x x x x x x x x	0.18 0.18 0.18 0 of formula 1	= $=$ $=$ $=$ $=$ $=$ $=$ $=$ $=$ $=$	9.33 2.76 5.07 0 0 0e)+0.04] attive Value	2) + (32a). : Medium	(32e) =	35. 6100	03	(27 (29 (29 (31 (32 (34
Walls Type1 Walls Type2 Walls Type3 Total area of e Party wall * for windows and ** include the are. Fabric heat los Heat capacity Thermal mass For design assess can be used inste	15.3 28.1 28.1 elements d roof winddas on both ss, W/K = Cm = S( s parame sments whead of a declaration	ows, use e sides of interest the detailed calculations.	o  offective winternal walk  U)  offective winternal walk  uternal walk	ndow U-va ls and part - TFA) in constructi	51.82 15.33 28.15 108.73 8.49 alue calculatitions	x x x x x x x ated using	0.18 0.18 0.18 0 of formula 1	= $=$ $=$ $=$ $=$ $=$ $=$ $=$ $=$ $=$	9.33 2.76 5.07 0 0 0e)+0.04] attive Value	2) + (32a). : Medium	(32e) =	35. 6100 25	03 0.28 00	(27 (29 (29 (31 (32 (33 (34 (35
Nalls Type1 Nalls Type2 Nalls Type3 Total area of e Party wall for windows and include the area fabric heat lose Heat capacity Thermal mass can be used inste	15.3 28.1 28.1 28.1 28.1 28.1 28.1 28.1 28.1	ows, use e sides of interpretate (TMF) tere the detailed calcut X Y) calcut (X Y) c	o  offective winternal wall  U)  P = Cm ÷  tails of the ulation.  culated to	ndow U-vals and part - TFA) in constructi	51.82 15.33 28.15 108.76 8.49 alue calculatitions  n kJ/m²K ion are not	x x x x x x x ated using	0.18 0.18 0.18 0 of formula 1	= $=$ $=$ $=$ $=$ $=$ $=$ $=$ $=$ $=$	9.33 2.76 5.07 0 0 0e)+0.04] attive Value	2) + (32a). : Medium	(32e) =	35. 6100	03 0.28 00	(27 (29 (29 (31 (32 (33 (34 (35
Walls Type1 Walls Type2 Walls Type3 Fotal area of e Party wall for windows and include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste	28.1 28.1 28.1 elements d roof windd as on both ss, W/K = Cm = S( s parame sments wh ead of a dei es : S (L al bridging	ows, use e sides of interpretate (TMF) tere the detailed calcut X Y) calcut (X Y) c	o  offective winternal wall  U)  P = Cm ÷  tails of the ulation.  culated to	ndow U-vals and part - TFA) in constructi	51.82 15.33 28.15 108.76 8.49 alue calculatitions  n kJ/m²K ion are not	x x x x x x x ated using	0.18 0.18 0.18 0 of formula 1	= [ = [ = [ ] = [ ] = [ /[(1/U-valu ) + (32) = ((28) Indicative	9.33 2.76 5.07 0 0 0e)+0.04] attive Value	2) + (32a). : Medium	(32e) =	35. 6100 25	03	(27 (29 (29 (31 (32 (33 (34 (35)
Nalls Type1 Nalls Type2 Nalls Type3 Total area of e Party wall for windows and include the area fabric heat lose Heat capacity Thermal mass can be used instea Thermal bridg f details of therma	15.3 28.1 28.1 28.1 elements d roof winder as on both ss, W/K = Cm = S( s parame es ments where ad of a decrease is S (L al bridging eat loss	ows, use e sides of in State (TMF) ere the de tailed calculare not kn	o  offective winternal wall  U)  offective winternal wall  uniternal wall  uniternal wall  culation  culated uniternal wall  own (36) =	ndow U-vals and part - TFA) in constructionsing Ap	51.82 15.33 28.15 108.76 8.49 alue calculatitions  n kJ/m²K ion are not	x x x x x x x ated using	0.18 0.18 0.18 0 of formula 1	= [ = [ = [ ] = [ ] = [ ] + (32) = ((28) Indicative	9.33 2.76 5.07 0 ue)+0.04] a (30) + (32 tive Value e values of	2) + (32a). : Medium <i>TMP in T</i> .	(32e) =	35. 6100 25	03	(27 (29 (29 (31 (32 (33 (34 (35
Walls Type1 Walls Type2 Walls Type3 Fotal area of 6 Party wall for windows and include the area abric heat los Heat capacity Thermal mass	15.3 28.1 28.1 28.1 elements d roof winder as on both ss, W/K = Cm = S( s parame es ments where ad of a decrease is S (L al bridging eat loss	ows, use e sides of in State (TMF) ere the de tailed calculare not kn	o  offective winternal wall  U)  offective winternal wall  uniternal wall  uniternal wall  culation  culated uniternal wall  own (36) =	ndow U-vals and part - TFA) in constructionsing Ap	51.82 15.33 28.15 108.76 8.49 alue calculatitions  n kJ/m²K ion are not	x x x x x x x ated using	0.18 0.18 0.18 0 of formula 1	= [ = [ = [ ] = [ ] = [ ] + (32) = ((28) Indicative	9.33 2.76 5.07 0 ue)+0.04] a tive Value e values of	2) + (32a). : Medium <i>TMP in T</i> .	(32e) =	35. 6100 25	03	(27 (29 (29 (31 (32 (33 (34 (35)
Walls Type1 Walls Type2 Walls Type3 Fotal area of every wall for windows and for w	28.1 28.1 28.1 elements d roof winder as on both ss, W/K = Cm = S( s parame esments where ead of a dece es : S (L al bridging eat loss at loss ca	ows, use e sides of in es S (A x k) eter (TMF) ere the de tailed calculated are not kn	o  offective winternal wall  U)  P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vals and part - TFA) in constructi using Ap	51.82 15.33 28.15 108.73 8.49 alue calculatitions  h kJ/m²K ion are not opendix h	x x x x x x x x x x x x x x x x x x x	0.18 0.18 0.18 0.18 0.18 0.18 constant (26)(30)	= [ = [ = [ ] = [	9.33 2.76 5.07 0 0 0e)+0.04] a tive Value e values of (36) = = 0.33 × (	2) + (32a). : Medium <i>TMP in T</i> 25)m x (5	(32e) =	35. 6100 25	03 0.28 00 11	(27 (29 (29 (31 (32 (33 (34 (35 (37
Walls Type1 Walls Type2 Walls Type3 Fotal area of 6 Party wall For windows and include the area Fabric heat lose Heat capacity Thermal mass For design assess For design assess For he used instead Thermal bridg If details of thermal Total fabric he Wentilation hea	15.3 28.1 28.1 28.1 28.1 28.1 28.1 28.1 28.1	ows, use e sides of in Sides o	o  offective winternal wall ternal wall tails of the plation. culated to own (36) =	ndow U-vals and part - TFA) in constructi using Ap = 0.15 x (3	51.82 15.33 28.15 108.76 8.49 alue calculations  h kJ/m²K ion are not opendix h 1)  Jun	x x x x x x x x x x x x x x x x x x x	0.18 0.18 0.18 0.18 0.18 0.18 Aug	= [ = [ = [ ] = [	9.33 2.76 5.07 0 0e)+0.04] a tive Value e values of (36) = = 0.33 × ( Oct	2) + (32a). : Medium : TMP in T. 25)m x (5 Nov 32.51	(32e) =   able 1f	35. 6100 25	03 0.28 00 11	(27 (29 (29 (29

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 1.1	1.1	1.1	1.09	1.08	1.07	1.07	1.07	1.08	1.08	1.09	1.09		
` /					<u> </u>	<u> </u>	<u> </u>	<u> </u>	L Average =	: Sum(40) <sub>1.</sub>	12 /12=	1.09	(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 heat	ing one	rav regui	rement:								kWh/ye	var:	
4. Water Heat	ing ene	igy requi	rement.								KVVII/ye	ai.	
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		22		(42)
Annual averag	ıl average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		5.92		(43)
not more that 125	nires per	person per T	uay (ali w		ioi and co								
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	Va,m = ta	ctor from	l able 1c x	(43)			<del></del>			
(44)m= 95.61	92.14	88.66	85.18	81.71	78.23	78.23	81.71	85.18	88.66	92.14	95.61		_
Energy content of	hot water	used - cal	culated m	onthly – 1	100 v Vd r	n v nm v F	Tm / 3600			ım(44) <sub>112</sub> =		1043.06	(44)
(45)m= 141.79	124.01	127.97	111.57	107.05	92.38	85.6	98.23	99.4	115.84	126.45	137.32		7(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	r storage).	enter 0 in	boxes (46		Total = Su	ım(45) <sub>112</sub> =	= [	1367.62	(45)
	18.6	19.2	16.74		· ·	12.84		14.91	17.38	18.97	20.6		(46)
(46)m= 21.27 Water storage		19.2	10.74	16.06	13.86	12.04	14.73	14.91	17.36	16.97	20.6		(40)
Storage volum		) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` '		-			•							, ,
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):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro	m watei	rstorage	, kWh/ye	ear			(48) x (49)	) =			0		(50)
b) If manufact			-										
Hot water stora	-			e 2 (kWl	h/litre/da	ay)					0		(51)
If community h	•		on 4.3										(50)
Temperature fa			2h							-	0		(52) (53)
·							(47) × (51)	) v (E2) v (	(E2) —				, ,
Energy lost fro Enter (50) or (		•	, KVVII/ye	zai			(47) x (51)	) X (52) X (	55) =	-	0		(54) (55)
Water storage		•	or oach	month			((56)m = (	EE) ~ (41)	m		0		(33)
					i					i			(==)
(56)m= 0  If cylinder contains	0 dedicate	0 d solar sto	0 rage, (57)ı	0 m = (56)m	0 x [(50) – (	0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (	0 (H11) is fro	0 m Append	x H	(56)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss for	nual) fra	m Table			!	!	!		•	0		(58)
Primary circuit	•	•			59)m = (	(58) <u>–</u> 36	35 x (41)	m			~		(-3)
(modified by				•	•	. ,	, ,		r thermo	ostat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
(,		ــــــــــــــــــــــــــــــــــــــ											` '

				<b></b>	<b>(22)</b>									
Combi loss			1	<u> </u>	<u>`                                    </u>	<del>- ` `</del>		u T	10.01	45.40	1.5.44	10.70	1	(64)
(61)m= 48.7		45.18	42.01	41.64	38.58	39.87	41.6		42.01	45.18	45.44	48.72		(61)
	<del>-</del>						<del>` ´</del>	_			<del>ì ´                                     </del>	<del>r` ´                                     </del>	(59)m + (61)m	(00)
(62)m= 190.5		173.15	153.58	148.69	130.96	125.47	139.		141.41	161.02	171.89	186.04		(62)
Solar DHW inp										r contribut	ion to wate	er heating)		
(add additio						<del> </del>	<del>i -</del>	ix G)		_			1	(00)
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output from													1	
(64)m= 190.5	166.42	173.15	153.58	148.69	130.96	125.47	139.	87	141.41	161.02	171.89	186.04		,
							(	Outpu	ut from wa	ater heate	r (annual) <sub>1</sub>	12	1889.01	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (6	1)m]	+ 0.8 x	((46)m	+ (57)m	+ (59)m	.1	
(65)m= 59.3	3 51.84	53.85	47.6	46	40.36	38.43	43.0	)7	43.55	49.81	53.4	57.84		(65)
include (5	7)m in cal	culation o	of (65)m	only if c	ylinder i	s in the	dwelli	ng o	r hot w	ater is f	rom com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a	):										
Metabolic ga	ains (Table	e 5), Wat	ts											
Jai		Mar	Apr	May	Jun	Jul	Αu	ıg	Sep	Oct	Nov	Dec		
(66)m= 110.9	99 110.99	110.99	110.99	110.99	110.99	110.99	110.	99	110.99	110.99	110.99	110.99		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	ee Ta	able 5		•	•	-	
(67)m= 17.5	3 15.57	12.66	9.59	7.17	6.05	6.54	8.5	;	11.41	14.48	16.9	18.02		(67)
Appliances	gains (calc	ulated in	Append	dix L, ea	uation L	.13 or L1	3a), a	also :	see Tal	ble 5			l	
(68)m= 194.7	<del>`                                    </del>	191.71	180.87	167.18	154.32	145.72	143.		148.8	159.64	173.33	186.19		(68)
Cooking gai	ns (calcula	ited in Ai	opendix	L. eguat	ion L15	or L15a	), also	see	e Table	5			ı	
(69)m= 34. <sup>2</sup>	<del>_`</del>	34.1	34.1	34.1	34.1	34.1	34.	_	34.1	34.1	34.1	34.1		(69)
Pumps and	 fans gains	(Table F	 5a)			I.						1		
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3		(70)
Losses e.g.				ļ	ļ	1 -							I	` ,
(71)m= -88.7		-88.79	-88.79	-88.79	-88.79	-88.79	-88.7	79 T	-88.79	-88.79	-88.79	-88.79	1	(71)
	!		00.70	00.70	00.70	00.70	00.	, ,	00.70	00.70	00.70	00.70		()
Water heating (72)m= 79.7	<del></del>	72.37	66.11	61.83	56.06	51.65	57.8	<u> </u>	60.49	66.95	74.17	77.74	1	(72)
` '			00.11	01.03		ļ	L				<u> </u>	<u> </u>		(12)
<b>Total interr</b> (73)m= 351.3	<del>.</del>	336.05	245.00	205 40		)m + (67)m					· · · · · ·		1	(73)
` '		336.05	315.86	295.48	275.72	263.21	269.	39	279.99	300.37	323.7	341.25		(73)
6. Solar ga Solar gains a		usina sola	r flux from	Tahla 6a	and assoc	riated equa	ations to	o con	wert to th	e annlicat	ole orientat	tion		
Orientation:		•	Area		Flu	•	1110113 11		g_	Сарріїсаї	FF	iioii.	Gains	
Onemation.	Table 6d		m <sup>2</sup>			ble 6a			9_ able 6b	Т	able 6c		(W)	
East 0.9	x 1	x	8.9	06	x -	19.64	] <sub>x</sub> [		0.63	<b>Т</b> х Г	0.7		53.78	(76)
East 0.9		×			-		]			╣	0.7	╡ -		](76) ](76)
East 0.9		_	2.2			19.64	] L ] [		0.63	╡╞		=	13.57	](76) ](76)
		X	2.2			19.64	]		0.63		0.7	=	13.57	_
		X	8.9		-	38.42	] X ] [		0.63	X	0.7	_ =	105.21	(76)
East 0.9	X 1	X	2.2	26	x;	38.42	X		0.63	x	0.7	=	26.54	(76)

East	0.9x	1		<b>,</b> [	2.26	7 x	- 3	88.42	] x		0.63	x	0.7		26.54	(76)
East	0.9x	<u>.</u> 1	_	ا ] ،	8.96	」 】x	<b>—</b>	3.27	] ]		0.63	d x	0.7	= =	173.26	(76)
East	0.9x	1	=	 	2.26	」 】 x		3.27	] ]		0.63	ا ×	0.7	=	43.7	(76)
East	0.9x	1	<del>_</del> ,	, [	2.26	i x	-	3.27	] ] x		0.63	x	0.7	= =	43.7	(76)
East	0.9x	1		, [	8.96	۱ ×		2.28	) ] x		0.63	٦ ×	0.7		252.69	(76)
East	0.9x	1	,	, [	2.26	i x		2.28	)   x		0.63	×	0.7	= =	63.74	(76)
East	0.9x	1		, [	2.26	٦ x		2.28	)   x		0.63	×	0.7		63.74	(76)
East	0.9x	1		, [	8.96	i x	1	13.09	X		0.63	= x	0.7	=	309.68	(76)
East	0.9x	1	,	, [	2.26	i x	1	13.09	x		0.63	×	0.7	=	78.11	(76)
East	0.9x	1	,	٠ [	2.26	i x	1	13.09	x		0.63	×	0.7		78.11	(76)
East	0.9x	1	,	آ	8.96	Ī×	1	15.77	x		0.63	×	0.7		317.01	(76)
East	0.9x	1	,	٠ [	2.26	Ī×	1	15.77	x		0.63	×	0.7	=	79.96	(76)
East	0.9x	1	,	٠ [	2.26	Ī×	1	15.77	x		0.63	×	0.7	=	79.96	(76)
East	0.9x	1	,	٠ [	8.96	Ī×	1	10.22	x		0.63	×	0.7	<u> </u>	301.81	(76)
East	0.9x	1	,	٠ [	2.26	×	1	10.22	x		0.63	×	0.7		76.13	(76)
East	0.9x	1	,	<u>،</u> [	2.26	×	1	10.22	x		0.63	×	0.7		76.13	(76)
East	0.9x	1	,	٠ [	8.96	x	9	4.68	x		0.63	x	0.7		259.25	(76)
East	0.9x	1	,	٠ [	2.26	X	9	4.68	X		0.63	×	0.7	=	65.39	(76)
East	0.9x	1	,	٠ [	2.26	x	9	4.68	x		0.63	x	0.7	=	65.39	(76)
East	0.9x	1	,	٠ [	8.96	×	7	3.59	X		0.63	x	0.7	=	201.51	(76)
East	0.9x	1	,	· [	2.26	×	7	3.59	x		0.63	x	0.7	=	50.83	(76)
East	0.9x	1	,	<b>·</b> [	2.26	X	7	3.59	X		0.63	x	0.7	=	50.83	(76)
East	0.9x	1	,	κ [	8.96	X	4	5.59	X		0.63	X	0.7	=	124.84	(76)
East	0.9x	1	,	<b>·</b> [	2.26	×	4	5.59	X		0.63	X	0.7	=	31.49	(76)
East	0.9x	1	,	<b>·</b> [	2.26	×	4	5.59	X		0.63	X	0.7	=	31.49	(76)
East	0.9x	1	,	· [	8.96	X	2	4.49	X		0.63	х	0.7	=	67.06	(76)
East	0.9x	1	,	<b>·</b> [	2.26	×	2	4.49	X		0.63	X	0.7	=	16.91	(76)
East	0.9x	1		٠ [	2.26	X	2	4.49	X		0.63	x	0.7	=	16.91	(76)
East	0.9x	1	,	٠ [	8.96	×		6.15	X		0.63	X	0.7	=	44.23	(76)
East	0.9x	1	,	٠ [	2.26	X		6.15	X		0.63	X	0.7	=	11.16	(76)
East	0.9x	1	)	· [	2.26	X		6.15	X		0.63	X	0.7	=	11.16	(76)
_				$\overline{}$	for each mor	$\neg$	470.04	454.00	<del></del>	$\overline{}$	um(74)m			00.54	1	(02)
(83)m=	80.91	158.28	260.66		$\begin{array}{c c} 380.16 & 465. \\ \hline (84)m = (73)i \end{array}$		476.94	454.06	390	0.03	303.16	187.8	1 100.89	66.54		(83)
(84)m=	432.27	507.09	596.71	_	696.03 761.3	_	752.66	717.27	659	42	583.15	488.1	3 424.59	407.79	1	(84)
				_			702.00	7 17 .27	1 000		000.10	400.10	7 424.00	407.70		()
					neating seas		aroo	from Tok	olo O	Th	1 (°C)				24	7(95)
•		•	•	•	riods in the l ving area, h1	-			)IE 9	, 111	i ( C)				21	(85)
UlliSa	Jan	Feb	Mar	Τ	Apr Ma	T	Jun	Jul	ΙΔ	ug	Sep	Oct	Nov	Dec	]	
(86)m=	1	0.99	0.98	+	0.93 0.8	<del>-  </del>	0.61	0.45	0.5	_	0.78	0.97	0.99	1		(86)
		ļļ						<u> </u>			!		1 - 7	<u> </u>	J	. ,
(87)m=	19.85	20.02	20.3	1 11/	ving area T1 20.64   20.8	÷г	ow ste 20.98	ps 3 to 1	20.		20.92	20.58	20.15	19.82	]	(87)
(2. )	10.00				20.0			L					1 -5.10	L	J	` '

Ta	a = a +	ا به مانسیام		مان مام نس		مال ماله	. f	bla O T	ha (00)					
-	erature 20	20	eating p	20.01	20.01	20.02	20.02	20.02	20.02	20.01	20.01	20.01		(88)
(88)m=		<u> </u>				<u> </u>	ļ.		20.02	20.01	20.01	20.01		(00)
Utilisa (89)m=	ation fac	tor for g	ains for 0.97	rest of d	welling, 0.74	h2,m (se 0.52	ee Table 0.35	9a) <sub>0.4</sub>	0.7	0.95	0.99	1		(89)
		<u> </u>	<u> </u>			<u> </u>		<u> </u>	<u> </u>	<u> </u>	0.99	ļ		(00)
		· · ·	ature in			<del>` `</del>	ì	<u> </u>		<del> </del>				(00)
(90)m=	18.47	18.71	19.12	19.61	19.91	20.01	20.02	20.02	19.96	19.53	18.91	18.43		(90)
									I	fLA = Livin	g area ÷ (4	+) =	0.4	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m=	19.02	19.24	19.59	20.03	20.3	20.4	20.42	20.41	20.35	19.96	19.41	18.99		(92)
			he mean		· ·	i	ì	4e, whe		opriate		1	1	
(93)m=	19.02	19.24	19.59	20.03	20.3	20.4	20.42	20.41	20.35	19.96	19.41	18.99		(93)
•		·	uirement											
			ternal ter or gains	•		ed at st	ep 11 of	Table 9	o, so tha	it Ti,m=(	76)m an	d re-calc	ulate	
ine ui	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		<u> </u>	ains, hm		iviay	Juli	l oui	Aug	ОСР	001	1407	DCC		
(94)m=	1	0.99	0.97	0.91	0.76	0.56	0.39	0.45	0.73	0.95	0.99	1		(94)
	ıl gains,	hmGm	, W = (9 <sup>2</sup>	1)m x (84	4)m		<u> </u>							
(95)m=	430.37	501.95	579.09	630.03	579.66	419.36	280.92	293.98	426.87	463.33	420.68	406.45		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able 8		ļ.	<u>!</u>	!				
(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	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
(97)m=	1118.31	1086.35	989.89	832.09	641.94	428.92	282.12	296.3	463.79	698.32	922.5	1113.21		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	511.83	392.72	305.64	145.48	46.34	0	0	0	0	174.83	361.31	525.83		
								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2463.97	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								35.75	(99)
9a. En	ergy red	quiremer	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:							,					
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- <b>(</b> 201 <b>)</b> =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								93.4	(206)
Efficie	ency of	seconda	ry/supple	ementar	y heatin	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊒ ar
Space		l	ement (c			L	l oui		Сор		1101	200	KVVIII y O	, cai
- 1	511.83	392.72	305.64	145.48	46.34	0	0	0	0	174.83	361.31	525.83		
(211)m	 \ = {[(98	)m x (20	)4)] } x 1	00 ÷ (20	16)	<u>I</u>	I	ļ	ļ	<u> </u>				(211)
(211)	547.99	420.47	327.23	155.76	49.61	0	0	0	0	187.18	386.84	562.99		(= )
		ļ				<u> </u>		Tota	l (kWh/yea			<b></b>	2638.09	(211)
Space	e heatin	a fuel (s	econdar	v), kWh/	month									
•		•	00 ÷ (20	• , .										
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)

Output from water heater (calculated above)  190.52   166.42   173.15   153.58   148.69   1	30.96 125.47	139.87	141.41	161.02	171.89	186.04		
	30.96 125.47	139.67	141.41	161.02	171.69	100.04		(21
Efficiency of water heater (217)m= 87.42 87.14 86.47 84.92 82.49	80.3 80.3	80.3	80.3	85.26	06.00	07.50	80.3	(21 (21)
	80.3 80.3	80.3	60.3	65.26	86.88	87.52		(21
Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m								
	63.08 156.25	174.18	176.1	188.87	197.85	212.56		_
		Total	= Sum(2	19a) <sub>112</sub> =			2239.18	(21
Annual totals				k\	Wh/year	r I	kWh/year	1
Space heating fuel used, main system 1						ļ	2638.09	_
Nater heating fuel used							2239.18	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(23
boiler with a fan-assisted flue						45		(23
Total electricity for the above, kWh/year		sum (	of (230a).	(230g) =			75	(23
Electricity for lighting						Ī	309.61	(23
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						_
	Energy			Emiss	ion fac	tor	Emissions	
	kWh/year			kg CO	2/kWh		kg CO2/yea	r
	Kvvii/yCai					_		(26
Space heating (main system 1)	(211) x			0.2	16	=	569.83	J '
Space heating (main system 1) Space heating (secondary)	•			0.2		= [	569.83	] ](26
Space heating (secondary)	(211) x				19	l I		] [26
	(211) x (215) x	+ (263) + (2	264) =	0.5	19	=	0	,
Space heating (secondary)  Vater heating  Space and water heating	(211) x (215) x (219) x	+ (263) + (2	264) =	0.5	19	=	0 483.66	](26 ](26
Space heating (secondary)  Vater heating	(211) x (215) x (219) x (261) + (262)	+ (263) + (2	264) =	0.5	19 16 19	= [	0 483.66 1053.49	(26 ) (26 ) (26

TER =

(273)

18.18

			lloor F	Notaile						
Assessor Name:	Joseph Treanor		User D	Strom	a Num	hor:		STRC	0032062	
Software Name:	Stroma FSAP 20	012		Softwa					on: 1.0.4.14	
		Р	roperty	Address						
Address :	, Gondar Gardens									
1. Overall dwelling dim	nensions:									
			Are	a(m²)		Av. He	ight(m)	_	Volume(m	3)
Ground floor			é	93.61	(1a) x	2	2.55	(2a) =	238.71	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(	1e)+(1r	n)	93.61	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	238.71	(5)
2. Ventilation rate:										_
	main heating	secondar heating	'у 	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	fans				Γ	3	X	10 =	30	(7a)
Number of passive ven	ts				Ē	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	X -	40 =	0	(7c)
Ç					L					``
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans =	(6a)+(6b)+(7	7a)+(7b)+(	(7c) =	Γ	30		÷ (5) =	0.13	(8)
	been carried out or is inter	nded, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			<u> </u>
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 for the all and the h		. 0 05 4-				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timbe present, use the value corn				•	uction			0	(11)
	nings); if equal user 0.35	ooponanig to	o uno grodi	ior man are	a (ano					
If suspended wooder	n floor, enter 0.2 (unse	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
• ,	enter 0.05, else enter 0								0	(13)
J	ws and doors draught	stripped		0.05 10.0	(4.4) 4	001			0	(14)
Window infiltration				0.25 - [0.2] (8) + (10)			. (15) -		0	(15)
Infiltration rate	e, q50, expressed in c	ubic motro	oc par ha	. , , , ,	, , ,	, , ,	, ,	aroa	0	(16)
If based on air permeat	•		•	•	•	elle oi e	rivelope	alea	0.38	(17)
·	lies if a pressurisation test h					is being u	sed		0.36	(10)
Number of sides shelte	red								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpor	ating shelter factor			(21) = (18	) x (20) =				0.32	(21)
Infiltration rate modified	for monthly wind spec	ed							7	
Jan Feb	Mar Apr May	y Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind s	speed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (	22)m ∸ 4									
(22a)m = 1.27   1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
• '				<u> </u>					J	

djusted infiltration rate (allowing for shelter a	and wind s	speed) =	(21a) x	(22a)m	_			-		
0.41 0.4 0.39 0.35 0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.38			
alculate effective air change rate for the app If mechanical ventilation:	olicable ca	ise							)	<b>7</b> (2
If exhaust air heat pump using Appendix N, (23b) = (2	3a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)				)	(^ (2
If balanced with heat recovery: efficiency in % allowing	g for in-use f	actor (fron	n Table 4h	) =	, , ,				)	      (2
a) If balanced mechanical ventilation with h	_				2h)m + (	23h) 🗴 [	1 – (23c)		,	(
ta)m= 0 0 0 0 0 0	0	0	0	0	0	0	0	. 100j		(2
b) If balanced mechanical ventilation without	ut heat red	covery (N	л ЛV) (24h	$\lim_{n \to \infty} (2)$	2b)m + (	23b)	ļ.	l		
hb)m= 0 0 0 0 0 0	0	0	0	0	0	0	0			(2
c) If whole house extract ventilation or posi	 tive input :	ventilatio	n from o	LLLL outside			<u>Į</u>			
if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$	-				.5 × (23b	o)				
4c)m= 0 0 0 0 0	0	0	0	0	0	0	0			(2
d) If natural ventilation or whole house posi	tive input	ventilatio	on from I	oft				•		
if $(22b)m = 1$ , then $(24d)m = (22b)m$ other	nerwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			1		
4d)m= 0.58 0.58 0.58 0.56 0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(2
Effective air change rate - enter (24a) or (2	4b) or (24	c) or (24	d) in box	(25)		,	,			
5)m= 0.58 0.58 0.56 0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(2
B. Heat losses and heat loss parameter:										
LEMENT Gross Openings	Net Ar	ea	U-val	ıe	AXU		k-value	)	Α >	(k
area (m²) m²	A ,r	m²	W/m2	K .	(W/	K)	kJ/m²·l	<	kJ/	K
indows Type 1	4.72	x1	/[1/( 1.4 )+	0.04] =	6.26					(2
indows Type 2	2.29	х1	/[1/( 1.4 )+	0.04] =	3.04					(2
indows Type 3	4.5	х1	/[1/( 1.4 )+	0.04] =	5.97					(2
indows Type 4	2.26	x1	/[1/( 1.4 )+	0.04] =	3					(2
oor	21.67	7 X	0.13	=	2.8171	$\overline{}$		$\neg$		(2
alls Type1 87.82 23.07	64.75	5 X	0.18	<u> </u>	11.66			7 7		<b>=</b> (2
alls Type2 23.15 0	23.15	5 X	0.18	<b>=</b> i	4.17	T i		7 F		= (2
otal area of elements, m <sup>2</sup>	132.6	4								 (;
arty wall	5.94	_	0		0					) 门(3
or windows and roof windows, use effective window U						l L as given in	paragraph	L 3.2		``
include the areas on both sides of internal walls and p			,		, ,	Ü	, , ,			
abric heat loss, $W/K = S (A \times U)$			(26)(30)	+ (32) =				49.	22	(;
eat capacity Cm = S(A x k)				((28).	(30) + (32	2) + (32a)	(32e) =	716	6.55	(:
nermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K	•		Indica	tive Value	: Medium		25	50	(3
r design assessments where the details of the constru	ction are no	t known pi	ecisely the	indicative	e values of	TMP in T	able 1f			
n be used instead of a detailed calculation. nermal bridges : S (L x Y) calculated using A	Annendiy I	<b>K</b>						44		$\neg_{\iota}$
details of thermal bridging are not known (36) = $0.15 \times 10^{-3}$								11.	.57	(
otal fabric heat loss	(31)			(33) +	(36) =			60.	.79	<b>—</b> (:
entilation heat loss calculated monthly				(38)m	= 0.33 × (	(25)m x (5	)			┙`
Jan Feb Mar Apr May	y Jun	Jul	Aug	Sep	Oct	Nov	Dec			
3)m= 45.92 45.66 45.41 44.25 44.03		43.01	42.82	43.4	44.03	44.47	44.93			(:
eat transfer coefficient, W/K	1			(39)m	= (37) + (	38)m	!	1		
9)m= 106.71 106.46 106.21 105.04 104.83	2 103.81	103.81	103.62	104.2	104.82	105.26	105.73			

Heat loss para	meter (l	-II D\ \\//	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.14	1.14	1.13	1.12	1.12	1.11	1.11	1.11	1.11	1.12	1.12	1.13		
(40)1114	1.17	1.10	1.12	1.12	1	1	1.11			Sum(40) <sub>1</sub> .		1.12	(40)
Number of day	s in mo	nth (Tabl	le 1a)					,	Wordgo =	Cum(40)	12 / 12-	1.12	()
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 \0/242 1   2 24											1-10/1- /		
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 ( <sup>-</sup>	ΓFA -13		67		(42)
Annual averag Reduce the annua not more that 125	l average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o		.66		(43)
		· ·					I .	I -	_	1	<del>- 1</del>		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in		r day lor ea	ich month	vu,iii = ia	1	i abie ic x	(43)		ı				
(44)m= 107.43	103.52	99.61	95.71	91.8	87.89	87.89	91.8	95.71	99.61	103.52	107.43		_
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600			ım(44) <sub>112</sub> = ables 1b, 1		1171.91	(44)
(45)m= 159.31	139.33	143.78	125.35	120.28	103.79	96.18	110.36	111.68	130.15	142.07	154.28		
								-	Total = Su	ım(45) <sub>112</sub> =	=	1536.56	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)			•		
(46)m= 23.9	20.9	21.57	18.8	18.04	15.57	14.43	16.55	16.75	19.52	21.31	23.14		(46)
Water storage						•							
Storage volum	` '					•		ame ves	sel		0		(47)
If community h	•			•			` '		(61.1)	· \			
Otherwise if no		hot wate	er (this in	ıcludes ı	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	(47)			
Water storage  a) If manufact		oclared k	oss facto	or ie kno	wn (k\//k	n/day/):							(48)
ŕ				JI IS KIIO	vvii (Kvvi	ı/uay).					0		
Temperature fa							()				0		(49)
Energy lost fro b) If manufact		_	-		or ic not		(48) x (49)	) =			0		(50)
Hot water stora			-								0		(51)
If community h	•			_ (	, ,	-57					<u> </u>		(0.)
Volume factor	_										0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	rstorage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (	54) in (5	55)									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)ı	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains		-					_	-	_		_	ix H	(==)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by	factor f	rom Tabl	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

	calculated			<u> </u>	<del>`</del>	<del>- `</del>	<del>.</del>					1	
(61)m= 50.	Ļ	50.76	47.2	46.78	43.34	44.79	46.7		50.76	49.32	50.96	J	(61)
	<del></del>						(62)r		(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 210	.27 185.36	194.54	172.55	167.06	147.13	140.97	157.	14 158.88	180.92	191.39	205.24		(62)
	put calculated								ar contribu	tion to wate	er heating)		
` —	onal lines if	FGHRS	and/or \	WWHRS	applies	s, see Ap	pend	x G)		,		1	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from	n water hea	ter										•	
(64)m= 210	.27 185.36	194.54	172.55	167.06	147.13	140.97	157.	14 158.88	180.92	191.39	205.24		-
							(	Output from w	ater heate	er (annual)	12	2111.44	(64)
Heat gains	from water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	1 + (6	1)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	[]	
(65)m= 65.	71 57.83	60.5	53.48	51.69	45.35	43.18	48.3	9 48.93	55.97	59.57	64.04		(65)
include (	57)m in cal	culation o	of (65)m	only if o	ylinder	is in the	dwelli	ng or hot w	ater is f	rom com	munity h	neating	
5. Interna	ıl gains (see	e Table 5	and 5a	):									
Metabolic o	gains (Table	5), Wat	ts										
Ja		Mar	Apr	May	Jun	Jul	Αι	ıg Sep	Oct	Nov	Dec		
(66)m= 133	3.6 133.6	133.6	133.6	133.6	133.6	133.6	133	6 133.6	133.6	133.6	133.6		(66)
Lighting ga	ins (calcula	ted in Ap	pendix	L, equat	ion L9 c	r L9a), a	ılso se	ee Table 5	1	•	•		
(67)m= 21.	89 19.44	15.81	11.97	8.95	7.56	8.16	10.6	1 14.24	18.08	21.11	22.5	]	(67)
Appliances	gains (calc	ulated in	Append	dix L, ea	uation L	.13 or L1	3a), a	ılso see Ta	ble 5	- <b>!</b>		ı	
(68)m= 245	<u> </u>	241.69	228.02	210.76	194.55	183.71	181.		201.25	218.51	234.73	]	(68)
Cooking ga	ains (calcula	ited in Ai	opendix	L. eguat	ion L15	or L15a	). also	see Table	· e 5	1	<u>!</u>	ı	
(69)m= 36.	<del>`</del>	36.36	36.36	36.36	36.36	36.36	36.3	<u> </u>	36.36	36.36	36.36	1	(69)
	u I fans gains	(Table 5	ia)		L	1				1		ı	
(70)m= 3		3	3	3	3	3	3	3	3	3	3	1	(70)
	. evaporatio	n (negat	ive valu	L es) (Tah	l <u> </u>	<u> </u>	<u> </u>		ļ		<u> </u>	I	
(71)m= -106	·	-106.88	-106.88	-106.88	-106.88	-106.88	-106.	88 -106.88	-106.88	-106.88	-106.88	1	(71)
` '	ing gains (1			100.00		1 .00.00	1 .00.	1 .00.00	100.00	1 .00.00	100.00	l	,
(72)m= 88.	<del></del>	81.31	74.28	69.47	62.98	58.03	65.0	4 67.96	75.22	82.73	86.07	1	(72)
( )			74.20	00.47			<u> </u>	m + (69)m +		ļ	<u> </u>	l	()
(73)m= 421	nal gains =	404.9	380.35	355.27	331.16	315.99	322	<u> </u>	360.64	388.43	409.38	1	(73)
6. Solar g		404.9	300.33	333.27	331.10	313.99	322	9 333.67	300.04	300.43	409.38		(10)
	are calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	o convert to the	ne applica	ble orientat	tion		
-	: Access F	-	Area		Fli			g_	ю арріюа	FF		Gains	
Onomation	Table 6d		m <sup>2</sup>			ble 6a		Table 6b	Т	able 6c		(W)	
East 0.	9x 1	x	4.	5	х	19.64	] <sub>x</sub> [	0.63	x [	0.7		27.01	(76)
_	9x 1	x	2.2			19.64	」^L ] <sub>x</sub>	0.63	^	0.7	=	13.57	](76)
_	9x 1	x	4.			38.42	] ^		-   ^ L -   x	0.7	╡ -	52.84	](76) ](76)
		^ ^					]   	0.63	_	0.7	=		](76) ](76)
			2.2		-	38.42	]	0.63	<b>=</b>		=	26.54	╡
<b>∟</b> ası ().	9x 1	X	4.	5	X	63.27	X	0.63	X	0.7	=	87.02	(76)

East	0.04		1	0.00	1	20.07	1	0.00	l		l	40.7	7(76)
East	0.9x	1	] X ]	2.26	X 1	63.27	X 1	0.63	X	0.7	= 	43.7	(76)
East	0.9x 0.9x	1	] X ]	4.5	X I	92.28	X	0.63	X	0.7	= 	126.91	(76)
East	0.9x	1	] X ] ,	2.26	l x l	92.28	X	0.63	X	0.7	=   _	63.74	(76)
East	늗	1	] X ]	4.5	] X ]	113.09	] X ]	0.63	X	0.7	] = ]	155.53	(76)
East	0.9x 0.9x	1	] X ] ,	2.26	l X l	113.09	] X ] ,	0.63	X	0.7	=   _	78.11	(76)
East	0.9x	1	] X ] ,	4.5	l X l	115.77	] X ] ,	0.63	X	0.7	] =   _	159.21	(76) (76)
East	0.9x	1	]	2.26	l x l v	115.77	] X ] v	0.63	X	0.7	] =   _	79.96 151.58	\\ \( \begin{array}{c} (76) \\ (76) \end{array}
East	0.9x	1	] x ] x	4.5	x x	110.22	l x	0.63	x	0.7	=   <sub>=</sub>		(76)
East	0.9x	1	] ^ ] x	4.5	] ^ ] x	94.68	] X ] x	0.63	X	0.7	]	76.13 130.2	(76)
East	0.9x	1	] ^ ] x	2.26	] ^ ] <sub>x</sub>	94.68	] ^ ] x	0.63	X	0.7	-   =	65.39	(76)
East	0.9x	1	] ^ ] x	4.5	) ^   x	73.59	] ^ ] x	0.63	X	0.7	-   =	101.2	(76)
East	0.9x	<u>'</u> 1	] ^ ] <sub>x</sub>	2.26	] ^ ] x	73.59	] ^ ] <sub>x</sub>	0.63	X	0.7		50.83	(76)
East	0.9x	<u>'</u> 1	] ^ ] x	4.5	] ^ ] x	45.59	] ^ ] x	0.63	X	0.7	]	62.7	(76)
East	0.9x	<u>'</u> 1	]	2.26	] ^ ] x	45.59	] ^ ] <sub>x</sub>	0.63	x	0.7		31.49	(76)
East	0.9x	<u>'</u> 1	]	4.5	] ^ ] <sub>x</sub>	24.49	] ^ ] <sub>X</sub>	0.63	x	0.7	!   _	33.68	(76)
East	0.9x	<u>'</u> 1	]	2.26	] ^ ] <sub>X</sub>	24.49	] ^ ] <sub>X</sub>	0.63	x	0.7	!   _	16.91	(76)
East	0.9x	<u>'</u> 1	] x	4.5	) x	16.15	] x	0.63	x	0.7	!   _	22.21	(76)
East	0.9x	<u>.</u> 1	] ]	2.26	]   x	16.15	] ]	0.63	X	0.7	!   _	11.16	(76)
West	0.9x	0.77	] ]	4.72	l X	19.64	] ]	0.63	X	0.7	!   _	56.66	(80)
West	0.9x	0.77	] ]	2.29	)   x	19.64	] ]	0.63	X	0.7	!   =	41.24	(80)
West	0.9x	0.77	] ]	4.72	)   x	38.42	] ]	0.63	X	0.7	!   =	110.84	(80)
West	0.9x	0.77	X	2.29	X	38.42	X	0.63	x	0.7	   =	80.67	(80)
West	0.9x	0.77	X	4.72	X	63.27	X	0.63	x	0.7	=	182.54	(80)
West	0.9x	0.77	X	2.29	x	63.27	X	0.63	X	0.7	=	132.85	(80)
West	0.9x	0.77	x	4.72	x	92.28	x	0.63	х	0.7	=	266.23	(80)
West	0.9x	0.77	X	2.29	x	92.28	x	0.63	x	0.7	j =	193.75	(80)
West	0.9x	0.77	x	4.72	x	113.09	x	0.63	x	0.7	j =	326.27	(80)
West	0.9x	0.77	x	2.29	x	113.09	x	0.63	x	0.7	=	237.45	(80)
West	0.9x	0.77	X	4.72	x	115.77	x	0.63	X	0.7	=	334	(80)
West	0.9x	0.77	X	2.29	x	115.77	x	0.63	x	0.7	=	243.07	(80)
West	0.9x	0.77	X	4.72	x	110.22	x	0.63	x	0.7	=	317.98	(80)
West	0.9x	0.77	X	2.29	x	110.22	x	0.63	x	0.7	=	231.41	(80)
West	0.9x	0.77	X	4.72	x	94.68	x	0.63	x	0.7	=	273.14	(80)
West	0.9x	0.77	X	2.29	x	94.68	X	0.63	X	0.7	=	198.78	(80)
West	0.9x	0.77	X	4.72	x	73.59	X	0.63	x	0.7	=	212.3	(80)
West	0.9x	0.77	X	2.29	x	73.59	X	0.63	x	0.7	=	154.51	(80)
West	0.9x	0.77	X	4.72	x	45.59	x	0.63	x	0.7	=	131.52	(80)
West	0.9x	0.77	X	2.29	x	45.59	x	0.63	x	0.7	=	95.72	(80)
West	0.9x	0.77	x	4.72	x	24.49	x	0.63	x	0.7	=	70.65	(80)
West	0.9x	0.77	X	2.29	X	24.49	X	0.63	X	0.7	=	51.42	(80)

Nest	0.9x	0.77	х	4.7	72	x	1	6.15	×	0.63	x	0.7	=	46.6	(80)
Vest	0.9x	0.77	x	2.2	29	X	1	6.15	×	0.63	x	0.7	=	33.91	(80)
	_														
Solar g	ains in v	watts, ca	alculated	for eac	h month	1			(83)m =	: Sum(74)m	ı(82)m				
83)m=	138.47	270.88	446.11	650.62	797.36	$\overline{}$	316.24	777.09	667.5	1 518.84	321.43	3 172.66	113.87	]	(83)
otal g	ains – ir	nternal a	and solar	(84)m =	= (73)m	+ (	83)m	, watts	•	•	•	•	•	4	
84)m=	560.33	690.58	851	1030.97	1152.62	1	147.4	1093.08	990.4	1 854.71	682.0	7 561.09	523.26		(84
7 Mea	an inter	nal temr	perature	(heating	seasor	n)			•	•	•	_		•	
			neating p				area	from Tab	ole 9.	Γh1 (°C)				21	(85
-		•	ains for l			_			,	( )					`
	Jan	Feb	Mar	Apr	May	T	Jun	Jul	Au	g Sep	Oct	Nov	Dec	]	
36)m=	1	0.99	0.98	0.91	0.76	$\dagger$	0.56	0.42	0.48	<del>-</del>	0.96	1	1		(86
Ĺ			-1 '-	l' '			1 -			<u> </u>	<u> </u>		<u> </u>	J	
Г	i	•	ature in		· `	_		i	1		1 00 50	1 00 00	10.74	1	(87
37)m=	19.77	19.97	20.29	20.67	20.9	<u> </u>	20.98	21	20.99	20.93	20.56	20.09	19.74		(67
Tempe	erature	during h	eating p	eriods ir	rest of	dw	velling	from Ta	ble 9,	Th2 (°C)	_		i	1	
38)m=	19.97	19.97	19.97	19.98	19.98	Ĺ	19.99	19.99	20	19.99	19.98	19.98	19.98		88)
Utilisa	ition fac	tor for g	ains for	rest of d	welling,	h2	,m (se	e Table	9a)						
39)m=	1	0.99	0.97	0.88	0.7		0.48	0.32	0.37	0.68	0.95	0.99	1	]	(89
Mean	internal	temper	ature in	the rest	of dwell	lina	1 T2 (f	ollow ste	ns 3 t	o 7 in Tal		•	•	•	
90)m=	18.33	18.62	19.08	19.61	19.89	Ť	19.98	19.99	19.99	1	19.49	18.8	18.29	]	(90
, F												ving area ÷ (		0.32	(91
			. "				` .		,,	<i>a</i>	_			0.02	
г	1				1	$\overline{}$				$fLA) \times T$		1 40 04	10.75	1	(00
92)m= [	18.79	19.05	19.47	19.95	20.22		20.3	20.31	20.3		19.83		18.75		(92
Appiy 93)m= [	18.79	19.05	ne mear 19.47	19.95	20.22	_	20.3	20.31	20.3	here app 20.25	19.83		18.75	1	(93
<u> </u>					20.22		20.3	20.31	20.3	20.25	19.63	19.21	18.75		(90
			uirement		ro obtoi	200	d ot ot	op 11 of	Toblo	Ob oo th	ot Ti m	-(76)m on	d ro ool	nuloto	
			or gains	•		nec	ı al Si	ер птог	rabie	90, 50 111	at 11,111=	=(76)m an	iu re-cait	Julate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	Sep	Oct	Nov	Dec	]	
Utilisa	ition fac	tor for g	ains, hm	!  :							•	<b>!</b>		ı	
94)m=	1	0.99	0.97	0.88	0.72		0.51	0.35	0.41	0.7	0.94	0.99	1	]	(94
Useful	l gains,	hmGm	, W = (94	4)m x (8	4)m	•				•		•	•	4	
95)m=	558.23	683.35	821.22	909.23	824.19	5	82.45	384.34	403.0	9 597.36	644.2	1 556.35	521.84		(95
Month	nly avera	age exte	rnal tem	perature	from T	abl	le 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 l	oss rate	for me	an intern	al tempe	erature,	Lm	า , W =	=[(39)m	x [(93)	m– (96)n	n ]			_	
97)m=	1546.23	1506.12	1377.08	1160.24	892.67	5	91.94	385.47	405.4	4 641.17	967.5	5 1275.05	1538.34		(97
Space	e heating	g require	ement fo	r each n	nonth, k	Wh	n/mon	th = 0.02	24 x [(9	97)m – (9	5)m] x (	41)m	_	- -	
98)m=	735.07	552.9	413.56	180.73	50.95		0	0	0	0	240.5	7 517.47	756.27		
_									Т	otal per yea	r (kWh/ye	ear) = Sum(9	98) <sub>15,912</sub> =	3447.51	(98
Space	e heating	g require	ement in	kWh/m²	²/year									36.83	(99
•		•	nts – Indi			evet	tems i	ncluding	micre	-CHP) -					
a. LITE			ns – mu	<del>Muuai</del> II	<del>caming s</del>	ysı	iems i	noluuing	ППСГС	-OHIP)					
Snaar	e heatin	u.													

Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.4	(206)
Efficiency of secondary/supplementary heating s	system	, %						0	(208)
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)  735.07   552.9   413.56   180.73   50.95	0	0	0	0	240.57	517.47	756.27	1	
	<u> </u>	U	U	U	240.57	317.47	756.27		(211)
$ (211) m = \{ [(98) m x (204)] \} x 100 \div (206) $ $ 787.02  591.97  442.78  193.5  54.55 $	0	0	0	0	257.57	554.03	809.71		(211)
			Tota	I (kWh/yea	ar) =Sum(2		<u> </u>	3691.13	(211)
Space heating fuel (secondary), kWh/month									_
= {[(98)m x (201)] } x 100 ÷ (208)								1	
(215)m= 0 0 0 0 0	0	0	0 Tota	0	0	0	0	_	7(045)
Water besting			Tota	i (Kvvii/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)
Water heating Output from water heater (calculated above)									
	47.13	140.97	157.14	158.88	180.92	191.39	205.24		
Efficiency of water heater								80.3	(216)
` '	80.3	80.3	80.3	80.3	85.77	87.43	88.04		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
·	83.23	175.55	195.7	197.86	210.93	218.9	233.13		
	_		Tota	I = Sum(2	19a) <sub>112</sub> =			2494.99	(219)
Annual totals					k!	Wh/year	•	kWh/yea	
Space heating fuel used, main system 1					k¹	Wh/year	•	<b>kWh/yea</b> 3691.13	, 
Space heating fuel used, main system 1 Water heating fuel used					k¹	Wh/year		kWh/yea	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot					k\	Wh/year		<b>kWh/yea</b> 3691.13	, ] ]
Space heating fuel used, main system 1 Water heating fuel used					k\	Wh/year	30	<b>kWh/yea</b> 3691.13	(230c)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot					k\	Wh/year		<b>kWh/yea</b> 3691.13	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:			sum	of (230a).	(230g) =		30	<b>kWh/yea</b> 3691.13	(230c)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue			sum	of (230a).			30	kWh/yea 3691.13 2494.99	(230c) (230e)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year	s inclu	iding mic					30	kWh/yea 3691.13 2494.99	(230c) (230e) (231)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting		J			(230g) =		30 45	kWh/yea 3691.13 2494.99 75 386.62	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	End	iding mi e <b>rgy</b> h/year			(230g) =	ion fac	30 45	kWh/yea 3691.13 2494.99	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	End	<b>ergy</b> h/year			(230g) =	ion fac 2/kWh	30 45	kWh/yea 3691.13 2494.99 75 386.62	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems	<b>En</b> ekW	ergy h/year			(230g) = <b>Emiss</b> kg CO	ion fac 2/kWh	30 45 <b>tor</b>	kWh/yea 3691.13 2494.99 75 386.62 Emissions kg CO2/ye	(230c) (230e) (231) (232)
Space heating fuel used, main system 1  Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)	End kW	ergy h/year ) ×			(230g) =  Emiss kg CO:	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b>	kWh/yea 3691.13 2494.99 75 386.62 Emissions kg CO2/ye	(230c) (230e) (231) (232) sar (261)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	End kW (211 (215 (219	ergy h/year ) x ) x ) x			(230g) =  Emiss kg CO:  0.2	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b> =	kWh/yeal 3691.13 2494.99 75 386.62 Emissions kg CO2/ye 797.28	(230c) (230e) (231) (232) (232) (261) (263)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating Space and water heating	End kW (211 (215 (219	ergy h/year ) x ) x ) x	cro-CHP		(230g) =  Emiss kg CO:  0.2  0.5	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b> =	kWh/yeal 3691.13 2494.99 75 386.62 Emissions kg CO2/ye 797.28 0 538.92	(230c) (230e) (231) (232)  s ar (261) (263) (264) (265)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	End kW (211 (215 (219 (261 (231	ergy h/year ) x ) x ) x	cro-CHP		(230g) =  Emiss kg CO:  0.2	ion fac 2/kWh 16 19	30 45 <b>tor</b> = =	kWh/yeal 3691.13 2494.99 75 386.62 Emissions kg CO2/ye 797.28 0	(230c) (230e) (231) (232)  s ar (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1575.78 (272)

TER = 16.83 (273)

			Lloor D	) otoilo						
	–		User D					070		
Assessor Name: Software Name:	Joseph Treanor Stroma FSAP 20	112		Strom: Softwa					0032062 on: 1.0.4.14	
Software Name:	Silollia FSAF 20			Address		Sion:		VEISIG	JII. 1.U.4.14	
Address :	, Gondar Gardens		i i		Λυ					
1. Overall dwelling dime		, Loridori,	11110 11							
<u> </u>			Area	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor					(1a) x		.55	(2a) =	240.8	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(	1e)+(1n	1) 9	4.43	(4)			_		
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	240.8	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	<b>+</b> [	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 fa	ans				,	3	x ·	10 =	30	(7a)
Number of passive vents	5				F	0	x ·	10 =	0	(7b)
Number of flueless gas f						0	x 4	40 =	0	(7c)
Trainison of muorocc gao					L					(, o)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	a)+(7b)+(	7c) =	Γ	30		÷ (5) =	0.12	(8)
If a pressurisation test has I	been carried out or is inter	nded, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (					•	uction			0	(11)
if both types of wall are p deducting areas of open	oresent, use the value corr ings): if equal user 0.35	esponding to	the great	er wall are	a (after					
If suspended wooden	• / .	aled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0	, )	`	,					0	(13)
Percentage of window	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	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in co	ubic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	lity value, then (18) = I	[(17) ÷ 20]+(8	3), otherwi	ise (18) = (	16)				0.37	(18)
Air permeability value applie	es if a pressurisation test h	nas been don	e or a deg	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -		19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.32	(21)
Infiltration rate modified	for monthly wind spe	ed							-	
Jan Feb	Mar Apr May	y Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	22\m ÷ 4									
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(===)	1.00	1 0.00	3.00	L 3.02			L2		J	

Adjusted infiltr	ation rate (allo	wing for s	helter an	nd wind s	speed) =	(21a) x	(22a)m					
0.41	0.4 0.39	<del></del>	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37	1	
Calculate effe	-	e rate for	the appli	cable ca	se				l		J	
	al ventilation:										0	(23a)
	eat pump using A							) = (23a)			0	(23b)
	h heat recovery: e	-	_								0	(23c)
	ed mechanical	i	1	<u> </u>	<del>'                                    </del>	<del>,                                    </del>	<del>í `</del>	<del>,                                    </del>	<del>-                                    </del>	<del>``</del>	) ÷ 100] 1	(0.4.)
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(24a)
· -	ed mechanical	1	1	1	<del>, , ,</del>	<del>- ^ ` ` </del>	ŕ	<del> </del>	<del>-                                    </del>	ı	1	(0.41)
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(24b)
,	nouse extract \		•	•				C (00h	. \			
	$ \begin{array}{c c} n < 0.5 \times (23b) \\ \hline 0 & 0 \end{array} $	), then (24	$\frac{C}{C} = (230)$	o); otner	wise (24)	C) = (22)	$\frac{1}{0}$	.5 × (230	)   <sub>0</sub>	0	1	(24c)
( 1)											J	(240)
,	ventilation or $n = 1$ , then (24)							0.5]			_	
(24d)m= 0.58	0.58 0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	]	(24d)
Effective air	change rate -	enter (24a	a) or (24l	o) or (24	c) or (24	d) in box	x (25)					
(25)m= 0.58	0.58 0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	]	(25)
3. Heat losse	s and heat los	s paramet	er:									
ELEMENT	Gross	Openir		Net Ar	ea	U-val	ue	AXU		k-value	9	ΑΧk
	area (m²)		n <sup>2</sup>	A ,r	m²	W/m2		(W/I	K)	kJ/m²•		kJ/K
Windows Type	e 1			1.98	х1.	/[1/( 1.4 )+	0.04] =	2.62				(27)
Windows Type	e 2			7.83	x1.	/[1/( 1.4 )+	0.04] =	10.38				(27)
Windows Type	e 3			3.93	х1.	/[1/( 1.4 )+	0.04] =	5.21				(27)
Windows Type	e 4			1.98	x1.	/[1/( 1.4 )+	0.04] =	2.62				(27)
Floor				9.17	x	0.13	= i	1.1921				(28)
Walls Type1	91.51	23.6	51	67.9	X	0.18	₹ - i	12.22	T i			(29)
Walls Type2	15.93	0		15.93	3 x	0.18	<del>-</del>	2.87	T i		<b>i</b> i	(29)
Roof	17.06	0		17.06	3 x	0.13	<b>=</b>	2.22	<b>=</b>		<b>=</b> =	(30)
Total area of e	elements, m <sup>2</sup>			133.6	7							(31)
Party wall	,			5.86	=	0		0	п г			(32)
* for windows and				alue calcui					as given in	paragrapl		(* /
** include the are			iis ana par	นเนอกร		(26)(30)	) + (32) =				40.0	(22)
Heat capacity	•	,				(20)(00)		(30) + (32	2) ± (32a)	(326) -	49.8	(33)
Thermal mass	,	,	· ΤΕΔ\ ir	n k I/m²K			., ,	itive Value:	, , ,	(326) =	6134.7	
For design asses	•		,			ecisely the				ahle 1f	250	(35)
can be used inste			, , , , , , , , , , , , , , , , , , , ,	1011 a10 110	crarown pr	colooly unc	maioative	, , , , , , , , , , , , , , , , , , , ,		abio 11		
Thermal bridg	es : S (L x Y)	calculated	using Ap	pendix l	K						16.32	(36)
if details of therma Total fabric he		known (36)	= 0.15 x (3	81)			(33) ±	· (36) =			60.40	(27)
Ventilation he		ed month	V					= 0.33 × (	25)m v (5)	١	66.12	(37)
Jan	Feb Ma		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Jail	I I GD I IAIG	ı I Ybı	I way	L Juli	l Jui	ı Aug	I geh	I OCI	INUV	l Dec	]	

(38)m= 4	16.28	46.02	45.78	44.61	44.39	43.37	43.37	43.18	43.76	44.39	44.83	45.29		(38)
Heat tran	sfer co	efficien	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m= 1	12.4 1	112.15	111.9	110.73	110.51	109.49	109.49	109.3	109.88	110.51	110.95	111.41		
Heat loss	s param	eter (H	ILP), W/	′m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	110.73	(39)
(40)m=	1.19	1.19	1.18	1.17	1.17	1.16	1.16	1.16	1.16	1.17	1.17	1.18		
									,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.17	(40)
Number	of days	1	nth (Tab	le 1a)			ı					ı	1	
<u></u>	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	r heatin	g ener	gy requi	rement:								kWh/ye	ear:	
Assumed	l occup:	ancy N	d									60		(42)
Assumed occupancy, N $2.68$ 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 av	•		iter usaç	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		97	'.89		(43)
Reduce the		-		• .		-	-	to achieve	a water us	se target o	f			
not more th	at 125 liti	res per p	erson per	aay (ali w		not and co.	<u> </u>	ı			1	ı	I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water u						ctor trom i	аріе 1с х	. /			1	ı	I	
(44)m= 10	07.68 1	103.76	99.85	95.93	92.02	88.1	88.1	92.02	95.93	99.85	103.76	107.68		<b>¬</b>
Energy con	ntent of ho	ot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1174.67	(44)
(45)m= 15	59.68 1	139.66	144.12	125.64	120.56	104.03	96.4	110.62	111.94	130.46	142.41	154.64		
	·			. ,						Γotal = Su	m(45) <sub>112</sub> =		1540.17	(45)
If instantant	eous wate	er heatin	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,	) to (61)		1	ı	1	
` '		20.95	21.62	18.85	18.08	15.6	14.46	16.59	16.79	19.57	21.36	23.2		(46)
Water sto	•		includin	na anv sa	olar or M	/MHRS	storane	within sa	ame ves	امء		0		(47)
If commu		` '		•			Ū		arric ves.	301		U		(41)
Otherwise	•	_			-			, ,	ers) ente	er '0' in <i>(</i>	47)			
Water sto				(					,		, ,			
a) If man	nufactur	er's de	clared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempera	ture fac	tor fro	m Table	2b								0		(49)
Energy lo	st from	water	storage	, kWh/ye	ear			(48) x (49)	) =			0		(50)
b) If man				-									· I	
Hot water	_				e 2 (KVV	n/litre/da	ıy)					0		(51)
Volume fa	-	-		011 4.3								0		(52)
Temperat				2b								0		(53)
Energy lo					ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50			_	, 1	Jul			() x (0.)	/	30,	-	0		(55)
Water sto	, ,	,	•	or each	month			((56)m = (	55) × (41)r	m				` '
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder co			-					-	_		_	_	l ix H	(-0)
_	0	0	0	0	0	0	0	0	0	0	0	0		(57)
(57)m=	<u> </u>	U	U	U	U	U			U	U				(31)

Primary circuit loss (annua	l) from Table 3						0		(58)
Primary circuit loss calcula	•	n (59)m = (58) ÷	365 × (41)	)m				ı	
(modified by factor from	Table H5 if there is	s solar water he	ating and a	a cylinde	r thermo	stat)		_	
(59)m= 0 0	0 0	0 0	0	0	0	0	0		(59)
Combi loss calculated for e	each month (61)m	= (60) ÷ 365 × (	41)m						
	.88 47.31 46.89	<del>-                                    </del>	<del>-i</del>	47.31	50.88	49.32	50.96		(61)
Total heat required for wat	er heating calculate	ed for each mor	 nth (62)m =	: 0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
	95 172.95 167.4		<del>- ` ´                                  </del>	159.25	181.34	191.72	205.6		(62)
Solar DHW input calculated using			ntity) (enter 'C	l )' if no sola	r contributi	on to wate	Ler heating)	l	
(add additional lines if FGH							, , , , , , , , , , , , , , , , , , , ,		
·	0 0 0	0 0	0	0	0	0	0		(63)
Output from water heater			<u> </u>	<u>!</u>	<u> </u>			ļ	
· — — —	95 172.95 167.4	5 147.48 141.	3 157.51	159.25	181.34	191.72	205.6		
	11.2.00			out from wa			<u> </u>	2115.93	(64)
Heat gains from water hea	ting kWh/month ()	25 ' [0 85 🗸 //5							1(- )
	.64 53.6 51.81			49.05	56.1	59.68	64.16	] 	(65)
		ll	ļ	ļ	<u> </u>		<u> </u>	<u> </u>	(00)
include (57)m in calculat	` ' '	cylinaer is in th	e aweiling	or not w	ater is tr	om com	munity r	eating	
5. Internal gains (see Tal	ole 5 and 5a):								
Metabolic gains (Table 5),					ı		<u> </u>	I	
	1ar Apr Ma	<del> </del>	$+$ $\check{}$	Sep	Oct	Nov	Dec		
(66)m= 134.08 134.08 134	1.08   134.08   134.0	8 134.08 134.0	134.08	134.08	134.08	134.08	134.08		(66)
Lighting gains (calculated	n Appendix L, equ	ation L9 or L9a)	, also see	Table 5				•	
(67)m= 22.02 19.55 15	5.9 12.04 9	7.6 8.21	10.67	14.32	18.19	21.23	22.63		(67)
Appliances gains (calculate	ed in Appendix L, e	equation L13 or	L13a), also	see Ta	ble 5				
(68)m= 247 249.56 24	3.1 229.35 211.9	9 195.68 184.7	78 182.22	188.68	202.43	219.78	236.1		(68)
Cooking gains (calculated	in Appendix L, equ	ation L15 or L1	5a), also s	ee Table	5				
(69)m= 36.41 36.41 36	.41 36.41 36.41	36.41 36.4	1 36.41	36.41	36.41	36.41	36.41		(69)
Pumps and fans gains (Ta	ble 5a)		-		-		-	'	
(70)m= 3 3	3 3 3	3 3	3	3	3	3	3		(70)
Losses e.g. evaporation (n	egative values) (Ta	able 5)	<u> </u>	•	•		Į.	J	
(71)m= -107.27 -107.27 -10	<del>- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1</del>	<del> </del>	27 -107.27	-107.27	-107.27	-107.27	-107.27		(71)
Water heating gains (Table	e 5)	l l					<u>I</u>	1	
	.5 74.45 69.63	63.13 58.1	7 65.19	68.12	75.4	82.89	86.24		(72)
Total internal gains =			7)m + (68)m	ļ			<u> </u>	ł	
	3.73 382.06 356.8	<del></del>	· · · · ·	337.35	362.24	390.12	411.19	1	(73)
6. Solar gains:	5.70   602.00   600.00	002.00	024.01	007.00	002.24	000.12	411.10		()
Solar gains are calculated using	solar flux from Table 6	a and associated e	guations to co	onvert to th	e applicab	le orientat	ion.		
Orientation: Access Factor		Flux		g_		FF		Gains	
Table 6d	m²	Table 6a	. Т	able 6b	Ta	able 6c		(W)	
East 0.9x 2	x 1.98	x 19.64	x	0.63	x	0.7		23.77	(76)
East 0.9x 1	x 7.83	x 19.64		0.63	^	0.7	= =	47	](76)
1	7.03	19.04	^	0.00	<b>」^</b> L	0.1		71	1(, 5)

	_				•								_
East	0.9x	2	X	1.98	X	38.42	X	0.63	X	0.7	=	46.5	(76)
East	0.9x	1	X	7.83	X	38.42	X	0.63	X	0.7	=	91.94	(76)
East	0.9x	2	X	1.98	X	63.27	X	0.63	X	0.7	=	76.57	(76)
East	0.9x	1	X	7.83	X	63.27	X	0.63	X	0.7	=	151.41	(76)
East	0.9x	2	X	1.98	X	92.28	X	0.63	X	0.7	=	111.68	(76)
East	0.9x	1	X	7.83	x	92.28	x	0.63	X	0.7	=	220.82	(76)
East	0.9x	2	X	1.98	x	113.09	X	0.63	X	0.7	=	136.87	(76)
East	0.9x	1	X	7.83	X	113.09	x	0.63	X	0.7	=	270.63	(76)
East	0.9x	2	X	1.98	X	115.77	x	0.63	X	0.7	=	140.11	(76)
East	0.9x	1	X	7.83	X	115.77	x	0.63	X	0.7	=	277.03	(76)
East	0.9x	2	X	1.98	X	110.22	x	0.63	X	0.7	=	133.39	(76)
East	0.9x	1	X	7.83	X	110.22	x	0.63	X	0.7	=	263.75	(76)
East	0.9x	2	x	1.98	x	94.68	x	0.63	x	0.7	=	114.58	(76)
East	0.9x	1	x	7.83	x	94.68	x	0.63	x	0.7	=	226.55	(76)
East	0.9x	2	X	1.98	x	73.59	X	0.63	x	0.7	=	89.06	(76)
East	0.9x	1	x	7.83	x	73.59	x	0.63	x	0.7	=	176.1	(76)
East	0.9x	2	X	1.98	X	45.59	X	0.63	x	0.7	=	55.17	(76)
East	0.9x	1	X	7.83	X	45.59	x	0.63	x	0.7	=	109.09	(76)
East	0.9x	2	X	1.98	X	24.49	x	0.63	X	0.7	=	29.64	(76)
East	0.9x	1	X	7.83	X	24.49	X	0.63	x	0.7	=	58.6	(76)
East	0.9x	2	X	1.98	x	16.15	X	0.63	X	0.7	=	19.55	(76)
East	0.9x	1	X	7.83	X	16.15	x	0.63	X	0.7	=	38.65	(76)
South	0.9x	0.54	X	3.93	X	46.75	X	0.63	X	0.7	=	78.76	(78)
South	0.9x	0.54	X	1.98	X	46.75	X	0.63	X	0.7	=	39.68	(78)
South	0.9x	0.54	X	3.93	X	76.57	X	0.63	X	0.7	=	128.99	(78)
South	0.9x	0.54	X	1.98	X	76.57	X	0.63	X	0.7	=	64.99	(78)
South	0.9x	0.54	X	3.93	x	97.53	X	0.63	X	0.7	=	164.31	(78)
South	0.9x	0.54	X	1.98	X	97.53	X	0.63	X	0.7	=	82.78	(78)
South	0.9x	0.54	X	3.93	X	110.23	x	0.63	X	0.7	=	185.7	(78)
South	0.9x	0.54	x	1.98	X	110.23	X	0.63	x	0.7	=	93.56	(78)
South	0.9x	0.54	X	3.93	X	114.87	X	0.63	X	0.7	=	193.51	(78)
South	0.9x	0.54	x	1.98	x	114.87	X	0.63	X	0.7	=	97.49	(78)
South	0.9x	0.54	X	3.93	x	110.55	X	0.63	X	0.7	=	186.23	(78)
South	0.9x	0.54	X	1.98	X	110.55	X	0.63	X	0.7	=	93.83	(78)
South	0.9x	0.54	X	3.93	X	108.01	X	0.63	X	0.7	=	181.96	(78)
South	0.9x	0.54	X	1.98	X	108.01	x	0.63	X	0.7	=	91.67	(78)
South	0.9x	0.54	x	3.93	x	104.89	x	0.63	x	0.7	=	176.71	(78)
South	0.9x	0.54	x	1.98	x	104.89	x	0.63	x	0.7	=	89.03	(78)
South	0.9x	0.54	x	3.93	x	101.89	x	0.63	x	0.7	=	171.64	(78)
South	0.9x	0.54	x	1.98	x	101.89	x	0.63	x	0.7	=	86.47	(78)
South	0.9x	0.54	×	3.93	x	82.59	x	0.63	x	0.7	=	139.12	(78)

South	0.9x	0.54		x 1.	98	x	8	32.59	x		0.63	x	0.7	=	70.09	(78)
South	0.9x	0.54		x 3.	93	x	5	55.42	X		0.63	х	0.7	=	93.36	(78)
South	0.9x	0.54		x 1.	98	X	5	55.42	X		0.63	x	0.7	=	47.03	(78)
South	0.9x	0.54		x 3.	93	x		40.4	x		0.63	x	0.7	=	68.05	(78)
South	0.9x	0.54		x 1.	98	x		40.4	x		0.63	x [	0.7	=	34.29	(78)
•				ed for eac		$\overline{}$		1	<del>`                                    </del>		um(74)m .	(82)m		1	1	
(83)m=		332.41	475.07		698.5	_	597.2	670.77	606	3.87	523.27	373.48	228.63	160.54		(83)
_				ar (84)m	<u> </u>	<del>`</del>		r	·			l	1	T	1	(0.4)
(84)m=	612.93	753.97	881.8	993.83	1055.35	10	029.83	988.15	931	.18	860.61	735.72	618.75	571.72		(84)
7. Me	an inter	nal temp	eratur	e (heating	g seasor	n)										
Temp	erature	during h	neating	periods i	n the livi	ng	area	from Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains fo	r living ar	ea, h1,m	) (s	ee Ta	ble 9a)			,			,	1	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93	0.82		0.65	0.48	0.5	53	0.78	0.96	0.99	1		(86)
Mean	interna	l temper	ature i	n living a	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	Γabl	e 9c)				_	
(87)m=	19.75	19.96	20.25	20.59	20.84	2	20.96	20.99	20.	.99	20.91	20.56	20.08	19.71		(87)
Temp	erature	during h	neating	periods i	n rest of	dw	velling	from Ta	able 9	9, T	h2 (°C)					
(88)m=	19.93	19.93	19.93	19.94	19.94	1	19.95	19.95	19.	.95	19.95	19.94	19.94	19.94		(88)
Utilisa	ation fac	tor for a	ains fo	r rest of c	lwelling.	h2	.m (se	ee Table	9a)		•	•	•	•	•	
(89)m=	1	0.99	0.97	0.91	0.77	_	0.55	0.37	0.4	41	0.69	0.94	0.99	1	]	(89)
Mean	interna	l I tamnar	atura i	n the rest	of dwell	ina	T2 (f	ollow etc	ne 3	R to	! 7 in Tahl	L  a_0c)	Į	!	ı	
(90)m=	18.27	18.57	18.99	19.47	19.79	Ť	19.93	19.95	19.		19.88	19.45	18.76	18.22	]	(90)
(==)			<u> </u>		ļ	<u> </u>					<u> </u>		ng area ÷ (	ļ	0.3	(91)
		1.6	-1 (	f ()			- \ (1)		. /4		A) TO					`
(92)m=	18.72	18.99	19.37	for the wi	20.11	_	<u>19) = 1</u> 20.24	20.27	+ (1		20.19	19.78	19.16	18.67	1	(92)
				n interna	Į	_			L				19.10	10.07		(02)
(93)m=	18.72	18.99	19.37	19.81	20.11	_	20.24	20.27	20.		20.19	19.78	19.16	18.67	]	(93)
		ting requ						_								<u> </u>
				emperatu	re obtair	nec	at st	ep 11 of	Tabl	le 9l	b, so tha	ıt Ti,m=(	76)m an	d re-calc	culate	
				using T									,	,	,	
	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
		tor for g	1	1	1			1				1	1		1	(0.1)
(94)m=	0.99	0.99	0.96	0.9	0.78		0.58	0.4	0.4	45	0.71	0.93	0.99	1		(94)
		1	r `	94)m x (8	<del> </del>	Τ.							1 044 00	T 500 40	l	(OE)
(95)m=	609.64	743.32	849.23		818.18		97.64	398.76	417	.97	614.77	687.54	611.32	569.48		(95)
(96)m=	4.3	age exte	6.5	mperatur 8.9	11.7	$\overline{}$	14.6	16.6	16	: 1	14.1	10.6	7.1	4.2	1	(96)
				nal temp				ļ					7.1	4.2		(30)
(97)m=	1620.73	i		<del></del>		_	17.87	401.42	422		669.61	1014.93	1338.39	1612.62	]	(97)
. ,			l .	or each	Į	_		l	<u> </u>		l	l	l	1.0.2.02		(- )
(98)m=	752.25	562.36	439.87		82.84	T	0	0	- 7 / 1		0	243.58	523.49	776.09	]	
•		I	I		1			I		Tota	ı ıl per year		r) = Sum(9	Ļ	3605.1	(98)
Space	e heatin	a reauire	ement i	n kWh/m	²/year										38.18	(99)
- 1		5 - 1			,											` ′

9a. Energy requirements	s – Individual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space heating:		<u> </u>		<u> </u>		,					<b>¬</b>
Fraction of space heat			mentary	-		(004)				0	(201)
Fraction of space heat	•	, ,			(202) = 1					1	(202)
Fraction of total heating	g from main sy	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main spac	e heating syst	em 1								93.4	(206)
Efficiency of secondary	/supplementai	y heating	g system	າ, %						0	(208)
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requiren	<u> </u>	i					040.50	500.40	770.00	1	
	439.87 224.62	82.84	0	0	0	0	243.58	523.49	776.09		
$(211)$ m = {[(98)m x (204)]	<u> </u>	·	0				000 70	500.40	000.00	1	(211)
805.41 602.1	470.96 240.49	88.69	0	0	0 Tota	0 I (kWh/yea	260.79	560.48	830.93	0050.00	7(244)
		/ tl-			TOLA	ii (KVVII/yea	ar) =3um(2	Z I I) <sub>15,1012</sub>	<del>_</del>	3859.86	(211)
Space heating fuel (sec = {[(98)m x (201)] } x 100	• •	rnonth									
$ \frac{(215)m}{(215)m} = 0 \qquad 0 $	0 0	0	0	0	0	0	0	0	0	]	
	<u> </u>	!			Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<u>.                                    </u>	0	(215)
Water heating											_
Output from water heate							_			1	
210.64 185.69	195 172.95	167.45	147.48	141.3	157.51	159.25	181.34	191.72	205.6		<b>_</b>
Efficiency of water heate								l		80.3	(216
' <u> </u>	87.04 85.71	83.38	80.3	80.3	80.3	80.3	85.79	87.45	88.08		(217)
Fuel for water heating, k (219)m = (64)m x 100 -											
` '	224.04 201.79	200.82	183.66	175.96	196.16	198.32	211.37	219.23	233.43		
	-				Tota	I = Sum(2	19a) <sub>112</sub> =	-	-	2496.01	(219)
Annual totals							k'	Wh/year	•	kWh/yea	<u>r</u>
Space heating fuel used	, main system	1								3859.86	╛
Water heating fuel used										2496.01	
Electricity for pumps, far	ns and electric	keep-ho	t								
central heating pump:									30	]	(2300
boiler with a fan-assiste	ed flue								45	<u>,</u> ]	(230
Total electricity for the al	hove kWh/vea	ar			sum	of (230a).	(230g) =			J 75	(231)
•	5515, 111111111111111111111111111111111					, ,	, 0,				(232)
Electricity for lighting					0.15					388.81	(232)
12a. CO2 emissions –	Individual heat	ing syste	ems inclu	uding mi	cro-CHF	)					
				<b>ergy</b> /h/year			Emiss kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main sys	stem 1)		(211	I) x			0.2	16	=	833.73	(261)
Space heating (seconda	ıry)		(215	5) x			0.5	19	=	0	(263)
Water heating	- *		(219	9) x			0.2		=	539.14	(264)
Space and water heating	7				+ (263) + (	(264) =					=
opace and water nealing	el .		(20	., . (202)	(_00)					1372.87	(265)

Electricity for pumps, fans and electric keep-hot (231) x 0.519 = 38.93 (267) Electricity for lighting (232) x 0.519 = 201.79 (268) Total CO2, kg/year sum of (265)...(271) = 1613.58 (272)

 $TER = 17.09 \tag{273}$ 

			lloor F	) otoilo						
Assessor Name:	Joseph Treanor		User D	Strom	a Num	bor		STDC	0032062	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.14	
		Р	roperty	Address						
Address :	, Gondar Gardens,									
1. Overall dwelling dim	nensions:									
			Are	a(m²)		Av. He	ight(m)	,	Volume(m <sup>3</sup>	<u> </u>
Ground floor				92.1	(1a) x	2	2.55	(2a) =	234.85	(3a)
Total floor area TFA = (	(1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	92.1	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	234.85	(5)
2. Ventilation rate:										
		secondar heating	'у 	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	fans				Ī	3	X	10 =	30	(7a)
Number of passive ven	ts				F	0	x -	10 =	0	(7b)
Number of flueless gas	fires				F	0	X 4	40 =	0	(7c)
The second secon					L					(, o)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans =	(6a)+(6b)+(7	7a)+(7b)+(	(7c) =	Γ	30		÷ (5) =	0.13	(8)
If a pressurisation test has	s been carried out or is intend	ded, procee	d to (17),	otherwise (	continue fr	om (9) to	(16)			<u> </u>
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 (a.e. at a at a a that a		0.05.6				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corre				•	uction			0	(11)
	nings); if equal user 0.35	oponang te	o uno grodi	ior man are	a (ano					
If suspended wooder	n floor, enter 0.2 (unsea	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
• ,	enter 0.05, else enter 0								0	(13)
J	ws and doors draught s	stripped		0.05 10.0	(4.4) 4	001			0	(14)
Window infiltration				0.25 - [0.2] (8) + (10)			. (15) -		0	(15)
Infiltration rate	e, q50, expressed in cu	ibio motro	oc par ba	. , , , ,	, , ,	, , ,	, ,	aroa	0	(16)
If based on air permeat	• • •		•	•	•	elle ol e	rivelope	alea	0.38	(17)
·	lies if a pressurisation test h					is being u	sed		0.36	(10)
Number of sides shelte	red			-					2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpor	ating shelter factor			(21) = (18	) x (20) =				0.32	(21)
Infiltration rate modified	I for monthly wind spee	ed							7	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind s	speed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (	(22)m ÷ 4									
(22a)m = 1.27   1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
• '									J	

0.41	ation rat	e (allowi	ng for sr 0.35	o.35	d wind s	peed) = 0.31	(21a) x	(22a)m <sub>0.32</sub>	0.35	0.36	0.38		
Calculate effe							0.3	0.32	0.55	0.30	0.36		
If mechanic	al ventila	ıtion:										0	(23
If exhaust air h		0		, ,	,	. `	,, .	•	) = (23a)			0	(23
If balanced wit		-	-	_								0	(23
a) If balance							<del>- ` ` - </del>	<u> </u>	<del> </del>		· · · · ·	÷ 100] I	(0.4
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	1						<u> </u>	<u> </u>	<del>-                                    </del>			l	(24
(24b)m= 0	0	0	0	0	. ,	0	0	0	0	0	0		(24
c) If whole h	nouse ex n < 0.5 ×			-	-				5 v (23h	.)			
$\frac{11(220)1}{(24c)m=0}$	0.5 7	0	0	0	0	0	0	0	0	0	0		(24
d) If natural											Ů	l	•
	n = 1, the								0.5]				
(24d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24
Effective air	change	rate - er	iter (24a	) or (24k	o) or (24d	c) or (24	d) in box	(25)			-		
(25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25
3. Heat losse	e and he	at loss r	naramete	or.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	1 <del>C</del>	AXU		k-value	Э. А	Xk
	area		m		A ,r		W/m2		(W/I	<)	kJ/m²-l		J/K
Windows Type	<del>)</del> 1				4.29	х1.	/[1/( 1.4 )+	0.04] =	5.69				(27
Windows Type	∌ 2				2.08	x1.	/[1/( 1.4 )+	0.04] =	2.76				(27
Windows Type	∍ 3				4.09	x1.	/[1/( 1.4 )+	0.04] =	5.42				(27
Windows Type	e 4				2.05	x1.	/[1/( 1.4 )+	0.04] =	2.72				(27
Walls Type1	92.1	13	23.0	1	69.12	2 x	0.18	□ = Ī	12.44	<u> </u>			(29
Walls Type2	21.5	<u></u>	0		21.51	x	0.18	<u> </u>	3.87	<b>=</b>		i	(29)
Roof	15.3	3	0		15.3	x	0.13		1.99	<b>=</b>		i i	(30
Total area of e	elements	 , m²			128.9	4							(31
* for windows and			ffective wi	ndow U-va			formula 1	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	1 3.2	•
** include the are	as on both	sides of in	ternal wali	ls and par	titions								
Fabric heat los		•	U)				(26)(30)	+ (32) =				48.81	(33
Heat capacity	,	` ,						((28)	.(30) + (32	2) + (32a).	(32e) =	5575.5	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35
For design asses can be used inste				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridg				usina Ar	pendix k	<						15.73	(36
if details of therm	•	,			•	•						10.75	(00
Total fabric he			, ,	,	,			(33) +	(36) =			64.54	(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		
Jan		44.75	43.58	43.37	42.36	42.36	42.17	42.75	43.37	43.81	44.27		(38
	44.99	44.75	10.00									1	
			10.00		<u> </u>			(39)m	= (37) + (37)	38)m		l	
(38)m= 45.25			108.13	107.91	106.9	106.9	106.71	(39)m 107.29	= (37) + (37)	38)m 108.35	108.81		

Heat loss para	ameter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.19	1.19	1.19	1.17	1.17	1.16	1.16	1.16	1.16	1.17	1.18	1.18		
				ļ		Į.	Į.	'	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.17	(40)
Number of day	ys 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 hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
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.		65		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o		7.22		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i							_	·'	!				
(44)m= 106.94	103.05	99.16	95.27	91.38	87.5	87.5	91.38	95.27	99.16	103.05	106.94		
									Total = Su	m(44) <sub>112</sub> =		1166.62	(44)
Energy content of	f hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 158.59	138.7	143.13	124.78	119.73	103.32	95.74	109.86	111.18	129.57	141.43	153.58		
If instantaneous v	votor hoot	ing at paint	of upo (no	hot woto	· otorogol	antar O in	hayaa (16		Total = Su	m(45) <sub>112</sub> =	- [	1529.62	(45)
			,	ı	, , , , , , , , , , , , , , , , , , ,	·	` '			1	i I		(40)
(46)m= 23.79 Water storage	20.81	21.47	18.72	17.96	15.5	14.36	16.48	16.68	19.43	21.21	23.04		(46)
Storage volum		) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•	•	-			_							` ,
Otherwise if no	_			_			' '	ers) ente	er '0' in (	47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		_	-				(48) x (49)	) =			0		(50)
<ul><li>b) If manufact</li><li>Hot water store</li></ul>			-								0		(51)
If community h	•			.0 2 (1000	1,11ti 0, de	· <b>y</b> /					0		(01)
Volume factor	_										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		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder 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 Appendi	хH	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	- <del></del>							0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

0 1:1		, ,		(0.4)	(00)	005 (44								
Combi loss			·	<u> </u>	<del>`</del>	`	,	1	40.00	50.50	T 40.00		1	(64)
(61)m= 50.9		50.53	46.98	46.57	43.1	Ļ	46.		46.98	50.53	49.32	50.96		(61)
	<del>-i</del>						<del>`</del>	_			ì	<del>`</del>	(59)m + (61)m	(00)
(62)m= 209.5		193.66	171.77	166.3	146.		156		158.16	180.1	190.75	204.54		(62)
Solar DHW inp										r contribu	tion to wate	er heating)		
(add addition		r			<del>- · ·</del>	<del> </del>	<del>i                                      </del>				1 0	Ι ,	1	(62)
(63)m= 0	0	0	0	0	0	0	C	)	0	0	0	0	J	(63)
Output from					i	<u> </u>	1				-	1	1	
(64)m= 209.5	5 184.73	193.66	171.77	166.3	146.	47   140.33	156		158.16	180.1	190.75	204.54		1,04
											er (annual) <sub>1</sub>		2102.78	(64)
Heat gains f		<del></del>			<del>-</del>	<del></del>	<del>r `</del>			( [(46)m	<del>- ` ´ </del>	<del>- `                                   </del>	i ] i	
(65)m= 65.4	7 57.63	60.22	53.24	51.45	45.1	4 42.98	48.	17	48.71	55.71	59.35	63.81		(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylind	er is in the	dwell	ling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):										
Metabolic gains (Table 5), Watts														
Jar	r Feb	Mar	Apr	May	Ju	n Jul	А	ug	Sep	Oct	Nov	Dec		
(66)m= 132.6	7 132.67	132.67	132.67	132.67	132.	67 132.67	132	.67	132.67	132.67	132.67	132.67		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L	9 or L9a), a	lso s	ee -	Table 5				-	
(67)m= 21.6	5 19.23	15.64	11.84	8.85	7.4	7 8.07	10	.5	14.09	17.89	20.88	22.26	]	(67)
Appliances (	gains (calc	ulated ir	Append	dix L, eq	uatio	n L13 or L1	3a),	also	see Tal	ble 5	•	•	•	
(68)m= 242.8	9 245.41	239.06	225.54	208.47	192.	43 181.71	179	.19	185.54	199.06	216.13	232.17	]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L	15 or L15a	), als	o se	e Table	5	•		•	
(69)m= 36.2°	<del>_`</del>	36.27	36.27	36.27	36.2		36.	_	36.27	36.27	36.27	36.27	]	(69)
Pumps and	fans gains	(Table	 5а)											
(70)m= 3	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)						1	<u>!</u>	J	
		-106.14			-106.	14 -106.14	-106	5.14	-106.14	-106.14	-106.14	-106.14	1	(71)
Water heatir	ng gains (1	rable 5)			<u> </u>	I	<u> </u>				!		J	
(72)m= 88	85.75	80.95	73.94	69.16	62.	7 57.77	64.	75	67.66	74.88	82.44	85.76	1	(72)
Total intern					l	<b>L</b> (66)m + (67)n	<u> </u>				Į	ļ	J	. ,
(73)m= 418.3	_ <del>_</del>	401.44	377.12	352.28	328	<del>` '</del>	320	_	333.08	357.63	385.24	405.99	1	(73)
6. Solar ga		101111	011112	002.20	020	. 1 010.00	1 020		000.00	007.00	000.21	100.00		( - /
Solar gains ar		using sola	r flux from	Table 6a	and as	sociated equa	ations	to co	nvert to th	e applical	ble orientat	tion.		
Orientation:		•	Area			Flux			g_		FF		Gains	
	Table 6d		m²			Table 6a		Т	able 6b	Т	able 6c		(W)	
East 0.9	x 1	x	4.0	)9	х Г	19.64	] <sub>x</sub>		0.63	x	0.7		24.55	(76)
East 0.9		x	2.0		x $\vdash$	19.64	] ]		0.63		0.7	= =	24.61	](76)
East 0.9		×	4.0		x $\vdash$	38.42	] ]		0.63	_ x	0.7	= =	48.02	](76)
East 0.9		x	2.0		x $\Gamma$	38.42	] x	_	0.63		0.7		48.14	](76)
East 0.9		×			^ <u> </u>	63.27	] ^ ] x	_	0.63	^ L	0.7		79.09	](76)
	`	^	4.0	13	^ _	03.21	<b>」</b> ^		0.03	^ L	0.7		19.09	J(, 0)

C4			1		1		1						٦
East	0.9x	2	X	2.05	X	63.27	X	0.63	X	0.7	=	79.28	(76)
East	0.9x	1	X	4.09	X	92.28	X	0.63	X	0.7	=	115.35	(76)
East	0.9x	2	X	2.05	X	92.28	X	0.63	X	0.7	=	115.63	(76)
East	0.9x	1	X	4.09	X	113.09	X	0.63	X	0.7	=	141.36	(76)
East	0.9x	2	X	2.05	X	113.09	X	0.63	X	0.7	=	141.71	(76)
East	0.9x	1	X	4.09	X	115.77	X	0.63	X	0.7	=	144.71	(76)
East	0.9x	2	X	2.05	X	115.77	X	0.63	X	0.7	=	145.06	(76)
East	0.9x	1	X	4.09	X	110.22	X	0.63	X	0.7	=	137.77	(76)
East	0.9x	2	X	2.05	X	110.22	X	0.63	X	0.7	=	138.1	(76)
East	0.9x	1	X	4.09	X	94.68	X	0.63	X	0.7	=	118.34	(76)
East	0.9x	2	X	2.05	x	94.68	x	0.63	x	0.7	=	118.63	(76)
East	0.9x	1	X	4.09	x	73.59	X	0.63	X	0.7	=	91.98	(76)
East	0.9x	2	X	2.05	X	73.59	X	0.63	x	0.7	=	92.21	(76)
East	0.9x	1	X	4.09	X	45.59	X	0.63	X	0.7	=	56.98	(76)
East	0.9x	2	X	2.05	x	45.59	X	0.63	x	0.7	=	57.12	(76)
East	0.9x	1	x	4.09	x	24.49	x	0.63	x	0.7	=	30.61	(76)
East	0.9x	2	x	2.05	x	24.49	x	0.63	x	0.7	=	30.69	(76)
East	0.9x	1	X	4.09	X	16.15	X	0.63	x	0.7	=	20.19	(76)
East	0.9x	2	x	2.05	x	16.15	x	0.63	x	0.7	=	20.24	(76)
West	0.9x	0.77	x	4.29	x	19.64	x	0.63	x	0.7	=	51.5	(80)
West	0.9x	0.77	x	2.08	x	19.64	x	0.63	x	0.7	=	37.45	(80)
West	0.9x	0.77	x	4.29	x	38.42	X	0.63	x	0.7	=	100.74	(80)
West	0.9x	0.77	x	2.08	X	38.42	X	0.63	X	0.7	=	73.27	(80)
West	0.9x	0.77	x	4.29	x	63.27	X	0.63	x	0.7	=	165.91	(80)
West	0.9x	0.77	x	2.08	x	63.27	x	0.63	x	0.7	=	120.66	(80)
West	0.9x	0.77	x	4.29	x	92.28	x	0.63	x	0.7	=	241.97	(80)
West	0.9x	0.77	X	2.08	x	92.28	X	0.63	x	0.7	=	175.98	(80)
West	0.9x	0.77	x	4.29	x	113.09	x	0.63	x	0.7	=	296.55	(80)
West	0.9x	0.77	x	2.08	x	113.09	x	0.63	x	0.7	=	215.67	(80)
West	0.9x	0.77	x	4.29	x	115.77	x	0.63	x	0.7	=	303.57	(80)
West	0.9x	0.77	x	2.08	x	115.77	x	0.63	x	0.7	=	220.78	(80)
West	0.9x	0.77	x	4.29	X	110.22	X	0.63	x	0.7	=	289.01	(80)
West	0.9x	0.77	X	2.08	x	110.22	X	0.63	x	0.7	=	210.19	(80)
West	0.9x	0.77	x	4.29	x	94.68	x	0.63	x	0.7	=	248.26	(80)
West	0.9x	0.77	x	2.08	x	94.68	x	0.63	x	0.7	=	180.55	(80)
West	0.9x	0.77	x	4.29	x	73.59	x	0.63	x	0.7	=	192.96	(80)
West	0.9x	0.77	x	2.08	x	73.59	x	0.63	x	0.7	j =	140.34	(80)
West	0.9x	0.77	x	4.29	x	45.59	x	0.63	x	0.7	=	119.54	(80)
West	0.9x	0.77	x	2.08	x	45.59	x	0.63	x	0.7	=	86.94	(80)
West	0.9x	0.77	x	4.29	x	24.49	x	0.63	x	0.7	=	64.21	(80)
West	0.9x	0.77	x	2.08	x	24.49	x	0.63	X	0.7	=	46.7	(80)

	_														
West	0.9x	0.77	X	4.2	29	X	16	6.15	X	0.63	x	0.7	=	42.35	(80)
West	0.9x	0.77	X	2.0	)8	x	16	6.15	x	0.63	x	0.7	=	30.8	(80)
Solar o	gains in	watts, ca	alculated	for eac	h month				(83)m =	Sum(74)m	(82)m			-	
(83)m=	138.11	270.18	444.95	648.93	795.29	814	4.12	775.07	665.78	517.49	320.59	172.21	113.58		(83)
Total g	gains – ii	nternal a	and solar	(84)m =	= (73)m	+ (83	3)m ,	watts							
(84)m=	556.45	686.37	846.39	1026.05	1147.56	114	2.51	1088.43	986.01	850.58	678.22	557.46	519.57		(84)
7. Me	an inter	nal temp	perature	(heating	season	)									
Temp	erature	during h	neating p	eriods ir	n the livi	ng a	rea f	rom Tab	ole 9, T	h1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(se	e Tal	ble 9a)					'		_
	Jan	Feb	Mar	Apr	May	J	lun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.92	0.77	0.	.58	0.43	0.49	0.77	0.97	1	1		(86)
Moon	intorna	l tompor	ature in l	living or	00 T1 /f/	المال	v ctor	oc 2 to 7	in Tak	olo Oo)	!	<b>.</b>		ı	
(87)m=	19.71	19.91	20.23	20.62	20.88	1	v Step 0.98	21	20.99	20.91	20.53	20.03	19.67		(87)
(01)111=	19.71	19.91	20.23	20.02	20.88	20	1.90	21	20.99	20.91	20.33	20.03	19.07		(01)
Temp		during h	neating p	eriods ir	rest of	dwe	elling	from Ta	ble 9,	Th2 (°C)				1	
=m(88)	19.93	19.93	19.93	19.94	19.94	19	.95	19.95	19.95	19.95	19.94	19.94	19.93		(88)
Utilisa	ation fac	tor for g	ains for r	est of d	welling,	h2,n	n (se	e Table	9a)						
(89)m=	1	0.99	0.97	0.89	0.71	1	49	0.33	0.38	0.69	0.95	0.99	1		(89)
				(1 (	. ( .   .		<u>-</u>		0 1		L - 0 - \	<u> </u>		I	
			1		i	Ť	<del>`</del>		i –	7 in Tab		1 40 00	40.40	l	(00)
(90)m=	18.21	18.5	18.97	19.52	19.83	19	.94	19.95	19.95	19.88	19.4	18.69	18.16		(90)
										•	fLA = Livir	ng area ÷ (4	4) =	0.33	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling	) = fL	A × T1	+ (1 –	LA) × T2					
(92)m=	18.7	18.96	19.39	19.88	20.18	20	.28	20.29	20.29	20.22	19.77	19.14	18.66		(92)
Apply	adjustn	nent to tl	he mean	interna	l temper	atur	e fror	m Table	4e, wł	nere appr	opriate				
(93)m=	18.7	18.96	19.39	19.88	20.18	$\overline{}$	.28	20.29	20.29	20.22	19.77	19.14	18.66		(93)
8. Sp	ace hea	ting requ	uirement				,								
				nperatu	re obtair	ned a	at ste	p 11 of	Table	9b, so tha	nt Ti,m=(	76)m an	d re-calc	ulate	
			or gains ı									,			
	Jan	Feb	Mar	Apr	May	J	lun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:											
(94)m=	1	0.99	0.97	0.89	0.73	0.	52	0.36	0.42	0.71	0.95	0.99	1		(94)
Usefu	ıl gains,	hmGm ,	, W = (94	1)m x (8	4)m										
(95)m=	554.25	679.02	817.1	909.39	833.35	594	4.76	393.33	412.24	604.29	641.48	552.61	518.07		(95)
Montl	hly aver	age exte	rnal tem	perature	from T	able	8			•	•	•			
(96)m=	4.3	4.9	6.5	8.9	11.7	14	4.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm ,	, W =	:[(39)m	x [(93)r	n– (96)m	]	•			
(97)m=	1580.95	1540.14	1408.39	1187.68	914.96	607	7.19	394.93	415.46	656.89	989.64	1304.06	1573.34		(97)
Space	e heatin	a require	ement fo	r each n	nonth, k'	Wh/r	montl	h = 0.02	24 x [(9	7)m – (95	o)m] x (4	1)m		1	
(98)m=	763.87	578.68	439.92	200.37	60.72	1	0	0	0	<del></del>	259.03	541.04	785.12		
	<u> </u>				<u> </u>	<u> </u>				tal per year		<u>l</u>		3628.74	(98)
_					N/				10	por your	(ATTIII y Cal	., = Odin(3	<b>-</b> ∫15,912		=
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year									39.4	(99)
9a. En	ergy rec	quiremer	nts – Indi	vidual h	eating s	yste	ms ir	ncluding	micro-	CHP)					
-	e heatir	_													
Fracti	ion of sp	ace hea	at from se	econdar	y/supple	mer	ntary	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) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.4	(206)
Efficiency of secondary/supplementary heating	system	1, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)	0 1	0	0	0	250.02	541.04	705 10	1	
763.87 578.68 439.92 200.37 60.72	0	0	0	0	259.03	541.04	785.12		(04.4)
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$ $817.84  619.57  471  214.53  65.01$	0	0	0	0	277.33	579.27	840.6	]	(211)
				I (kWh/yea		211) <sub>15,1012</sub>		3885.16	(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		<b>-</b>
			Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>		0	(215)
Water heating Output from water heater (calculated above)									
	146.47	140.33	156.43	158.16	180.1	190.75	204.54		
Efficiency of water heater								80.3	(216)
(217)m= 88.02 87.73 87.05 85.44 82.77	80.3	80.3	80.3	80.3	85.97	87.53	88.11		(217)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$									
(219)III = (04)III × 100 ÷ (217)III									
(219)m= 238.08 210.57 222.46 201.04 200.91	182.4	174.75	194.81	196.96	209.5	217.92	232.15	]	
(219)m= 238.08 210.57 222.46 201.04 200.91	182.4	174.75		196.96 I = Sum(2		217.92	232.15	2481.55	(219)
Annual totals	182.4	174.75			19a) <sub>112</sub> =	217.92 Wh/year		kWh/year	
Annual totals Space heating fuel used, main system 1	182.4	174.75			19a) <sub>112</sub> =				
Annual totals	182.4	174.75			19a) <sub>112</sub> =			kWh/year	
Annual totals Space heating fuel used, main system 1	182.4	174.75			19a) <sub>112</sub> =			kWh/year 3885.16	
Annual totals Space heating fuel used, main system 1 Water heating fuel used	182.4	174.75			19a) <sub>112</sub> =			kWh/year 3885.16	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot	182.4	174.75			19a) <sub>112</sub> =			kWh/year 3885.16	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:	182.4	174.75	Tota		19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30	kWh/year 3885.16	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue	182.4	174.75	Tota	I = Sum(2 <sup>-</sup>	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30	kWh/year 3885.16 2481.55	(230c) (230e)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			Tota	I = Sum(2 <sup>-1</sup> of (230a).	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30	kWh/year 3885.16 2481.55	(230c) (230e) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu	uding mi	Tota	I = Sum(2 <sup>-1</sup> of (230a).	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30 45	kWh/year 3885.16 2481.55 75 382.41	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu		Tota	I = Sum(2 <sup>-1</sup> of (230a).	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30 45	kWh/year 3885.16 2481.55	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu En kW	ıding mi	Tota	I = Sum(2 <sup>-1</sup> of (230a).	19a) <sub>112</sub> = k¹(230g) =	ion fac	30 45	kWh/year 3885.16 2481.55 75 382.41	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	ns inclu En kW (211	uding mid ergy /h/year	Tota	I = Sum(2 <sup>-1</sup> of (230a).	(230g) =  Emiss kg CO:	ion factorist	30 45 <b>tor</b>	kWh/year 3885.16 2481.55 75 382.41 Emissions kg CO2/year 839.19	(230c) (230e) (231) (232) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	ns inclu Enc kW (211	ergy /h/year	Tota	I = Sum(2 <sup>-1</sup> of (230a).	(230g) =  Emiss kg CO:  0.5	ion fact 2/kWh	30 45 <b>tor</b>	kWh/year 3885.16 2481.55 75 382.41 Emissions kg CO2/yea 839.19	(230c) (230e) (231) (232) (232) (261) (263)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	ns inclu En- kW (211 (215 (219	ergy /h/year ) × 5) ×	sum	I = Sum(2 <sup>-1</sup> )	(230g) =  Emiss kg CO:	ion fact 2/kWh	30 45 <b>tor</b> =	kWh/year 3885.16 2481.55 75 382.41 Emissions kg CO2/yea 839.19 0 536.01	(230c) (230e) (231) (232) (261) (263) (264)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating Space and water heating	ns inclu En kW (211 (215 (219 (261	ergy /h/year ) x 5) x 0) x	sum	I = Sum(2 <sup>-1</sup> )	(230g) =  Emiss kg CO:  0.2  0.5	ion fact 2/kWh	30 45 <b>tor</b> = =	kWh/year 3885.16 2481.55 75 382.41 Emissions kg CO2/yea 839.19 0 536.01 1375.21	(230c) (230e) (231) (232) (261) (263) (264) (265)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	ns inclu En kW (211 (215 (219 (261 (231	ergy /h/year ) × 5) ×	sum	I = Sum(2 <sup>-1</sup> )	(230g) =  Emiss kg CO:  0.5	ion fact 2/kWh	30 45 <b>tor</b> =	kWh/year 3885.16 2481.55 75 382.41 Emissions kg CO2/yea 839.19 0 536.01	(230c) (230e) (231) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1612.61 (272)

TER = 17.51 (273)

			l leer P	otoile: -						
			User D					0===	200000	
Assessor Name:	Joseph Treanor	40		Strom					0032062	
Software Name:	Stroma FSAP 20			Softwa		rsion:		versio	on: 1.0.4.14	
Address :	, Gondar Gardens		i i	Address:	A/					
1. Overall dwelling dime		, London,	INVVO II	IG						
The state of the s			Area	a(m²)		Av. He	ight(m)		Volume(m³	)
Ground floor					(1a) x		2.55	(2a) =	197.52	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1n	n)	7.46	(4)			J		
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	197.52	(5)
2. Ventilation rate:										
		secondar	у	other		total			m³ per hou	r
Number of chimneys	heating +	heating 0	+ [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	<b></b>	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans				_ _ _	3	x ·	10 =	30	
Number of passive vents	8					0	x	10 =	0	(7b)
Number of flueless gas t					F	0	x	40 =	0	(7c)
rtamber of hadrood gas i										
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(	7c) =	Γ	30		÷ (5) =	0.15	(8)
If a pressurisation test has	been carried out or is inten	ded, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)		•	_
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (					•	uction			0	(11)
if both types of wall are p deducting areas of open	oresent, use the value corre	esponding to	the great	er wall are	a (after					
If suspended wooden	• / .	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	•	,	(	,,					0	(13)
Percentage of window									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 cu	ıbic metre	s per ho	our per so	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	lity value, then (18) = [	(17) ÷ 20]+(8	3), otherwi	se (18) = (	16)				0.4	(18)
Air permeability value appli	es if a pressurisation test h	as been don	ne or a deg	gree air pe	meability	is being u	sed			
Number of sides shelter	ed								2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	[9)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.34	(21)
Infiltration rate modified	for monthly wind spec	ed							-	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (2	22\m ÷ 4									
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(22α)111- 1.21 1.20	1.20 1.1 1.00	0.90	0.90	0.92	'	1.00	1.12	1.10	_	

Author   A	Adjusted infiltr	ation rat	e (allowi	ng for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m						
If reschause air heart pump using Appendix N, (23a) × Fmv (equation (NS)), otherwise (23b) = (23a) × Fmv (equation (NS)), otherwise (24b) = (23b) m + (23b) × [1 - (23c) × 100]   (24a)	0.44	0.43	0.42	0.38	0.37	0.32	0.32	0.32	0.34	0.37	0.38	0.4	]		
It balanced with heat recovery; efficiency in % allowing for in-use factor (from Table 4th) =			•	rate for t	he appli	cable ca	se		!			!			٦,,,,
It balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =				andis N. (C	12h) (22a	.) Fm. / (	auatian (N	VIEVV otho	muiaa (22h	·) (22a)					╡ .
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0										)) = (23a)					╡
24a m			•	•	_					<b>0.</b> ) (	001) [	. (22.)		0	(23c)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· ·				i		<del>-                                    </del>	<del>,                                    </del>	<del>í `</del>	<del>-                                    </del>	<del>,                                    </del>	<del>1 ` '</del>	) ÷ 100] 1		(240)
(24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		<u> </u>			<u> </u>	<u> </u>	<u> </u>					0	]		(24a)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  (24c)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· ·				i		<u> </u>	<del>-                                    </del>	ŕ	<del> </del>	<del></del>	Ι ,	1		(24b)
if (22b)	` '	<u> </u>			<u> </u>				<u> </u>	0	0	0	]		(240)
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]	•					•				.5 × (23b	o)	_	_		
fr (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]	(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24c)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)  Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)  3. Heat losses and heat loss parameter:  ELEMENT Gross Openings area (m²)    Windows Type 1										0.5]					
3. Heat losses and heat loss parameter:			<u> </u>		ŕ	<u> </u>	<del>_</del>	<del> </del>		<del>-</del>	0.57	0.58	]		(24d)
S. Heat losss and heat loss parameter:   ELEMENT   Gross area (m²)   Openings area (m²)   Net Area   U-value   A X U   K-value   KJ/m²-K   KJ/K	Effective air	change	rate - er	iter (24a	) or (24k	o) or (24	c) or (24	d) in box	x (25)						
Companies   Comp	(25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	]		(25)
Companies   Comp	2 Hoat losso	c and he	ot loce r	aramat	or:			•	•	•	•	•	•		
A , m²   A , m²   A , m²   M/m2K   (W/K)   kJ/m²-K   kJ/K			·			Not Ar	22	اديدا ا	ПО	ΔΧΙΙ		k-value	<u> </u>	ΔΥ	' k
Windows Type 2  4.5	ELEMENI		-							_	K)				
Windows Type 3  2.26	Windows Type	e 1				8.96	x1.	/[1/( 1.4 )+	0.04] =	11.88					(27)
Walls Type 1 83.91 17.98 65.93 x 0.18 = 11.87 (29)  Walls Type 2 14.15 0 14.15 x 0.18 = 2.55 (29)  Roof 77.46 0 77.46 x 0.13 = 10.07 (30)  Total area of elements, m² 175.52 (31)  * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2  ** include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 48.32 (33)  Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 5501.94 (34)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K (33) + (36) = 72.49 (37)  Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)  Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)  Heat transfer coefficient, W/K (39)m = (37) + (38)m  [39)m = 111.26 111.02 110.78 109.68 109.47 108.51 108.51 108.53 108.88 109.47 109.89 110.33	Windows Type	2				4.5	x1,	/[1/( 1.4 )+	0.04] =	5.97	$\overline{}$				(27)
Walls Type2	Windows Type	e 3				2.26	x1.	/[1/( 1.4 )+	0.04] =	3	$\overline{}$				(27)
Roof   T7.46   0   T7.46   x   0.13   = 10.07   (30)	Walls Type1	83.9	)1	17.9	8	65.93	3 x	0.18	= i	11.87					(29)
Total area of elements, m²	Walls Type2	14.1	5	0		14.15	5 x	0.18	<del>-</del>	2.55					(29)
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2  ** include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 48.32 (33)  Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 5501.94 (34)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K (34)  If details of thermal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss (33) + (36) = 72.49 (37)  Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 38.77 38.53 38.3 37.19 36.99 36.02 36.02 35.85 36.39 36.99 37.4 37.84  Heat transfer coefficient, W/K (39)m = (37) + (38)m  (39)m= 111.26 111.02 110.78 109.68 109.47 108.51 108.51 108.33 108.88 109.47 109.89 110.33	Roof	77.4	6	0		77.46	3 x	0.13	₹ - i	10.07			<b>=</b>		(30)
** include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 48.32 (33)  Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 5501.94 (34)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K 24.16 (36)  if details of thermal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss (33) + (36) = 72.49 (37)  Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)  Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (35)  Heat transfer coefficient, W/K (39)m = (37) + (38)m  (39)m = 111.26 111.02 110.78 109.68 109.47 108.51 108.51 108.33 108.88 109.47 109.89 110.33	Total area of e	lements	, m²			175.5	2								(31)
Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 48.32 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 5501.94 (34) Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K 24.16 (36) if details of thermal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss (33) + (36) = 72.49 (37)  Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 38.77 38.53 38.3 37.19 36.99 36.02 36.02 35.85 36.39 36.99 37.4 37.84 (38)  Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = (37) + (38)m (39)m = 111.26 111.02 110.78 109.68 109.47 108.51 108.51 108.33 108.88 109.47 109.89 110.33							ated using	formula 1	l/[(1/U-valu	ie)+0.04] a	as given in	paragraph	n 3.2		
Heat capacity $Cm = S(A \times k)$								(26)(30)	) + (32) =				48	.32	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K $ 24.16 \qquad (36) $ if details of thermal bridging are not known $(36) = 0.15 \times (31)$ Total fabric heat loss $ (33) + (36) =                                   $	Heat capacity	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =			(34)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K $ 24.16 \qquad (36) $ if details of thermal bridging are not known $(36) = 0.15 \times (31)$ Total fabric heat loss $ (33) + (36) =                                   $			,	P = Cm -	: TFA) ir	n kJ/m²K			Indica	itive Value	: Medium				╡
Thermal bridges: S (L x Y) calculated using Appendix K  if details of thermal bridging are not known (36) = 0.15 x (31)  Total fabric heat loss  Ventilation heat loss calculated monthly  (38)m = 0.33 x (25)m x (5)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  (38)m = 38.77 38.53 38.3 37.19 36.99 36.02 36.02 35.85 36.39 36.99 37.4 37.84  Heat transfer coefficient, W/K  (39)m = 111.26 111.02 110.78 109.68 109.47 108.51 108.51 108.33 108.88 109.47 109.89 110.33	For design assess	· sments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f			」` ′
if details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ 38.77 $38.53$ $38.3$ $37.19$ $36.99$ $36.02$ $36.02$ $35.85$ $36.39$ $36.99$ $37.4$ $37.84$ $(38)Heat transfer coefficient, W/K (39)m = (37) + (38)m(39)m = 111.26$ $111.02$ $110.78$ $109.68$ $109.47$ $108.51$ $108.51$ $108.33$ $108.88$ $109.47$ $109.89$ $110.33$															_
Total fabric heat loss   Ventilation heat loss calculated monthly	_	•	•		• .	•	<						24	.16	(36)
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (38)m=         38.77         38.53         38.3         37.19         36.99         36.02         35.85         36.39         36.99         37.4         37.84           Heat transfer coefficient, W/K         (39)m = (37) + (38)m           (39)m = (111.26         111.02         110.78         109.68         109.47         108.51         108.33         108.88         109.47         109.89         110.33			are not kn	own (36) =	= 0.15 x (3	11)			(33) +	(36) =			72	.49	(37)
(38)m= 38.77 38.53 38.3 37.19 36.99 36.02 36.02 35.85 36.39 36.99 37.4 37.84 (38)  Heat transfer coefficient, W/K (39)m = (37) + (38)m  (39)m= 111.26 111.02 110.78 109.68 109.47 108.51 108.51 108.33 108.88 109.47 109.89 110.33	Ventilation hea	at loss ca	alculated	monthly	У				(38)m	= 0.33 × (	25)m x (5	)	_		_
Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 111.26 111.02 110.78 109.68 109.47 108.51 108.51 108.33 108.88 109.47 109.89 110.33	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(39)m= 111.26 111.02 110.78 109.68 109.47 108.51 108.51 108.33 108.88 109.47 109.89 110.33	(38)m= 38.77	38.53	38.3	37.19	36.99	36.02	36.02	35.85	36.39	36.99	37.4	37.84	]		(38)
	Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (	38)m				
Average = $Sum(39)_{112}/12=$ 109.68 (39)	(39)m= 111.26	111.02	110.78	109.68	109.47	108.51	108.51	108.33	108.88	109.47	109.89	110.33	]		
								-		Average =	Sum(39)	12 /12=	10	9.68	(39)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.44	1.43	1.43	1.42	1.41	1.4	1.4	1.4	1.41	1.41	1.42	1.42		
` /		ļ							L Average =	Sum(40) <sub>1</sub> .	12 /12=	1.42	(40)
Number of day	s in mo	nth (Tabl	e 1a)							, ,	L		
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	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	49 x (TF	FA -13.9)	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13.		41		(42)
Annual averag Reduce the annua not more that 125	e hot wa al average	hot water	usage by	5% if the a	welling is	designed t			se target o		.51		(43)
	Feb					Jul	Λιια	Sep	Oct	Nov	Dec		
Jan Hot water usage in		Mar dav for ea	Apr	May $Vd.m = fac$	Jun		Aug (43)	Sep	Oct	Nov	Dec		
	97	93.34	89.68	86.02	82.36	82.36	86.02	89.68	93.34	97	100.66		
(44)m= 100.66	91	93.34	09.00	00.02	02.30	02.30	00.02			m(44) <sub>112</sub> =	L	1098.08	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x D	Tm / 3600			` '	L	1090.00	(44)
(45)m= 149.27	130.55	134.72	117.45	112.7	97.25	90.12	103.41	104.64	121.95	133.12	144.56		
(10)	.00.00	1 .0			01.20	002				m(45) <sub>112</sub> =		1439.75	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(10)112	L		` ′
(46)m= 22.39	19.58	20.21	17.62	16.9	14.59	13.52	15.51	15.7	18.29	19.97	21.68		(46)
Water storage	loss:	!				<u> </u>				!	<u> </u>		
Storage volum	e (litres)	) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage		oolorod k	ooo foot	ar io kno	up (k\//k	2/dox4):					1		(40)
a) If manufact				DI IS KIIO	WII (KVVI	i/day).					0		(48)
Temperature fa											0		(49)
Energy lost fro b) If manufact		_	-		or ic not		(48) x (49)	) =			0		(50)
Hot water stora			-								0		(51)
If community h	•			(		-57					<u> </u>		(0.1)
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter (50) or (	(54) in (5	55)									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)ı	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(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 Appendi	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	e H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss		r		<u> </u>	<del></del>	1	<del></del>		Т	_	I	1	(5.1)		
(61)m= 50.9		47.56	44.22	43.83	40.61	41.97	43.8	!	47.56	47.83	50.96		(61)		
	<del></del>		<del></del>				<del>`</del>		<del>`                                    </del>	<del>ì ´</del>	(57)m +	(59)m + (61)m			
(62)m= 200.2	23 175.2	182.28	161.68	156.53	137.86	132.08	147.2	24 148.87	169.52	180.96	195.52		(62)		
Solar DHW inp									ar contribu	tion to wate	er heating)				
(add addition	nal lines if	FGHRS	and/or \		applies	s, see Ap	pendi	x G)				1			
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)		
Output from	water hea	ter				_									
(64)m= 200.2	23 175.2	182.28	161.68	156.53	137.86	132.08	147.2	24 148.87	169.52	180.96	195.52		,		
							C	Output from w	ater heate	er (annual) <sub>1</sub>	12	1987.97	(64)		
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61	)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	]			
(65)m= 62.3°	7 54.57	56.69	50.11	48.43	42.49	40.46	45.3	4 45.85	52.44	56.22	60.81		(65)		
include (5	7)m in cal	culation	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is f	rom com	munity h	neating			
5. Internal	gains (see	e Table 5	and 5a	):											
Metabolic ga	5. Internal gains (see Table 5 and 5a):  1etabolic gains (Table 5), Watts														
Jar		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec				
(66)m= 120.6	120.64	120.64	120.64	120.64	120.64	120.64	120.6	120.64	120.64	120.64	120.64		(66)		
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso se	e Table 5	•		•	•			
(67)m= 19.1	4 17	13.82	10.47	7.82	6.6	7.14	9.28	12.45	15.81	18.45	19.67	]	(67)		
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation L	.13 or L1	3a), a	lso see Ta	ıble 5	!	!	•			
(68)m= 214.0	<del></del>	210.67	198.76	183.72	169.58	160.13	157.9		175.43	190.47	204.61	]	(68)		
Cooking gai	ns (calcula	ted in A	ppendix	L. eguat	ion L15	or L15a	). also	see Table	 e 5	<u>ļ</u>	<u>!</u>	ı			
(69)m= 35.0	<del>`</del>	35.06	35.06	35.06	35.06	35.06	35.0		35.06	35.06	35.06	]	(69)		
Pumps and	 fans nains	(Table !	 5а)			1						J			
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)		
Losses e.g.			<u> </u>	ļ	ļ .	1 -				1 -		I	` ,		
(71)m= -96.5	<del></del>	-96.52	-96.52	-96.52	-96.52	-96.52	-96.5	2 -96.52	-96.52	-96.52	-96.52	1	(71)		
Water heating	!		00.02	00.02	00.02	00.02		2 00.02	00.02	00.02		I	( )		
(72)m= 83.8	<del>~~</del>	76.19	69.6	65.09	59.01	54.38	60.9	4 63.68	70.48	78.09	81.73	1	(72)		
` '			09.0	05.09			l	m + (69)m +	<u> </u>	<u> </u>	<u> </u>	l	(12)		
<b>Total intern</b> (73)m= 379.2	_ <del>`</del>	362.88	341.01	318.83	297.39	283.84	290.3	<u> </u>	323.91	349.2	368.2	1	(73)		
6. Solar ga		302.00	341.01	310.03	297.39	203.04	290.3	301.64	323.91	349.2	300.2		(10)		
Solar gains a		using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to the	ne applica	hle orientat	tion				
Orientation:		•	Area		Fli	·		g_	то арриоа	FF		Gains			
Onomation.	Table 6d		m <sup>2</sup>			ble 6a		Table 6b	Т	able 6c		(W)			
South 0.9	× 0.54	x	4.	5	х	46.75	1 <sub>x</sub> [	0.63	x [	0.7		45.09	(78)		
South 0.9		×				46.75	] ^ L ] <sub>x</sub> [	0.63		0.7	┥ -	45.29	](78)		
South 0.9		_	4.			76.57	] ^	0.63		0.7	<del>-</del>	73.85	](78)		
South 0.9		_					1		<b>≓</b>		=		](78)		
		×	2.2		<b>—</b>	76.57	]	0.63	×	0.7	╡ -	74.18	-		
South 0.9	X 0.54	X	4.	5	x	97.53	X	0.63	X	0.7	=	94.07	(78)		

South	۰۲			1		٦			1			г		_	г		7(70)
	0.9x	0.54		X	2.26	→     ×	_	7.53	] X ]	0.63	==	X	0.7	╡ =	F	94.49	[78]
South	0.9x	0.54		X	4.5	X		10.23	] X ]	0.63		X	0.7	╡ -	F	106.32	](78)
South	0.9x	0.54		X	2.26	X		10.23	] X ]	0.63		X	0.7	╡ -	F	106.79	<u> </u> (78)
South	0.9x	0.54		X	4.5	」 ×	_	14.87	] X ]	0.63	==	X	0.7	╡ -	Ļ	110.79	<u> </u> (78)
South	0.9x	0.54		X	2.26	X	1	14.87	X	0.63	3	X	0.7	_ =	Ļ	111.28	(78)
South	0.9x	0.54		X	4.5	X	1	10.55	X	0.63	3	X	0.7	=	·	106.62	(78)
South	0.9x	0.54		X	2.26	X	1	10.55	X	0.63	3	X	0.7	=	Ļ	107.09	(78)
South	0.9x	0.54		X	4.5	X	1	08.01	X	0.63	3	X	0.7	=	·	104.17	(78)
South	0.9x	0.54		X	2.26	X	1	08.01	X	0.63	3	X	0.7	=	· <u>L</u>	104.64	(78)
South	0.9x	0.54		X	4.5	X	1	04.89	X	0.63	3	X	0.7	=	· <u>L</u>	101.17	(78)
South	0.9x	0.54		X	2.26	X	1	04.89	X	0.63	3	X	0.7	=	· <u>L</u>	101.62	(78)
South	0.9x	0.54		X	4.5	X	1	01.89	X	0.63	3	x	0.7	=	• [	98.27	(78)
South	0.9x	0.54		X	2.26	X	1	01.89	X	0.63	3	x	0.7	=	• [	98.7	(78)
South	0.9x	0.54		X	4.5	X	8	2.59	X	0.63	3	x	0.7			79.65	(78)
South	0.9x	0.54		x	2.26	X	8	2.59	X	0.63	3	x	0.7		• [	80.01	(78)
South	0.9x	0.54		x	4.5	X	5	5.42	x	0.63	3	x [	0.7		• [	53.45	(78)
South	0.9x	0.54		X	2.26	x	5	5.42	x	0.63	3	x	0.7	=	•	53.69	(78)
South	0.9x	0.54		X	4.5	x		40.4	x	0.63	3	x	0.7	=	•	38.96	(78)
South	0.9x	0.54		X	2.26	X		40.4	x	0.63	3	x	0.7		• [	39.14	(78)
West	0.9x	0.77		X	8.96	X	1	9.64	х	0.63	3	х	0.7		• [	53.78	(80)
West	0.9x	0.77		x	8.96	X	3	8.42	x	0.63	3	x	0.7		• [	105.21	(80)
West	0.9x	0.77		X	8.96	X	6	3.27	x	0.63	3	x [	0.7		· Ē	173.26	(80)
West	0.9x	0.77		x	8.96	x	9	2.28	x	0.63	3	x	0.7	<u> </u>	· Ē	252.69	(80)
West	0.9x	0.77		x	8.96	x	1	13.09	x	0.63	3	x	0.7	<u> </u>	Ē	309.68	(80)
West	0.9x	0.77		x	8.96	T x	1	15.77	x	0.63	3	х	0.7	<u> </u>	· Ē	317.01	(80)
West	0.9x	0.77		x	8.96	x	1	10.22	x	0.63	3	x	0.7	<u> </u>	· Ē	301.81	(80)
West	0.9x	0.77		x	8.96	x	9	4.68	x	0.63	3	x	0.7	<u> </u>	· Ē	259.25	(80)
West	0.9x	0.77		x	8.96	T x	7	3.59	х	0.63	3	х	0.7	<u> </u>	· Ē	201.51	(80)
West	0.9x	0.77		x	8.96	T x	4	5.59	х	0.63	3	х	0.7	<u> </u>	·Ē	124.84	(80)
West	0.9x	0.77		x	8.96	i x	2	4.49	x	0.63	3	x [	0.7			67.06	(80)
West	0.9x	0.77		X	8.96	i x		6.15	x	0.63		х	0.7	╡ -		44.23	(80)
	_								_			_					_
Solar ga	ains in	watts, ca	lculat	ted	for each mo	nth			(83)m	= Sum(74	l)m(8	32)m					
(83)m=	144.16	253.23	361.8	31	465.8 531.	75 5	30.73	510.62	462	.03 398.	.48 2	84.49	174.19	122.33	3		(83)
Total ga	ains – ir	nternal a	nd so	lar	(84)m = $(73)$	m + (	83)m	, watts							_		
(84)m=	523.38	629.9	724.	7	806.81 850.	58 8	28.12	794.46	752	.36 700.	.31 6	08.41	523.39	490.52	2		(84)
7. Mea	an inter	nal temp	eratu	re (	heating seas	son)											
Tempe	erature	during h	eating	g pe	eriods in the	living	area	from Tal	ole 9	Th1 (°C	;)					21	(85)
Utilisa	tion fac	tor for ga	ains fo	or li	ving area, h1	l,m (s	ee Ta	ble 9a)									_
	Jan	Feb	Ма	ır	Apr Ma	ay	Jun	Jul	Α	ug Se	ер	Oct	Nov	Dec			
(86)m=	1	0.99	0.98		0.95 0.88	8	0.73	0.57	0.6	0.8	4	0.97	0.99	1			(86)
Mean	internal	tempera	ature	in li	ving area T1	(follo	w ste	ps 3 to 7	7 in T	able 9c)							
(87)m=	19.46	19.66	19.9	_	20.35 20.6		20.9	20.97	20.			20.36	19.84	19.42			(87)
L		I							-	<b>!</b>	!		•		_		

Comparison   Com	T						al a III a a	f T.	hia O Ti	- 0 (0 <b>0</b> )					
Utilisation   Tactor for gains for rest of dwelling, h2,m (see Table 9a)   1   0.99   0.97   0.93   0.82   0.83   0.43   0.47   0.76   0.96   0.99   1   (89)	· -		<del></del>							·	10.75	10.75	10.74		(88)
Man internal temperature in the rest of dwelling T2 (Follow steps 3 to 7 in Table 9c)   Turn   Tur	` ′	!_		!				<u> </u>		19.76	19.75	19.75	19.74		(00)
Man internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (30)m= 17.72   18.01   18.45   19.01   19.45   19.77   19.75   19.75   19.75   19.75   19.01   19.03   18.27   17.67   0.00    (32)m= 18.33   18.90   18.99   19.48   19.89   20.12   20.19   20.18   20.04   19.5   18.83   18.29   (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (32)m= 18.33   18.90   18.99   19.48   19.89   20.12   20.19   20.18   20.04   19.5   18.83   18.29   (83)  Space heating requirement 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    Julisation factor for gains, hm:  (34)m= 0.99   0.99   0.97   0.92   0.83   0.86   0.48   0.53   0.78   0.95   0.99   0.98   0.98   0.97   0.92   0.95   0.99   0.91   0.92   0.95   0.99   0.91   0.91   0.95   0.99   0.95   0.99   0			<del></del>	1			· ·	1						1	(00)
Solid   18.45   19.01   19.45   19.77   19.75   19.7	(89)m=	1	0.99	0.97	0.93	0.82	0.63	0.43	0.47	0.76	0.95	0.99	1		(89)
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2   (22)ms   (8.33)   (8.59)   (19.48		1	<del>.</del> .	i			<u> </u>		-					l	
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2     (82)m	(90)m=	17.72	8.01	18.45	19.01	19.45	19.7	19.75	19.75						<b>¬</b> `´
18.33   18.59   18.99   19.48   19.48   19.89   20.12   20.19   20.18   20.04   19.5   18.83   18.29   (92)   Apply adjustment to the mean internal temperature from Table 4e, where appropriate   (33)   (33)   (33)   (33)   (35)   (38)   (										f	LA = Livin	g area ÷ (4	<b>1)</b> =	0.35	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (33)ms 18.33 18.59 18.99 19.89 19.89 20.12 20.19 20.18 20.04 19.5 18.83 18.29 (83)  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  Uain Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm: (94)m= 0.98 0.99 0.97 0.92 0.83 0.66 0.48 0.53 0.78 0.95 0.99 0.99 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m  Useful gains, hmGm, W = (94)m x (84)m  Useful to serie for mean internal temperature from Table 8 (95)m= 519.92 620.93 701.64 745.75 706.79 549.11 379.66 395.32 544.27 575.18 516.66 488.02 (95)  Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.77 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 ((39)m - (96)m) Table 150.79 183.87 1160.62 98.06 599.83 89.06 409.42 646.29 974.83 1288.59 1554.7 (97)  Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m  (96)m= 774.83 604.3 507.43 298.7 140.82 0 0 0 0 0 0 297.35 555.79 793.6 (98)  Space heating requirement in kWh/m²/year  Sa Energy requirements — Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  [C204) = (202) × (1 - (203)) = 1 (202)  Fraction of total heating from main system 1 (204) = (202) × (1 - (203)) = 1 (204)  Efficiency of secondary/supplementary heating systems including micro-CHP)  Space heating requirement (calculated above)  [774.83 604.3 507.43 298.7 4May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating preparement (calculated above)  [774.83 604.3 507.43 298.7 140.82 0 0 0 0 0 0 0 297.35 555.79 793.6 (201)  Efficiency of secondary/supplementary heating systems including micro-CHP)  Space heating requirement (calculated above)  [774.83 604.3 507.43 298.7 140.82 0 0 0 0 0 0 0 0 297.35 555.79 793.6 (201)  Efficiency of seco	Mean ir	nternal te	empera	ture (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
18.33   18.59   18.99   19.48   19.89   20.12   20.19   20.18   20.04   19.5   18.83   18.29     (33)	(92)m=	18.33 1	8.59	18.99	19.48	19.89	20.12	20.19	20.18	20.04	19.5	18.83	18.29		(92)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hmm.  (94)m	Apply a	djustme	nt to th	e mean	internal	temper	ature fro	m Table	4e, whe	re appro	opriate				
Set Ti to the mean intermal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.99 0.97 0.92 0.83 0.66 0.48 0.53 0.78 0.95 0.99 0.99 0.99 (94)  Useful gains, hmCm , W = (94)m x (84)m  (95)m= 519.92 620.93 701.64 745.75 706.79 549.11 379.66 395.32 544.27 575.18 516.66 488.02 (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 1561.36 1520.13 1383.67 1160.62 896.6 \$99.28 389.08 409.42 646.29 974.83 1288.59 1554.7 (97)  Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m  (88)m= 774.83 604.3 507.43 298.7 140.82 0 0 0 0 0 297.35 555.79 793.6  Space heating requirement in kWh/m²/year 510.00 0 0 297.35 555.79 793.6  Space heating requirement in kWh/m²/year 510.00 0 0 0 297.35 555.79 793.6  Space heating requirement in kWh/m²/year 510.00 0 0 0 0 297.35 555.79 793.6  Space heating requirement in kWh/m²/year 510.00 0 0 0 0 0 297.35 555.79 793.6  Space heating requirement in kWh/m²/year 510.00 0 0 0 0 0 297.35 555.79 793.6  Space heating requirement in kWh/m²/year 510.00 0 0 0 0 0 297.35 555.79 793.6  Space heating requirement in kWh/m²/year 510.00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(93)m=	18.33	8.59	18.99	19.48	19.89	20.12	20.19	20.18	20.04	19.5	18.83	18.29		(93)
the utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	8. Spac	e heatin	g requ	irement											
Utilisation factor for gains, hm:   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec					•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Utilisation factor for gains, hm:  (34)me							lun	lul	Διια	Sen	Oct	Nov	Dec		
(94)m=	L. Utilisatio					iviay	Juli	Jui	Aug	ОСР	001	1407	DCC		
Useful gains, hmGm , W = (94)m x (84)m (85)m			<del></del>	i		0.83	0.66	0.48	0.53	0.78	0.95	0.99	0.99		(94)
Signar   S		gains, hr	nGm,	W = (94	1)m x (84	4)m									
Ge me							549.11	379.66	395.32	544.27	575.18	516.66	488.02		(95)
Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m ) (97)m = (1561.36   1520.19   1383.67   1160.62   896.06   599.28   389.06   409.42   646.29   974.83   1288.59   1554.7 (97)	 Monthly	averag	e exter	nal tem	perature	from Ta	able 8	<u> </u>							
(97)me   1561.36   1520.19   1383.67   1160.62   896.06   599.28   389.06   409.42   646.29   974.83   1288.59   1554.7    Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)me   774.83   604.3   507.43   298.7   140.82   0   0   0   0   297.35   555.79   793.6    Total per year (kWh/year) = Sum(98)s <sub>3.01</sub> = 3972.83   (98)  Space heating requirement in kWh/m²/year   51.29   (99)  9a. Energy requirements — Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system   0   (201)  Fraction of space heating from main system(s)   (202) = 1 - (201) =	(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)
Space heating requirement for each month, kWh/month = 0.024 x [[97]m - (95]m] x (41)m  (98)m= 774.83 604.3 507.43 298.7 140.82 0 0 0 0 297.35 555.79 793.6    Total per year (kWh/year) = Sum(98), ss. v2 = 3972.83 (98)   Space heating requirement in kWh/m²/year	Heat los	ss rate fo	or mea	n intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]			l	
Space heating requirement in kWh/m²/year   Space heating requirements – Individual heating systems including micro-CHP     Space heating: Fraction of space heat from secondary/supplementary system   O (201)	(97)m= 1	561.36 15	520.19	1383.67	1160.62	896.06	599.28	389.06	409.42	646.29	974.83	1288.59	1554.7		(97)
Space heating requirement in kWh/m²/year   S1.29   (99)	Space h	neating r	equire	ment fo	r each m	nonth, k\	Wh/mon	th = 0.02	4 x [(97)	)m – (95	)m] x (4′	1)m			
Space heating requirement in kWh/m²/year   S1.29   (99)	(98)m= 7	74.83	604.3	507.43	298.7	140.82	0	0	0	0	297.35	555.79	793.6		
Space heating:   Fraction of space heat from secondary/supplementary system   (202) = 1 - (201) =   (202)									Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	3972.83	(98)
Space heating:           Fraction of space heat from secondary/supplementary system         0 (201)           Fraction of space heat from main system(s)         (202) = 1 - (201) = 1 (202)           Fraction of total heating from main system 1         (204) = (202) × [1 - (203)] = 1 (204)           Efficiency of main space heating system 1         93.4 (206)           Efficiency of secondary/supplementary heating system, %         0 (208)           Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         kWh/year           Space heating requirement (calculated above)         774.83 604.3 507.43 298.7 140.82 0 0 0 0 0 297.35 555.79 793.6         (211)m = {[(98)m x (204)] } x 100 ÷ (206)         (211)           829.58 647 543.29 319.81 150.77 0 0 0 0 318.36 595.07 849.68         Total (kWh/year) = Sum(211), 4.101	Space h	neating r	equire	ment in	kWh/m²	/year								51.29	(99)
Fraction of space heat from secondary/supplementary system	9a. Ener	gy requi	rement	ts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above)  774.83 604.3 507.43 298.7 140.82 0 0 0 0 297.35 555.79 793.6  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 4253.57 (211)  Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)  (215)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	•	_											•		_
Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  774.83 604.3 507.43 298.7 140.82 0 0 0 0 297.35 555.79 793.6  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  829.58 647 543.29 319.81 150.77 0 0 0 0 318.36 595.07 849.68  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 4253.57 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		-			-	• •	mentary	-						0	(201)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  774.83 604.3 507.43 298.7 140.82 0 0 0 0 297.35 555.79 793.6  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  829.58 647 543.29 319.81 150.77 0 0 0 0 318.36 595.07 849.68  Total (kWh/year) = Sum(211) <sub>151017</sub> 4253.57 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction	of space	e heat	from m	ain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  774.83 604.3 507.43 298.7 140.82 0 0 0 0 297.35 555.79 793.6  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  829.58 647 543.29 319.81 150.77 0 0 0 0 318.36 595.07 849.68  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 4253.57 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction	of total	heatin	g from ı	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   kWh/year	Efficien	cy of ma	in spa	ce heati	ng syste	em 1								93.4	(206)
Space heating requirement (calculated above)  774.83 604.3 507.43 298.7 140.82 0 0 0 0 297.35 555.79 793.6  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  829.58 647 543.29 319.81 150.77 0 0 0 318.36 595.07 849.68  Total (kWh/year) = Sum(211) <sub>151012</sub> 4253.57 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0 0	Efficien	cy of sec	condar	y/supple	ementar	y heating	g system	າ, %						0	(208)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
$ (211) \text{m} = \{ [(98) \text{m x } (204)] \} \text{ x } 100 \div (206) \\ \hline                                  $	Space h	neating r	equire	ment (c	alculate	d above)									
829.58 647 543.29 319.81 150.77 0 0 0 0 318.36 595.07 849.68  Total (kWh/year) = Sum(211) <sub>15,1012</sub> 4253.57 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0	7	74.83	604.3	507.43	298.7	140.82	0	0	0	0	297.35	555.79	793.6		
	(211)m =	= {[(98)m	x (204	1)] } x 1	00 ÷ (20	6)									(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0	8	329.58	647	543.29	319.81	150.77	0	0	0	0	318.36	595.07	849.68		
$= \{ [(98)m \times (201)] \} \times 100 \div (208)$ $(215)m =                                   $		-	-	-				-	Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>		4253.57	(211)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	Space h	neating f	uel (se	condary	y), kWh/	month									
		n x (201)	] } x 10	00 ÷ (20	8)									İ	
Total (kWh/year) = Sum(215) <sub>15,1012</sub> = 0 (215)	(215)m=	0	0	0	0	0	0	0							_
									Tota	ı (kWh/yea	ar) = Sum(2)	(15) <sub>1 510 12</sub>	=		(215)

200.23 175.2 182.28 161.68 156.53 1	37.86 132.08	147.24	148.87	160.50	100.06	105.50		
	37.00   132.00	147.24	140.07	169.52	180.96	195.52		(21
Efficiency of water heater (217)m= 88.12 87.91 87.49 86.58 84.79 8	80.3 80.3	80.3	80.3	86.45	87.69	00.21	80.3	(21 (21)
	00.3	80.3	00.3	00.43	67.09	88.21		(21
Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m								
219)m= 227.21 199.28 208.34 186.74 184.62 1	71.69 164.49	183.37	185.39	196.08	206.36	221.66		_
		Total	= Sum(2	19a) <sub>112</sub> =			2335.23	(21
Annual totals				k\	Wh/year	,	kWh/year	1
Space heating fuel used, main system 1						ļ	4253.57	]
Nater heating fuel used							2335.23	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(23
boiler with a fan-assisted flue						45		(23
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(23
Electricity for lighting						Ī	337.97	(23
12a. CO2 emissions – Individual heating systems	s including mi	cro-CHP						
	Energy			Emiss	ion fac	tor	Emissions	
	kWh/year			kg CO	2/kWh		kg CO2/yea	r
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				40	ı	918.77	(26
Space heating (main system 1)	(211) x			0.2	16	=	910.77	
Space heating (main system 1) Space heating (secondary)	•			0.2		=	0	(26
Space heating (secondary)	(211) x				19	l I		(26
Space heating (secondary)  Vater heating	(211) x (215) x	+ (263) + (2	264) =	0.5	19	=	0	]
Space heating (secondary)  Vater heating  Space and water heating	(211) x (215) x (219) x	+ (263) + (2	264) =	0.5	19	=	0 504.41	](26 ](26
	(211) x (215) x (219) x (261) + (262)	+ (263) + (2	264) =	0.5	19 16 19	= [	0 504.41 1423.18	(26

TER =

(273)

21.14

			lloor F	) otoilo						
Assessor Name:	Joseph Treaper		User D	Strom	o Num	hori		STDC	0032062	
Software Name:	Joseph Treanor Stroma FSAP 20	)12		Softwa					on: 1.0.4.14	
		Р	roperty	Address						
Address :	, Gondar Gardens									
1. Overall dwelling dim	nensions:									
			Are	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	3)
Ground floor			7	71.04	(1a) x	2	2.55	(2a) =	181.15	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	le)+(1r	n) 7	71.04	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	181.15	(5)
2. Ventilation rate:										_
	main heating	secondar 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 t	fans				Ī	3	x :	10 =	30	(7a)
Number of passive vent	ts				Ē	0	x -	10 =	0	(7b)
Number of flueless gas	fires				F	0	x	40 =	0	(7c)
Ç					L					` ′
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(	(7c) =	Γ	30		÷ (5) =	0.17	(8)
	been carried out or is inten	ded, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	O OF for stool or timbo		0.05 60				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timbe present, use the value corre				•	uction			0	(11)
	nings); if equal user 0.35	soponumg to	rino grodi	or wan are	a (ano					
•	floor, enter 0.2 (unse	,	.1 (seale	ed), else	enter 0				0	(12)
•	enter 0.05, else enter 0								0	(13)
· ·	ws and doors draught	stripped		0.05 [0.0	(4.4)4	001			0	(14)
Window infiltration Infiltration rate				0.25 - [0.2] (8) + (10)			± (15) =		0	(15)
	e, q50, expressed in cu	ihic metre	e ner ho	. , , ,	, , ,	, , ,	, ,	area	0	(16)
If based on air permeat	•		•	•	•	cuc or c	лисюрс	arca	0.42	(17)
·	lies if a pressurisation test h					is being u	sed		0.42	()
Number of sides shelte	red								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	•			(21) = (18)	) x (20) =				0.35	(21)
Infiltration rate modified	<del></del>	ed	i	•		i	i	i	1	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind s	speed from Table 7		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									
(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	]	
			L		L	L			1	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.45	0.44	0.43	0.39	0.38	0.34	0.34	0.33	0.35	0.38	0.4	0.42		
Calculate effec		•	rate for t	he appli	cable ca	se	-	-	-	-		· 	
If mechanica			andiv N. (2	2h) _ (22c	) v Emy (c	auation (I	VEVV otho	nuico (22h	) - (232)			0	(2
If exhaust air he If balanced with									) = (23a)			0	(2
		•	-	_					2h\ma . /	00h) [	4 (00.5)	0	(2
a) If balance		o l	0	o with nea	0	ery (IVIVI	1K) (24a	$\frac{1}{0} = \frac{2}{2}$	0	230) <b>x</b> [	$\frac{1 - (230)}{1}$	. <del>.</del> 100] ]	(2
												J	(2
b) If balance		o lical ve	0	0 Without	0	overy (r	0	0	0	0	0	1	(2
												J	(-
c) If whole h		(23b), t		•	•				.5 × (23k	p)	,	1	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
d) If natural if (22b)n		on or when (24d)							0.5]				
24d)m= 0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
Effective air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-		
(25)m= 0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
3. Heat losse	s and he	eat loss r	naramete	ōt.									
ELEMENT	Gros	SS	Openin m	gs	Net Ar A ,n		U-valı W/m2		A X U		k-value kJ/m²-l		A X k kJ/K
Vindows Type	area	(111-)	111	<b> -</b>			۷۷/۱۱۱۷ +( 1.4 )/1]/		(W/	N)	KJ/IIII		
• •					3.31	=			4.39	=			(2
Vindows Type					1.61	=	/[1/( 1.4 )+		2.13	=			(2
Vindows Type					3.21	=	/[1/( 1.4 )+		4.26	<b>=</b>			(2
Vindows Type					1.59	_	/[1/( 1.4 )+		2.11	<b>=</b>			(2
Vindows Type					3.16	_	/[1/( 1.4 )+	'	4.19	릴 ,			(2
Valls Type1	85.4	16	17.78	3	67.68	X	0.18	=	12.18	<u> </u>		<b>ᆜ</b>	(2
Valls Type2	22.9	9	0		22.99	X	0.18	=	4.14			╛╚	(2
Roof	71.0	)4	0		71.04	. X	0.13	=	9.24				(3
otal area of e	elements	, m²			179.4	9							(3
for windows and						ated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	1 3.2	
* include the area abric heat los				is anu pan	uuoris		(26)(30)	) + (32) =				40.12	(3
leat capacity		•	0)				(==):::(==)		(30) + (3)	2) + (32a).	(32e) =	49.13	==
hermal mass		,	P – Cm ≟	-TFΔ) in	n k I/m²K			,	tive Value	, , ,	(020) =	6079.56	) (;
or design assess	•	`		,			ecisely the				able 1f	250	(
an be used inste						. ,	, ,						
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix k	<						25.57	(;
details of therma		are not kn	own (36) =	= 0.15 x (3	1)								
otal fabric he									(36) =			74.7	(3
entilation hea	ı —								1	(25)m x (5)		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		,,
35.95	35.72	35.49	34.4	34.2	33.26	33.26	33.08	33.62	34.2	34.61	35.04	J	(3
leat transfer of	coefficie	nt, W/K			,		ı	(39)m	= (37) + (	38)m		1	
39)m= 110.65	110.42	110.19	109.1	108.9	107.96	107.96	107.78	108.32	108.9	109.31	109.74		
troma FSAP 201	2 Version	1.0.4.14 (	SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39) <sub>1</sub>	12 /12=	109. <b>≱</b> a	ige 2 of

Heat loss para	meter (I	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.56	1.55	1.55	1.54	1.53	1.52	1.52	1.52	1.52	1.53	1.54	1.54		
						<u> </u>	<u> </u>		Average =	Sum(40) <sub>1</sub> .	12 /12=	1.54	(40)
Number of day		<del>`</del>	le 1a)	i		ı				i	<del></del>		
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	ing ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu	inanev	N									07		(40)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13		27		(42)
Annual averag											.14		(43)
Reduce the annua not more that 125	-				-	-	to achieve	a water us	se target o	of			
		· ·					Α.	0					
Jan Hot water usage in	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
						1		00.00	T 00 0	T 00 40	00.05		
(44)m= 96.95	93.43	89.9	86.38	82.85	79.32	79.32	82.85	86.38	89.9	93.43	96.95	1057.67	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	1057.67	(44)
(45)m= 143.78	125.75	129.76	113.13	108.55	93.67	86.8	99.6	100.79	117.47	128.22	139.24		
(10)	.200	1 .200		.00.00	00.0.	00.0	00.0			m(45) <sub>112</sub> =	l	1386.77	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		· otal	(10)112	L		` ′
(46)m= 21.57	18.86	19.46	16.97	16.28	14.05	13.02	14.94	15.12	17.62	19.23	20.89		(46)
Water storage	loss:				<u> </u>			!	!				
Storage volum	e (litres)	) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage  a) If manufact		oclared k	nce fact	or is kno	wn (k\\/k	n/day/):							(48)
ŕ				JI IS KIIO	wii (Kvvi	i/uay).					0		
Temperature fa							(40) (40)				0		(49)
Energy lost fro b) If manufact		-	-		or is not		(48) x (49)	) =			0		(50)
Hot water stora			-								0		(51)
If community h	eating s	see section	on 4.3										
Volume factor											0		(52)
Temperature fa	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		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder 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	хН	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	•	•									0		(58)
Primary circuit				•	•	. ,	, ,		(1.	-1-1			
(modified by							<del></del>	<del></del>	i	<del>' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' </del>			/EO\
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss	: calculated	for each	h month	(61)m –	(60) ± 3	365 <b>v</b> (41	)m							
(61)m= 49.		45.81	42.6	42.22	39.12	40.42	42.	22	42.6	45.81	46.07	49.41	1	(61)
` ′								!		ļ	ļ.	<u> </u>	J (59)m + (61)m	(- )
(62)m= 193	<del></del>	175.57	155.73	150.77	132.79	1	141		143.39	163.28	174.3	188.65	]	(62)
` '	put calculated						<u> </u>			r contribu			J	` ,
	onal lines if											o:ag/		
(63)m=		0	0	0	0	0	Ö	_	0	0	0	0	]	(63)
Output fror	n water hea	ater		ļ.			!						ı	
(64)m= 193	.18 168.75	175.57	155.73	150.77	132.79	127.22	141	.82	143.39	163.28	174.3	188.65	]	
			<u> </u>					Outp	ut from wa	ater heate	er (annual)	I12	1915.45	(64)
Heat gains	from water	heating	ı, kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (6	1)m	ı] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	 .]	_
(65)m= 60.	16 52.56	54.6	48.26	46.65	40.93	38.97	43.	67	44.16	50.51	54.15	58.65	]	(65)
include (	57)m in cal	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
·	al gains (se		· , ,		•							•		
	gains (Tabl			,										
	an Feb	Mar	Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec	]	
(66)m= 113	.56 113.56	113.56	113.56	113.56	113.56	113.56	113	.56	113.56	113.56	113.56	113.56	1	(66)
Lighting ga	ins (calcula	ted in A	ppendix	L, equat	ion L9	or L9a), a	ılso s	ee 7	Table 5		•		•	
(67)m= 17	.8 15.81	12.86	9.74	7.28	6.14	6.64	8.6	3	11.58	14.71	17.17	18.3	]	(67)
Appliances	gains (cal	culated i	n Append	dix L, eq	uation I	 _13 or L1	3a),	also	see Tal	ble 5	•	•	•	
(68)m= 199	.71 201.78	196.56	185.44	171.41	158.22	149.41	147	.34	152.56	163.68	177.71	190.9	]	(68)
Cooking ga	ains (calcula	ated in A	Appendix	L, equat	ion L15	or L15a	), als	o se	e Table	5	•		•	
(69)m= 34.	36 34.36	34.36	34.36	34.36	34.36	34.36	34.	36	34.36	34.36	34.36	34.36	]	(69)
Pumps and	d fans gains	(Table	5a)	•		•					•	•	•	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	]	(70)
Losses e.g	. evaporati	on (nega	ative valu	es) (Tab	le 5)	•				•	•	•	•	
(71)m= -90	.84 -90.84	-90.84	-90.84	-90.84	-90.84	-90.84	-90	.84	-90.84	-90.84	-90.84	-90.84	]	(71)
Water heat	ting gains (	Table 5)	•	•	•	•	•			•	•	•	•	
(72)m= 80.	86 78.22	73.39	67.03	62.7	56.84	52.37	58	.7	61.34	67.89	75.21	78.83	]	(72)
Total inter	nal gains :	•	•	•	(60	6)m + (67)n	n + (68	3)m +	- (69)m + (	(70)m + (	71)m + (72)	)m	•	
(73)m= 358	355.88	342.88	322.28	301.45	281.27	268.49	274	.73	285.55	306.34	330.15	348.1	]	(73)
6. Solar g	ains:		•	•		•	,				•			
Solar gains	are calculated	using sola	ar flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica	ble orienta	tion.		
Orientation	: Access		Area			ux		_	g_ - b b = 0b	-	FF		Gains	
	Table 60	l 	m²		1	able 6a	_		able 6b	_ '	able 6c		(W)	_
	.9x 2	X	1.5	59	x	19.64	X		0.63	x	0.7	=	19.09	(76)
East 0	.9x 1	X	3.	16	X	19.64	X		0.63	X	0.7	=	18.97	(76)
East 0	.9x 2	×	1.5	59	X	38.42	X		0.63	x	0.7	=	37.34	(76)
	.9x 1	X	3.′	16	X	38.42	x		0.63	x	0.7	=	37.1	(76)
East 0	.9x 2	Х	1.5	59	X	63.27	X		0.63	x	0.7	=	61.49	(76)

	_		_										_
East	0.9x	1	X	3.16	X	63.27	Х	0.63	Х	0.7	=	61.11	(76)
East	0.9x	2	X	1.59	X	92.28	X	0.63	X	0.7	=	89.68	(76)
East	0.9x	1	X	3.16	X	92.28	X	0.63	Х	0.7	=	89.12	(76)
East	0.9x	2	X	1.59	X	113.09	X	0.63	X	0.7	=	109.91	(76)
East	0.9x	1	X	3.16	X	113.09	X	0.63	X	0.7	=	109.22	(76)
East	0.9x	2	X	1.59	X	115.77	X	0.63	X	0.7	=	112.51	(76)
East	0.9x	1	X	3.16	x	115.77	x	0.63	X	0.7	=	111.8	(76)
East	0.9x	2	X	1.59	x	110.22	x	0.63	x	0.7	=	107.12	(76)
East	0.9x	1	X	3.16	x	110.22	X	0.63	X	0.7	=	106.44	(76)
East	0.9x	2	X	1.59	x	94.68	X	0.63	X	0.7	=	92.01	(76)
East	0.9x	1	X	3.16	x	94.68	x	0.63	x	0.7	=	91.43	(76)
East	0.9x	2	x	1.59	x	73.59	x	0.63	x	0.7	=	71.52	(76)
East	0.9x	1	x	3.16	x	73.59	x	0.63	x	0.7	=	71.07	(76)
East	0.9x	2	x	1.59	x	45.59	x	0.63	x	0.7	=	44.31	(76)
East	0.9x	1	x	3.16	x	45.59	x	0.63	x	0.7	=	44.03	(76)
East	0.9x	2	x	1.59	x	24.49	x	0.63	х	0.7	=	23.8	(76)
East	0.9x	1	x	3.16	x	24.49	x	0.63	х	0.7	=	23.65	(76)
East	0.9x	2	x	1.59	x	16.15	x	0.63	x	0.7	=	15.7	(76)
East	0.9x	1	x	3.16	x	16.15	x	0.63	x	0.7	=	15.6	(76)
West	0.9x	0.77	x	3.31	x	19.64	x	0.63	x	0.7	=	39.74	(80)
West	0.9x	0.77	x	1.61	x	19.64	x	0.63	x	0.7	=	9.66	(80)
West	0.9x	0.77	x	3.21	x	19.64	x	0.63	х	0.7	=	19.27	(80)
West	0.9x	0.77	x	3.31	x	38.42	х	0.63	х	0.7	=	77.73	(80)
West	0.9x	0.77	X	1.61	x	38.42	x	0.63	х	0.7	=	18.9	(80)
West	0.9x	0.77	x	3.21	x	38.42	x	0.63	х	0.7	=	37.69	(80)
West	0.9x	0.77	x	3.31	x	63.27	x	0.63	х	0.7	=	128.01	(80)
West	0.9x	0.77	x	1.61	x	63.27	x	0.63	x	0.7	=	31.13	(80)
West	0.9x	0.77	X	3.21	x	63.27	x	0.63	х	0.7	=	62.07	(80)
West	0.9x	0.77	x	3.31	x	92.28	x	0.63	х	0.7	=	186.7	(80)
West	0.9x	0.77	x	1.61	x	92.28	x	0.63	х	0.7	=	45.41	(80)
West	0.9x	0.77	x	3.21	x	92.28	x	0.63	х	0.7	=	90.53	(80)
West	0.9x	0.77	x	3.31	x	113.09	x	0.63	х	0.7	=	228.8	(80)
West	0.9x	0.77	x	1.61	x	113.09	x	0.63	х	0.7	] =	55.65	(80)
West	0.9x	0.77	x	3.21	x	113.09	x	0.63	x	0.7	=	110.95	(80)
West	0.9x	0.77	x	3.31	x	115.77	x	0.63	x	0.7	] =	234.22	(80)
West	0.9x	0.77	x	1.61	x	115.77	x	0.63	х	0.7	j =	56.96	(80)
West	0.9x	0.77	x	3.21	x	115.77	x	0.63	x	0.7	] =	113.57	(80)
West	0.9x	0.77	x	3.31	×	110.22	x	0.63	x	0.7	j =	222.99	(80)
West	0.9x	0.77	x	1.61	x	110.22	x	0.63	x	0.7	=	54.23	(80)
West	0.9x	0.77	x	3.21	x	110.22	x	0.63	x	0.7	] =	108.13	(80)
West	0.9x	0.77	x	3.31	×	94.68	x	0.63	x	0.7	j =	191.54	(80)
			-		•		•		•		•		_

West	0.9x	0.77	X	1.0	61	x	9	4.68	X	0.63		x	0.7	-	= [	46.58	(80)
West	0.9x	0.77	Х	3.2	21	x	9	4.68	x	0.63		x	0.7	-	<b>=</b> [	92.88	(80)
West	0.9x	0.77	X	3.3	31	x	7	3.59	X	0.63		x	0.7	=	= [	148.88	(80)
West	0.9x	0.77	X	1.0	61	x	7	3.59	X	0.63		x	0.7	=	= [	36.21	(80)
West	0.9x	0.77	Х	3.2	21	x	7	3.59	X	0.63		x	0.7	-	= [	72.19	(80)
West	0.9x	0.77	Х	3.3	31	X	4	5.59	x	0.63		x	0.7	=	= [	92.23	(80)
West	0.9x	0.77	X	1.0	61	x	4	5.59	X	0.63		x	0.7	-	= [	22.43	(80)
West	0.9x	0.77	Х	3.2	21	x	4	5.59	x	0.63		x	0.7	-	= [	44.72	(80)
West	0.9x	0.77	Х	3.3	31	x	2	4.49	X	0.63		x	0.7	-	= [	49.55	(80)
West	0.9x	0.77	X	1.0	61	x	2	4.49	X	0.63		x	0.7	=	= [	12.05	(80)
West	0.9x	0.77	X	3.2	21	x	2	4.49	X	0.63		x	0.7	=	= [	24.02	(80)
West	0.9x	0.77	X	3.3	31	x	1	6.15	X	0.63		x	0.7	-	= [	32.68	(80)
West	0.9x	0.77	Х	1.0	61	x	1	6.15	x	0.63		x	0.7	-	= [	7.95	(80)
West	0.9x	0.77	Х	3.2	21	x	1	6.15	x	0.63		x	0.7	=	= [	15.84	(80)
Solar	ains in	watts, ca	alculate	for eac	h month	1			(83)m	= Sum(74)n	n(8	2)m			_		
(83)m=	106.72	208.77	343.81	501.43	614.52		29.07	598.9	514.	45 399.87	7 24	17.72	133.07	87.76	3		(83)
Total g	ains – i	nternal a	1	<u> </u>	<del>` ´ </del>	T `									_		
(84)m=	465.16	564.65	686.69	823.71	915.98	91	10.35	867.39	789.	18 685.4	1 55	54.06	463.22	435.86	6		(84)
7. Me	an inter	nal temp	erature	(heating	g seasor	n)											
Temp	erature	during h	eating p	eriods i	n the livi	ng a	area f	from Tab	ole 9,	Th1 (°C)					ſ	21	(85)
										` '					- 1		- 1
Utilisa	ation fac	tor for g	ains for	living ar	ea, h1,m	ı (se	ее Та	ble 9a)							_ L 		
Utilisa	ation fac Jan	tor for ga	ains for Mar	living ar	ea, h1,m May	T	ee Ta Jun	ble 9a) Jul	Αι	· · ·		Oct	Nov	Dec	c		
Utilisa (86)m=		Ī		T .	I	Ĺ,			Αι 0.5	ıg Sep	) (	Oct	Nov 0.99	Dec	С		(86)
(86)m=	Jan 1	Feb	Mar 0.98	Apr 0.94	May 0.84	C	Jun ).68	Jul 0.52	0.5	ug Sep 9 0.83	) (		+		c		(86)
(86)m=	Jan 1	Feb 0.99	Mar 0.98	Apr 0.94	May 0.84	ollo	Jun ).68	Jul 0.52	0.5	ug Sep 9 0.83 able 9c)	0		+				(86)
(86)m= Mean (87)m=	Jan 1 interna 19.3	Feb 0.99 Il tempera 19.5	Mar 0.98 ature in 19.86	Apr 0.94 living ar 20.32	May 0.84 ea T1 (f 20.7	ollor 2	Jun 0.68 w ste 0.91	Jul 0.52 ps 3 to 7 20.98	0.5 7 in T 20.9	ug Sep 9 0.83 able 9c) 96 20.78	0 0	).97	0.99	1			
(86)m= Mean (87)m=	Jan 1 interna 19.3	Feb 0.99 Il tempera 19.5	Mar 0.98 ature in 19.86	Apr 0.94 living ar 20.32	May 0.84 ea T1 (f 20.7	ollo ollo dw	Jun 0.68 w ste 0.91	Jul 0.52 ps 3 to 7 20.98	0.5 7 in T 20.9	ug Sep 9 0.83 able 9c) 96 20.78	0 0	).97	0.99	1	5		
(86)m=  Mean (87)m=  Temp (88)m=	Jan 1 interna 19.3 erature 19.64	Feb 0.99 Il temper: 19.5 during h	Mar 0.98 ature in 19.86 neating p	Apr 0.94 living ar 20.32 periods in 19.66	May 0.84 ea T1 (f 20.7 n rest of 19.66	ollov dw	Jun 0.68 w ste 0.91 elling 9.67	Jul 0.52 ps 3 to 7 20.98 from Ta	0.57 in T 20.99 able 9	ug Sep 9 0.83 able 9c) 96 20.78	0 0	0.26	0.99	19.26	5		(87)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa	Jan 1 interna 19.3 erature 19.64	Feb 0.99 I tempera 19.5 during h 19.65 ctor for ga	Mar 0.98 ature in 19.86 eating p 19.65 ains for	Apr 0.94 living ar 20.32 periods if 19.66 rest of d	May 0.84 ea T1 (f 20.7 n rest of 19.66 welling,	ollov dw h2,	Jun 0.68 w ste 0.91 elling 9.67 m (se	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67	0.57 in T 20.9 able 9 19.6	g Sep 9 0.83 able 9c) 96 20.78 1, Th2 (°C) 67 19.67	3 20	0.26	0.99 19.69	19.26	5		(87)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=	Jan 1 interna 19.3 erature 19.64 ation fac	Feb 0.99 Il tempera 19.5 during h 19.65 etor for ga 0.99	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97	Apr 0.94 living ar 20.32 periods if 19.66 rest of d 0.91	May 0.84 ea T1 (f 20.7 n rest of 19.66 welling, 0.78	0 C C C C C C C C C C C C C C C C C C C	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38	0.57 in T 20.92 able 9 19.6 9a) 0.4	g Sep 9 0.83 able 9c) 96 20.78 1, Th2 (°C) 67 19.67	0 (0 0 0 3 20 ) 19	0.97	0.99	19.26	5		(87)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean	Jan 1 interna 19.3 erature 19.64 ation fac	Feb 0.99 Il temper: 19.5 during h 19.65 ctor for gas 0.99 Il temper:	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in	Apr 0.94 living ar 20.32 periods in 19.66 rest of d 0.91 the rest	May 0.84 ea T1 (f 20.7 n rest of 19.66 welling, 0.78 of dwell	ollov 2 dw 1 1 h2,	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste	0.57 in T 20.9 able 9 19.6 9a) 0.4	ug Sep 9 0.83 able 9c) 96 20.78 9, Th2 (°C) 67 19.67 4 0.75 to 7 in Ta	) (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.26 9.66 0.95	0.99 19.69 19.66 0.99	1 19.26 19.65	5		(87) (88) (89)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=	Jan 1 interna 19.3 erature 19.64 ation fac	Feb 0.99 Il tempera 19.5 during h 19.65 etor for ga 0.99	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97	Apr 0.94 living ar 20.32 periods if 19.66 rest of d 0.91	May 0.84 ea T1 (f 20.7 n rest of 19.66 welling, 0.78	ollov 2 dw 1 1 h2,	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38	0.57 in T 20.92 able 9 19.6 9a) 0.4	ug Sep 9 0.83 able 9c) 96 20.78 9, Th2 (°C) 67 19.67 4 0.75 to 7 in Ta	0 (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.26 9.66 0.95 0.0)	0.99 19.69 19.66 0.99	1 19.26 19.65 1	5	0.20	(87) (88) (89) (90)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean	Jan 1 interna 19.3 erature 19.64 ation fac	Feb 0.99 Il temper: 19.5 during h 19.65 ctor for gas 0.99 Il temper:	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in	Apr 0.94 living ar 20.32 periods in 19.66 rest of d 0.91 the rest	May 0.84 ea T1 (f 20.7 n rest of 19.66 welling, 0.78 of dwell	ollov 2 dw 1 1 h2,	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste	0.57 in T 20.9 able 9 19.6 9a) 0.4	ug Sep 9 0.83 able 9c) 96 20.78 9, Th2 (°C) 67 19.67 4 0.75 to 7 in Ta	0 (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.26 9.66 0.95 0.0)	0.99 19.69 19.66 0.99	1 19.26 19.65 1	5	0.39	(87) (88) (89)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=	Jan 1 interna 19.3 erature 19.64 ation fac 1 interna 17.42	Feb 0.99 I temperation of the second of the second of temperation	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in 18.24	Apr 0.94 living ar 20.32 periods in 19.66 rest of d 0.91 the rest 18.9	May 0.84 ea T1 (f 20.7 n rest of 19.66 welling, 0.78 of dwell 19.38	ollov collov dw 11 h2, colling 11	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57 T2 (fc 9.62	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste 19.67	0.57 in T 20.9 able 9 9a) 0.4 eps 3 19.6	ug Sep 9 0.83 able 9c) 96 20.78 9, Th2 (°C) 67 19.67 4 0.75 to 7 in Ta	0 0 0 0 3 20 ) 1 19 0 18 1 18	0.97 0.26 9.66 0.95 C) 8.83	0.99 19.69 19.66 0.99	1 19.26 19.65 1	5	0.39	(87) (88) (89) (90) (91)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=	Jan  1 interna 19.3 erature 19.64 ation fac 1 interna 17.42 interna 18.15	Feb 0.99 Il temper: 19.5 during h 19.65 ctor for ga 0.99 Il temper: 17.72 Il temper: 18.41	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in 18.24 ature (for	Apr 0.94 living ar 20.32 periods if 19.66 rest of d 0.91 the rest 18.9 or the wh	May 0.84 ea T1 (f 20.7 n rest of 19.66 welling, 0.78 of dwell 19.38 nole dwe	collor collor collor dw 11 h2, collor dw 11 h2, collor dw 22 dw 24 dw 25 dw 26 dw 26 dw 27 dw 27 dw 28	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57 T2 (fo 9.62 g) = fl 0.12	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste 19.67  LA × T1 20.18	0.5 7 in T 20.9 able 9 19.6 9a) 0.4 eps 3 19.6 + (1 - 20.6	ag Sep 9 0.83  able 9c) 06 20.78  7, Th2 (°C) 19.67  4 0.75  to 7 in Ta 19.5  - fLA) × T 7 20	0 (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.97 0.26 0.26 9.66 0.95 1c) 8.83 = Livi	0.99 19.69 19.66 0.99	1 19.26 19.65 1	5 3 3	0.39	(87) (88) (89) (90)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply	Jan  1 interna 19.3 erature 19.64 ation fac 1 interna 17.42 interna 18.15 adjustr	Feb 0.99 Il tempers 19.5 during h 19.65 etor for ga 0.99 Il tempers 17.72 Il tempers 18.41 ment to th	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in 18.24 ature (for	Apr 0.94 living ar 20.32 periods in 19.66 rest of d 0.91 the rest 18.9 or the wh 19.45 n interna	May 0.84 ea T1 (f 20.7 n rest of 19.66 welling, 0.78 of dwell 19.38 nole dwe 19.9 I temper	ollor collor dw 11 h2, collor ling 11 11 11 11 11 11 11 11 11 11 11 11 11	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57 T2 (fc 9.62 g) = fl 0.12 re fro	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste 19.67  LA × T1 20.18 m Table	0.57 in T 20.52 able 9 19.62 9 19.62 + (1 - 20.52 4 4 e, 1)	able 9c) 66 20.78 7, Th2 (°C) 7, Th2 (°C) 7, Th3 Ta 19.67 4 0.75 10.7 19.67 19.5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.97 0.26 9.66 0.95 0.95 E. Livi	0.99  19.69  19.66  0.99  18.01  ng area ÷ (4	1 19.26 19.65 1 17.38 2) =	5 5 3	0.39	(87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=	Jan  1 interna 19.3 erature 19.64 ation fac 1 interna 17.42 interna 18.15 adjustr 18.15	Feb 0.99 Il temper: 19.5 during h 19.65 ctor for ga 0.99 Il temper: 17.72 Il temper: 18.41 ment to th	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in 18.24 ature (for 18.87 ne mean 18.87	Apr 0.94 living ar 20.32 periods if 19.66 rest of d 0.91 the rest 18.9 or the wh 19.45 n internal 19.45	May 0.84 ea T1 (f 20.7 n rest of 19.66 welling, 0.78 of dwell 19.38 nole dwe	ollor collor dw 11 h2, collor ling 11 11 11 11 11 11 11 11 11 11 11 11 11	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57 T2 (fo 9.62 g) = fl 0.12	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste 19.67  LA × T1 20.18	0.5 7 in T 20.9 able 9 19.6 9a) 0.4 eps 3 19.6 + (1 - 20.6	able 9c) 66 20.78 7, Th2 (°C) 7, Th2 (°C) 7, Th3 Ta 19.67 4 0.75 10.7 19.67 19.5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.97 0.26 0.26 9.66 0.95 1c) 8.83 = Livi	0.99 19.69 19.66 0.99 18.01 ng area ÷ (4	1 19.26 19.65 1 17.38	5 5 3	0.39	(87) (88) (89) (90) (91)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp	Jan 1 interna 19.3 erature 19.64 ation fac 1 interna 17.42 interna 18.15 adjustr 18.15 ace hea	Feb 0.99 Il tempers 19.5 during h 19.65 ctor for ga 0.99 Il tempers 17.72 Il tempers 18.41 ment to th 18.41 tting requ	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in 18.24 ature (for 18.87 he mean 18.87 uiremen	Apr 0.94 living ar 20.32 periods in 19.66 rest of d 0.91 the rest 18.9 or the wh 19.45 n internal 19.45	May 0.84 ea T1 (f 20.7 n rest of 19.66 welling, 0.78 of dwell 19.38 nole dwe 19.9 I temper 19.9	ollor dw 11 h2, C c c c c c c c c c c c c c c c c c c	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57 T2 (fc 9.62  g) = fl 0.12 re fro 0.12	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste 19.67  LA × T1 20.18 m Table 20.18	0.57 in T 20.9able 9 19.6 9a) 0.4 eps 3 19.6 + (1 - 20.7able 9 20.	ag Sep 9 0.83  able 9c) 96 20.78  7, Th2 (°C) 7 19.67  4 0.75  1 19.5  1 19.5  1 19.5  1 19.5  20  1 20  1 20	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.97 0.26 9.66 0.95 0.95 8.83 = Livi	0.99  19.69  19.66  0.99  18.01  ng area ÷ (4  18.66	1 19.26 19.65 1 17.38 2) =	5 3 1		(87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T	Jan  1 interna 19.3 erature 19.64 ation fac 1 interna 17.42 interna 18.15 adjustr 18.15 ace head i to the	Feb  0.99  I temper: 19.5  during h 19.65  ctor for ga 0.99  I temper: 17.72  I temper: 18.41  ment to th 18.41  tting requesting re	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in 18.24 ature (for 18.87 he mean 18.87 uiremen ernal te	Apr 0.94 living ar 20.32 periods if 19.66 rest of d 0.91 the rest 18.9 or the wh 19.45 n interna	May  0.84  ea T1 (f  20.7  rest of  19.66  welling,  0.78  of dwell  19.38  nole dwe  19.9  I tempel  19.9  re obtain	ollor dw 11 h2, C c c c c c c c c c c c c c c c c c c	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57 T2 (fc 9.62  g) = fl 0.12 re fro 0.12	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste 19.67  LA × T1 20.18 m Table 20.18	0.57 in T 20.9able 9 19.6 9a) 0.4 eps 3 19.6 + (1 - 20.7able 9 20.	able 9c) 66 20.78 7, Th2 (°C) 7, Th2 (°C) 7, Th3 Ta 19.67 4 0.75 10.7 19.67 19.5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.97 0.26 9.66 0.95 0.95 8.83 = Livi	0.99  19.69  19.66  0.99  18.01  ng area ÷ (4  18.66	1 19.26 19.65 1 17.38 2) =	5 3 1		(87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T	Jan  1 interna 19.3 erature 19.64 ation fac 1 interna 17.42 interna 18.15 adjustr 18.15 ace hea it to the illisation	Feb 0.99 Il tempera 19.5 during h 19.65 ctor for ga 0.99 Il tempera 17.72 Il tempera 18.41 ment to th 18.41 tting requirement interpretation factor for	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in 18.24 ature (for 18.87 he mean 18.87 uiremen ernal teepr gains	Apr 0.94 living ar 20.32 periods in 19.66 rest of d 0.91 the rest 18.9 or the wh 19.45 in internal 19.45 imperature using Ta	May  0.84  ea T1 (f  20.7  n rest of  19.66  welling,  0.78  of dwell  19.38  nole dwell  19.9  I temper  19.9  re obtain able 9a	ollor collor collor dw 11 h2, cu 11 h2, cu 12 cu 12 cu 13 h2, cu 14 cu 15 cu 1	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57 T2 (fo 9.62  g) = fl 0.12 re fro 0.12 at ste	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste 19.67  LA × T1 20.18 m Table 20.18 ep 11 of	0.5 7 in T 20.9 able 9 19.6 9a) 0.4 eps 3 19.6 + (1- 20.7 Table	able 9c) 9 0.83 able 9c) 96 20.78 1, Th2 (°C) 19.67 4 0.75 to 7 in Ta 19.5  - fLA) x T 17 20 where app 17 20 e 9b, so th	0 0 0 0 3 20 ) 7 19 6 18 6 18 6 18 6 18 7 19 7 19 8 18 9 18 9 18 9 18 9 18 18 18 18 18 18 18 18 18 18 18 18 18 1	0.97 0.26 9.66 0.95 0.95 0.95 1c) 8.83 = Livi	0.99  19.69  19.66  0.99  18.01  ng area ÷ (4  18.66  (76)m and	1 19.26 19.65 1 17.38 18.11 18.11	5 5 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		(87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T the ut	Jan  1 interna 19.3 erature 19.64 ation face 1 interna 17.42 interna 18.15 adjustr 18.15 ace head i to the cillisation Jan	Feb  0.99  I temper: 19.5  during h 19.65  ctor for ga 0.99  I temper: 17.72  I temper: 18.41  ment to th 18.41  tting requesting re	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in 18.24 ature (for 18.87 he mean 18.87 uiremen ernal te or gains Mar	Apr 0.94 living ar 20.32 periods in 19.66 rest of d 0.91 the rest 18.9 or the wh 19.45 n internal 19.45 mperaturusing Ta Apr	May  0.84  ea T1 (f  20.7  rest of  19.66  welling,  0.78  of dwell  19.38  nole dwe  19.9  I tempel  19.9  re obtain	ollor collor collor dw 11 h2, cu 11 h2, cu 12 cu 12 cu 13 h2, cu 14 cu 15 cu 1	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57 T2 (fc 9.62  g) = fl 0.12 re fro 0.12	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste 19.67  LA × T1 20.18 m Table 20.18	0.57 in T 20.9able 9 19.6 9a) 0.4 eps 3 19.6 + (1 - 20.7able 9 20.	able 9c)  able 9	0 0 0 0 3 20 ) 7 19 6 18 6 18 6 18 6 18 7 19 7 19 8 18 9 18 9 18 9 18 9 18 18 18 18 18 18 18 18 18 18 18 18 18 1	0.97 0.26 9.66 0.95 0.95 8.83 = Livi	0.99  19.69  19.66  0.99  18.01  ng area ÷ (4  18.66	1 19.26 19.65 1 17.38 2) =	5 5 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		(87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T the ut	Jan  1 interna 19.3 erature 19.64 ation face 1 interna 17.42 interna 18.15 adjustr 18.15 ace head i to the cillisation Jan	Feb  0.99  I temperation of the second of th	Mar 0.98 ature in 19.86 eating p 19.65 ains for 0.97 ature in 18.24 ature (for 18.87 he mean 18.87 uiremen ernal te or gains Mar	Apr 0.94 living ar 20.32 periods in 19.66 rest of d 0.91 the rest 18.9 or the wh 19.45 n internal 19.45 mperaturusing Ta Apr	May  0.84  ea T1 (f  20.7  n rest of  19.66  welling,  0.78  of dwell  19.38  nole dwell  19.9  I temper  19.9  re obtain able 9a	ollor collor col	Jun 0.68 w ste 0.91 elling 9.67 m (se 0.57 T2 (fo 9.62  g) = fl 0.12 re fro 0.12 at ste	Jul 0.52 ps 3 to 7 20.98 from Ta 19.67 ee Table 0.38 ollow ste 19.67  LA × T1 20.18 m Table 20.18 ep 11 of	0.5 7 in T 20.9 able 9 19.6 9a) 0.4 eps 3 19.6 + (1- 20.7 Table	able 9c) abl	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.97 0.26 9.66 0.95 0.95 0.95 1c) 8.83 = Livi	0.99  19.69  19.66  0.99  18.01  ng area ÷ (4  18.66  (76)m and	1 19.26 19.65 1 17.38 18.11 18.11	5 5 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		(87) (88) (89) (90) (91) (92)

Useful gains, hn	<u>`</u>	<del>-                                    </del>	r	T	ı	Г	ı		ı			(0=)
` '	57.24   663.76		723.85	553.98	377.73	392.19	529.54	526.38	457.94	433.78		(95)
Monthly average		<del>i                                     </del>	r	1	40.0	10.4	444	40.0	7.4	4.0		(96)
` '		8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(90)
Heat loss rate for (97)m= 1532.52 14	92.02 1363.09	1	892.46	596.01	385.96	406.02	639.27	957.3	1263.94	1526.45		(97)
Space heating re			l	<u> </u>	<u> </u>					1020.40		(0.)
	28.17 520.3	289.97	125.44	0	0.02	0	0	320.6	580.32	812.95		
` /			<u> </u>	<u> </u>	<u> </u>	<u>I</u> Tota	l per year	L (kWh/vear	) = Sum(9	8) <sub>15912</sub> =	4074	(98)
Space heating re	oguiromant i	n k\\/h/mi	2/voor				, , , , , , ,	( )	, (-	_ /L	F7.0F	(99)
	•						NID)				57.35	
9a. Energy requir		dividual n	eating s	ystems i	nciuding	micro-C	HP)					
Space heating: Fraction of space		secondar	v/supple	ementary	svstem					[	0	(201)
Fraction of space				,	•	(202) = 1	- (201) =			I [	1	(202)
Fraction of total		•	. ,			(204) = (2	02) <b>x</b> [1 –	(203)] =		l I	1	(204)
	_	-				( - ) (	- / [	( /1		<u>[</u>		(206)
Efficiency of ma	-	•			- 0/					 	93.4	╡ .
Efficiency of sec		1		g systen							0	(208)
LI	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating re	<u> </u>	1	i	i i				000.0	500.00	040.05		
	28.17 520.3	289.97	125.44	0	0	0	0	320.6	580.32	812.95		
$(211)$ m = {[(98)m	T T		r -	Ι.								(211)
852.5 67	72.56 557.07	310.46	134.31	0	0	0 Tota	0	343.26	621.33	870.4		7(044)
	. ,					Tota	ıl (kWh/yea	ar) =Surri(2	ZII) <sub>15,1012</sub>		4361.88	(211)
Space heating for	•		month									
$= \{[(98)m \times (201)] $ $(215)m = 0$	$\begin{bmatrix} 1 & 1 & 1 & 0 & 0 \\ 0 & & & & 0 \end{bmatrix}$	00)	0	0	0	0	0	0	0	0		
(2.0)	<u> </u>	1 -					l (kWh/yea				0	(215)
Water heating									7 15,1012			` ′
Output from wate	r heater (cal	culated a	bove)									
	68.75 175.57		150.77	132.79	127.22	141.82	143.39	163.28	174.3	188.65		
Efficiency of water	er heater										80.3	(216)
(217)m= 88.23 8	8.05 87.62	86.59	84.59	80.3	80.3	80.3	80.3	86.72	87.85	88.31		(217)
Fuel for water he												
(219)m = (64)m (219)m = 218.95 19	$\begin{array}{c c} x & 100 \div (217) \\ \hline 91.64 & 200.38 \end{array}$	7)m 179.83	178.23	165.37	158.43	176.62	178.57	188.28	198.41	213.62		
(213)111- 210.33	200.50	173.03	170.20	100.07	100.40		I = Sum(2		130.41	210.02	2248.34	(219)
Annual totals						. 010	• • • • • • • • • • • • • • • • • •		Wh/year	. L	kWh/yea	
Space heating fu	el used, maiı	n system	1					N.	vvii/y cai	[	4361.88	<u> </u>
Water heating fue		=								I [	2248.34	╡
Electricity for pun		d electric	keen-ho	ıt						L		
central heating p	•	2.200.10		-						30		(230c)
												,/

boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (230	0a)(230g) =	75 (231)
Electricity for lighting			314.43 (232)
12a. CO2 emissions – Individual heating system	s including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	942.17 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	485.64 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1427.81 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	38.93 (267)
Electricity for lighting	(232) x	0.519 =	163.19 (268)
Total CO2, kg/year	sur	m of (265)(271) =	1629.92 (272)

TER =

(273)

22.94

			User D	Details:						
Assessor Name:	Joseph Trear	or		Strom	a Num	ber:		STRO	032062	
Software Name:	Stroma FSAF	2012		Softwa	are Ve	rsion:		Versio	n: 1.0.4.14	
			i i	Address	: A9					
Address :	, Gondar Gard	ens, London,	NW6 1	HG						
1. Overall dwelling dim	ensions:		_							
One word the en				a(m²)	44. 3		ight(m)	1,- ,	Volume(m <sup>3</sup>	<u>-</u>
Ground floor			8	38.79	(1a) x	2	2.55	(2a) =	226.41	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d	)+(1e)+(1r	า) [	38.79	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	226.41	(5)
2. Ventilation rate:	main	oo oo n day		other		4040			m³ nor hou	
	main heating	secondar heating	· - –	otner	, –	total			m³ per hou	_
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					3	<b>x</b>	10 =	30	(7a)
Number of passive vent	S				Ē	0	x -	10 =	0	(7b)
Number of flueless gas	fires				F	0	x 4	40 =	0	(7c)
-					L					
								Air ch	nanges per ho	our
Infiltration due to chimne	-					30		÷ (5) =	0.13	(8)
If a pressurisation test has		ntended, procee	d to (17),	otherwise o	continue fr	rom (9) to	(16)			<b>-</b>
Number of storeys in Additional infiltration	the dwelling (ns)						[(0)	410.4	0	(9)
Structural infiltration: (	0.25 for stool or tin	obor frama ar	. 0.25 fo	r macani	v constr	ruction	[(9)	-1]x0.1 =	0	= $(10)$
if both types of wall are					•	uction			0	(11)
deducting areas of open			g		- (					
If suspended wooden	•	•	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	vs and doors drau	ght stripped							0	(14)
Window infiltration				0.25 - [0.2	. ,	-	. (45)		0	(15)
Infiltration rate	.50	12		(8) + (10)					0	(16)
Air permeability value  If based on air permeab			•	•	•	etre of e	envelope	area	5	(17)
Air permeability value appli	-					is heina u	sed		0.38	(18)
Number of sides shelter		oot nac boon acr	10 01 a ao	groo an po	moubility	io boilig a	000		2	(19)
Shelter factor				(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	) x (20) =				0.33	(21)
Infiltration rate modified	for monthly wind s	speed								_
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7	•								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Easter (22a)m (6	22\m · 4									
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	<del>'</del>	.08 0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(224)11- 1.21 1.23	1.1	.50 0.95	1 0.33	0.32	'	1.00	1.12	1.10	J	

0.41	0.41	0.4	0.36	0.35	d wind s 0.31	0.31	0.3	0.33	0.35	0.37	0.38		
Calculate effe		-				1	0.3	0.33	0.35	0.37	0.36		
If mechanica	al ventila	tion:										0	(23
If exhaust air h	eat pump ι	using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (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	(23
a) If balance	ed mecha	anical ve	ntilation	with hea	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		(24
b) If balance	ed mecha	anical ve	ntilation	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)r	nouse ext n < 0.5 ×			-	-				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilation	on or wh	ole hous	e positiv	e input	ventilatio	on from I	oft		l .		ı	
if (22b)r	n = 1, the	en (24d)	m = (22b)	)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			ı	
24d)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(24
Effective air	<del> </del>		<u> </u>	, ,	<del>``</del>	<del>``</del>	<del></del>	<u> </u>				İ	
25)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(25
3. Heat losse	s and he	eat loss p	paramete	er:									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	е А	Χk
	area	(m²)	m		A ,r		W/m2		(W/I	K)	kJ/m²-ł		J/K
Windows Type	€ 1				5.08	x1,	/[1/( 1.4 )+	0.04] =	6.73				(27
Nindows Type	€ 2				5.06	x1,	/[1/( 1.4 )+	0.04] =	6.71				(27
Windows Type	€ 3				10.85	x1,	/[1/( 1.4 )+	0.04] =	14.38				(27
Nalls Type1	65.5	5	20.99	9	44.51	X	0.18	= [	8.01				(29
Walls Type2	24.8	4	0		24.84	1 x	0.18		4.47				
							0.10	=	4.47				(29
Walls Type3	7.37	7	0		7.37	x	0.18	= [ 	1.33				= '
Walls Type3 Fotal area of e	L		0		7.37 97.71	=		=					(29
	L		0					=					(29)
Γotal area of ε Party wall	elements	, m²		ndow U-va	97.71	) x	0.18	= [	0	as given in	paragraph	3.2	(29
Total area of earty wall  for windows and include the area	elements I roof windo	, m² ows, use e sides of in	ffective wi		97.71 33.69	x dated using	0.18 0 formula 1	= [ = [ /[(1/U-valu	0	as given in	paragraph	3.2	(29
Fotal area of earty wall  for windows and include the area  Fabric heat los	elements d roof windo as on both ss, W/K =	, m²  ows, use e sides of in = S (A x	ffective wi		97.71 33.69	x dated using	0.18	= [ = [ /[(1/U-valu	0	as given in	paragraph	3.2	(29)
Fotal area of earty wall  for windows and include the area  Fabric heat los  Heat capacity	elements.  If roof windows on both  ss, W/K =  Cm = S(	, m²  ows, use e sides of interpretation  Sides (A x A x k )	ffective wi ternal wali U)	ls and part	97.71 33.69 alue calculatitions	x lated using	0.18 0 formula 1	$= \begin{bmatrix} \\ \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \end{bmatrix}$ $+ (32) = \begin{bmatrix} \\ \end{bmatrix}$	0				(3:
Fotal area of earty wall  for windows and include the area Fabric heat los Heat capacity Thermal mass	elements.  If roof windown as on both ss, W/K = Cm = S( s parame	, m²  bws, use e sides of in a S (A x A x A x B)  ter (TMF	ffective winternal walk U) P = Cm ÷	's and part - TFA) ir	97.71 33.69 alue calculations	x lated using	0.18 0 1 formula 1 (26)(30)	= [ 	1.33 0 re)+0.04] & .(30) + (32) tive Value	2) + (32a). : Medium	(32e) =	41.64	(3)
Fotal area of earty wall  for windows and include the area Fabric heat los Heat capacity Thermal mass	elements.  If roof windows on both  SS, W/K =  Cm = S(  S parame  sments who	, m²  ows, use e sides of in = S (A x A x k)  ter (TMF ere the de	ffective winternal walk U)  P = Cm ÷	's and part - TFA) ir	97.71 33.69 alue calculations	x lated using	0.18 0 1 formula 1 (26)(30)	= [ 	1.33 0 re)+0.04] & .(30) + (32) tive Value	2) + (32a). : Medium	(32e) =	41.64 6119.25	(32)
Fotal area of earty wall  for windows and include the area  Fabric heat los  Heat capacity  Thermal mass  For design assess  an be used inste	elements.  If roof winder as on both as, W/K = Cm = S( as parame asments whe and of a det	, m²  cows, use e sides of in  = S (A x  A x k)  ter (TMF ere the de tailed calcu	ffective winternal walk  U)  P = Cm ÷  tails of the lation.	s and pari - TFA) ir constructi	97.71 33.69 alue calculations a kJ/m²K	x ated using	0.18 0 1 formula 1 (26)(30)	= [ 	1.33 0 re)+0.04] & .(30) + (32) tive Value	2) + (32a). : Medium	(32e) =	41.64 6119.25 250	(3:
Fotal area of earty wall  for windows and include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste	elements.  If roof windows on both  SS, W/K =  Cm = S(  S parame  sments who  and of a det  es : S (L	, m²  sides of interpolation  S (A x A x k )  ter (TMF)  ere the dentalled calcumus  x Y) calcumus	ffective winternal walk  U)  P = Cm ÷  tails of the  ulation.  culated to	s and part - TFA) ir constructi	97.71 33.69 alue calculatitions a kJ/m²K ion are not	x ated using	0.18 0 1 formula 1 (26)(30)	= [ 	1.33 0 re)+0.04] & .(30) + (32) tive Value	2) + (32a). : Medium	(32e) =	41.64 6119.25	(3:
Fotal area of earty wall  for windows and include the area fabric heat los Heat capacity Thermal mass For design assess an be used inste	elements.  If roof windown as on both as, W/K = Cm = S( as parame asments who and of a det es : S (L al bridging	, m²  sides of interpolation  S (A x A x k )  ter (TMF)  ere the dentalled calcumus  x Y) calcumus	ffective winternal walk  U)  P = Cm ÷  tails of the  ulation.  culated to	s and part - TFA) ir constructi	97.71 33.69 alue calculatitions a kJ/m²K ion are not	x ated using	0.18 0 1 formula 1 (26)(30)	= [   = [   /[(1/U-valu   + (32) =   ((28)   Indica   indicative	1.33 0 re)+0.04] & .(30) + (32) tive Value	2) + (32a). : Medium	(32e) =	41.64 6119.25 250	(34)
Total area of e	elements.  If roof windown as on both as on both ss, W/K = Cm = S( as parame and of a detection and of a detection and bridging that loss	, m²  sides of in  S (A x A x k )  ter (TMF)  ere the de tailed calcu x Y) calcu are not kn	ffective winternal walk U)  P = Cm ÷ tails of the ulation. culated to	- TFA) ir constructi using Ap	97.71 33.69 alue calculatitions a kJ/m²K ion are not	x ated using	0.18 0 1 formula 1 (26)(30)	= [ 	1.33 0 re)+0.04] a .(30) + (32 tive Value e values of	2) + (32a). : Medium : TMP in T	(32e) =	41.64 6119.25 250 7.09	(34)
Fotal area of earty wall  for windows and include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste Thermal bridge If details of therma Total fabric he	elements.  If roof windown as on both as on both ss, W/K = Cm = S( as parame and of a detection and of a detection and bridging that loss	, m²  sides of in  S (A x A x k )  ter (TMF)  ere the de tailed calcu x Y) calcu are not kn	ffective winternal walk U)  P = Cm ÷ tails of the ulation. culated to	- TFA) ir constructi using Ap	97.71 33.69 alue calculatitions a kJ/m²K ion are not	x ated using	0.18 0 1 formula 1 (26)(30)	= [ 	1.33 0 1.30 + (32) 1.30 + (3	2) + (32a). : Medium : TMP in T	(32e) =	41.64 6119.25 250 7.09	(34)
Fotal area of earty wall  for windows and include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste Thermal bridge Indead of thermal Total fabric head Indead of the Indead of the Indead of the Indead Indead of the Ind	elements.  If roof windown as on both as on both as who as the same and of a determination and bridging the sat loss cat loss cat	, m²  sides of in  S (A x A x k)  ter (TMF  ere the de tailed calcu x Y) calc  are not kn	ffective winternal walk  U)  P = Cm ÷ tails of the valuation.  culated to cown (36) =	- TFA) ir constructi using Ap	97.71 33.69 alue calculations a kJ/m²K fon are not	x ated using	0.18  0  formula 1.  (26)(30)	= [	1.33  0  1e)+0.04] a  1:30  1:	2) + (32a). : Medium : <i>TMP in T</i>	(32e) =    able 1f	41.64 6119.25 250 7.09	(29
Party wall  for windows and include the area  abric heat los  Heat capacity  Thermal mass  For design assess  an be used inste  Thermal bridge  details of therma  Total fabric he  Jan	elements.  If roof windows on both  SS, W/K =  Cm = S(  S parame  Sments wheeled of a det  es : S (L  al bridging  eat loss  at loss ca  Feb  43.53	, m²  ows, use e sides of in a S (A x K)  ter (TMF) ere the de tailed calculated are not known alculated 43.28	ffective winternal walk U) P = Cm ÷ tails of the ulation. culated u own (36) =	- TFA) ir constructi using Ap = 0.15 x (3	97.71 33.69 alue calculatitions a kJ/m²K fon are not spendix h 1) Jun	x t known pr	0.18  0 formula 1. (26)(30) ecisely the	= [   = [  /[(1/U-valu   + (32) =   ((28)   Indica   indicative   (33) +   (38)m   Sep   41.31	1.33  0  1e)+0.04] a  1:30  1:33  1:33  0  1:35  1:36	2) + (32a). : Medium : TMP in T. 25)m x (5 Nov 42.36	(32e) =   able 1f	41.64 6119.25 250 7.09	(3) (3) (3) (3) (3) (3) (3)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.04	1.04	1.04	1.02	1.02	1.01	1.01	1.01	1.01	1.02	1.03	1.03		
` /				<u> </u>	<u> </u>	<u> </u>			L Average =	Sum(40) <sub>1.</sub>	12 /12=	1.02	(40)
Number of day	s in mo	nth (Tabl	e 1a)							, ,	L		
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 ene	rav reaui	rement:								kWh/ye	ear:	
		. 97 . 0 9 6											
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.		61		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o		.16		(43)
							I .	_	_				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in				vu,iii = ia	Clor Irom I	i abie ic x	(43)				1		
(44)m= 105.77	101.93	98.08	94.24	90.39	86.54	86.54	90.39	94.24	98.08	101.93	105.77		_
Energy content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	n x nm x D	)Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	1153.91	(44)
(45)m= 156.86	137.19	141.57	123.42	118.43	102.19	94.7	108.67	109.97	128.15	139.89	151.91		
( )			-					l		m(45) <sub>112</sub> =		1512.95	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			()2	L		`
(46)m= 23.53	20.58	21.24	18.51	17.76	15.33	14.2	16.3	16.49	19.22	20.98	22.79		(46)
Water storage	loss:												
Storage volum	e (litres)	) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	-			-			' '						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage a) If manufact		eclared l	nee facto	nr is kna	wn (k\//h	n/dav/).							(48)
Temperature fa				JI IS KIIO	wii (Kvvi	i/uay).					0		
•							(48) x (49)				0		(49)
Energy lost fro b) If manufact		_	-		or is not		(40) X (49)	) =			0		(50)
Hot water stora			-								0		(51)
If community h	eating s	ee sectio	on 4.3										
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (	(54) in (5	55)									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder 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	хH	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(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 Tabl	e H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

	s calculated		month (	(61)m =	(60) ÷	365 × (41	<del></del>			ī	1	1	1	
(61)m= 50	0.96 46.03	49.98	46.47	46.06	42.68	44.1	46.	06	46.47	49.98	49.32	50.96		(61)
	<del></del>						÷ή	_		<del>`                                    </del>	<del>` ´                                     </del>	(57)m +	(59)m + (61)m	
(62)m= 20°	7.82 183.22	191.55	169.9	164.49	144.8	7 138.8	154	.73	156.44	178.14	189.2	202.87		(62)
	nput calculated									r contribu	tion to wate	er heating)		
` —	ional lines if	FGHRS	and/or \	WWHRS	applie	es, see Ap	pend	lix G	)				1	
(63)m=	0 0	0	0	0	0	0	0	)	0	0	0	0		(63)
Output fro	m water hea												•	
(64)m= 20°	7.82 183.22	191.55	169.9	164.49	144.8	7 138.8	154	.73	156.44	178.14	189.2	202.87		-
								Outpu	ut from wa	ater heate	er (annual)	112	2082.02	(64)
Heat gains	s from water	heating,	kWh/m	onth 0.2	5 ′ [0.8	35 × (45)m	า + (6	1)m]	+ 0.8 x	([(46)m	+ (57)m	+ (59)m	]	
(65)m= 64	4.9 57.12	59.57	52.66	50.89	44.65	42.51	47.	65	48.18	55.11	58.84	63.25		(65)
include	(57)m in cald	culation o	of (65)m	only if c	ylinde	r is in the	dwell	ing c	or hot w	ater is f	rom com	munity h	neating	
5. Intern	al gains (see	e Table 5	and 5a	):										
Metabolic	gains (Table	5), Wat	ts											
	lan Feb	Mar	Apr	May	Jur	Jul	A	ug	Sep	Oct	Nov	Dec		
(66)m= 13	0.44 130.44	130.44	130.44	130.44	130.4	4 130.44	130	.44	130.44	130.44	130.44	130.44		(66)
Lighting g	ains (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee T	able 5		•	•	•	
(67)m= 21	1.11 18.75	15.25	11.55	8.63	7.29	7.87	10.	23	13.74	17.44	20.36	21.7	]	(67)
Appliance	s gains (calc	ulated in	Append	dix L, ea	uation	L13 or L1	3a), a	also	see Tal	ble 5			1	
· · · —	6.83 239.29	233.1	219.91	203.27	187.6		174		180.92	194.1	210.74	226.38	]	(68)
Cookina a	ains (calcula	ited in Ai	opendix	L. egua	tion L1	 5 or L15a	). als	o se	e Table	5	1	1	ı	
	36.04	36.04	36.04	36.04	36.04		36.	_	36.04	36.04	36.04	36.04	1	(69)
Pumps an	d fans gains	(Table 5	 5a)		I		<u> </u>			<u> </u>	1		J	
	3 3	3	3	3	3	3	3	П	3	3	3	3	]	(70)
	I g. evaporatio	n (negat	tive valu	L es) (Tah	L Je 5)					<u> </u>	<u> </u>	<u> </u>	I	
	4.35 -104.35	-104.35	-104.35	-104.35	-104.3	5 -104.35	-104	.35	-104.35	-104.35	-104.35	-104.35	1	(71)
` ′	ating gains (T					1	10.				1 .000	1 .000	I	,
	7.23 85	80.06	73.13	68.4	62.01	57.14	64.	n4 T	66.92	74.07	81.73	85.01	1	(72)
` ′			70.10	00.4		66)m + (67)n	<u> </u>			l	1	ļ	J	()
	rnal gains = 0.31   408.18	393.54	369.73	345.44	322.0		314		326.7	350.74	377.96	398.23	1	(73)
6. Solar (		393.54	309.73	343.44	322.0	3   307.33	314	.13	320.7	330.74	377.90	390.23		(10)
	are calculated	using sola	r flux from	Table 6a	and ass	nciated equa	ations	to con	overt to th	e applica	ble orientat	tion		
_	n: Access F	-	Area			lux	2110110		g_	о арріїса	FF		Gains	
Onomation	Table 6d		m <sup>2</sup>			able 6a			able 6b	Т	able 6c		(W)	
East (	0.9x 1	x	10.	85	x	19.64	x		0.63	x [	0.7		65.13	(76)
_	0.9x 1	x	10.		×	38.42	] ^   ] <sub>x</sub>		0.63	^     x	0.7		127.4	](76)
_	0.9x 1	x	10.		^ <u></u>	63.27	」^ ]			_	0.7		209.81	](76) ](76)
	0.9x 1	^ ^			<b>-</b>		-		0.63	_		=		](76) ](76)
			10.		x	92.28	]		0.63	╡╞	0.7	=	305.99	╡
<b>∟</b> ası (	).9x 1	X	10.	85	X	113.09	X		0.63	X	0.7	=	375	(76)

East	۰.۰.۲					1			l I			Г		_	ſ		٦(70)
	0.9x	1	_	X	10.85	X	$\vdash$	15.77	X	0.63		X	0.7	=	=     	383.88	[76]
East	0.9x	1	_	X	10.85	X I	_	10.22	X	0.63		X	0.7	=	=    -	365.47	<b></b> (76)
East	0.9x	1	_	X	10.85	X	_	4.68	X	0.63		X	0.7	=	=     	313.94	<b></b> (76)
East	0.9x	1	_	X	10.85	X	$\vdash$	3.59	X	0.63		X	0.7	'	=      -	244.01	<u> </u> (76)
East	0.9x	1		Х	10.85	X	4	5.59	X	0.63		X	0.7	_   '	=     	151.17	<u></u> (76)
East	0.9x	1		X	10.85	X	2	4.49	X	0.63		X	0.7	:	=   	81.2	<b>(76)</b>
East	0.9x	1		X	10.85	X	1	6.15	X	0.63		X	0.7	:	إ =	53.56	(76)
West	0.9x	0.77		X	5.08	X	1	9.64	X	0.63		X	0.7	:	=	30.49	(80)
West	0.9x	0.77		Х	5.06	X	1	9.64	X	0.63		X	0.7		= [	30.37	(80)
West	0.9x	0.77		X	5.08	X	3	8.42	X	0.63		X	0.7		إ =	59.65	(80)
West	0.9x	0.77		X	5.06	X	3	8.42	X	0.63		X	0.7		= <u> </u>	59.41	(80)
West	0.9x	0.77		X	5.08	X	6	3.27	X	0.63		x	0.7		= [	98.23	(80)
West	0.9x	0.77		X	5.06	X	6	3.27	x	0.63		x	0.7	:	= [	97.85	(80)
West	0.9x	0.77		x	5.08	X	9	2.28	x	0.63		x	0.7	:	= [	143.27	(80)
West	0.9x	0.77		x	5.06	×	9	2.28	x	0.63		x	0.7	:	= [	142.7	(80)
West	0.9x	0.77		x	5.08	X	1	13.09	x	0.63		x	0.7		= [	175.58	(80)
West	0.9x	0.77		x	5.06	X	1	13.09	x	0.63		x	0.7		= [	174.89	(80)
West	0.9x	0.77		x	5.08	X	1	15.77	x	0.63		x	0.7	-	= [	179.74	(80)
West	0.9x	0.77		x	5.06	x	1	15.77	x	0.63		x	0.7	-	= <u>[</u>	179.03	(80)
West	0.9x	0.77		x	5.08	x	1	10.22	x	0.63		x	0.7		= [	171.12	(80)
West	0.9x	0.77		x	5.06	x	1	10.22	x	0.63		x	0.7		- Ī	170.44	(80)
West	0.9x	0.77		x	5.08	x	9	4.68	x	0.63		x	0.7		<u> </u>	146.99	(80)
West	0.9x	0.77		x	5.06	x	9	4.68	x	0.63		x	0.7		<u> </u>	146.41	(80)
West	0.9x	0.77		x	5.08	x	7	3.59	x	0.63		x	0.7	-	<u> </u>	114.25	(80)
West	0.9x	0.77		х	5.06	x	7	3.59	x	0.63		x [	0.7		<u> </u>	113.8	(80)
West	0.9x	0.77		x	5.08	x	4	5.59	x	0.63		x	0.7	-	<u> </u>	70.78	(80)
West	0.9x	0.77		x	5.06	x	4	5.59	x	0.63		x	0.7		<b>-</b> [	70.5	(80)
West	0.9x	0.77	$\equiv$	х	5.08	x	2	4.49	x	0.63		x [	0.7		<u> </u>	38.02	(80)
West	0.9x	0.77	Ħ	x	5.06	X	2	4.49	x	0.63		x	0.7	<u> </u>	<u> </u>	37.87	(80)
West	0.9x	0.77	一	x	5.08	X	1	6.15	x	0.63		x	0.7	<u> </u>	<u> </u>	25.07	(80)
West	0.9x	0.77		x	5.06	X	1	6.15	х	0.63		x	0.7		<u> </u>	24.98	(80)
	L					ı						_					_
Solar g	gains in v	watts, ca	lculat	ed	for each mon	th			(83)m	= Sum(74)	)m(8	32)m					
(83)m=	125.99	246.46	405.8	9	591.96 725.4	7 7	42.65	707.03	607	.33 472.0	06 29	92.45	157.09	103.6	1		(83)
Total g	ains – ir	nternal a	nd so	lar	(84)m = $(73)$ n	า + (	83)m	, watts									
(84)m=	536.29	654.64	799.4	3	961.69 1070.9	1 10	064.71	1014.36	921	.46 798.	76 64	43.19	535.05	501.8	4		(84)
7. Me	an interi	nal temp	eratui	re (l	heating seaso	n)											
Temp	erature	during h	eating	ре	eriods in the li	ving	area	from Tab	ole 9,	Th1 (°C	)					21	(85)
Utilisa	ation fac	tor for ga	ains fo	r li	ving area, h1,	m (s	ee Ta	ble 9a)							١		_
	Jan	Feb	Ма	r	Apr Ma	y	Jun	Jul	Αı	ug Se	ep	Oct	Nov	De	С		
(86)m=	1	0.99	0.97		0.9 0.73		0.53	0.39	0.4	4 0.72	2 (	0.96	0.99	1			(86)
Mean	internal	tempera	ature	in li	ving area T1	follo	w ste	ps 3 to 7	in T	able 9c)							
(87)m=	19.91	20.1	20.4	_	20.74 20.93		20.99	21	2		5 2	20.65	20.21	19.88	3		(87)
J		<u></u>						<u> </u>			!		1	<u> </u>			

T	المرابعة المحاددة				م منال میداد	. f	bla O T	۱۵ (۵C)					
· -		ng heating	<del>`</del>	1		i	i	· · ·	20.07	20.00	20.00	1	(88)
` ′	20.05 20		20.06	20.07	20.08	20.08	20.08	20.07	20.07	20.06	20.06		(00)
_		or gains for		<u>_</u>	<del>```</del>		<del>-                                    </del>				ı	1	(00)
(89)m=	1 0.5	99 0.97	0.87	0.67	0.46	0.31	0.36	0.65	0.94	0.99	1		(89)
Mean in	ternal ten	nperature in	the rest	of dwell	ing T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)			-	
(90)m= 1	18.59 18	.87 19.3	19.78	20.01	20.07	20.07	20.08	20.04	19.66	19.03	18.55		(90)
								f	fLA = Livin	g area ÷ (4	4) =	0.38	(91)
Mean in	ternal ten	nperature (f	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.1 19	.34 19.72	20.15	20.36	20.42	20.43	20.43	20.39	20.04	19.48	19.06		(92)
Apply a	djustment	to the mea	n interna	l temper	ature fro	m Table	4e, whe	ere appro	priate			1	
(93)m=	19.1 19	.34 19.72	20.15	20.36	20.42	20.43	20.43	20.39	20.04	19.48	19.06		(93)
8. Space	e heating	requiremer	nt										
		n internal te or for gains	•		ned at st	ep 11 of	Table 9l	b, so tha	t Ti,m=(	76)m an	d re-calc	culate	
	Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	on factor f	or gains, hr	n:		•	•		•			•	•	
(94)m=	1 0.5	99 0.96	0.87	0.69	0.49	0.34	0.39	0.68	0.94	0.99	1		(94)
Useful g	gains, hm	Gm , W = (9	94)m x (8	4)m									
(95)m= 5	534.3 647	7.67 769.9	837.95	742.02	517.05	342.79	359.37	539.18	604.29	530.41	500.51		(95)
Monthly	average	external ter	nperature	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)
_		mean inter	<del></del>			<del>- `                                   </del>	x [(93)m	– (96)m				1	
` ′	368.91 133			785.37	522.07	343.32	360.52	566.33	855.84	1127.92	1360.42		(97)
_		quirement f	1	1					<del> </del>	·		1	
(98)m = 6	20.95 46	332.5	132.67	32.25	0	0	0	0	187.16	430.21	639.77		_
							Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2835.5	(98)
Space h	neating re	quirement i	n kWh/m²	²/year								31.93	(99)
9a. Energ	gy require	ments – Ind	dividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	neating:												_
Fraction	of space	heat from	secondar	y/supple	mentary	system						0	(201)
Fraction	of space	heat from i	main syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction	of total h	eating from	main sy	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiend	cy of mair	space hea	iting syste	em 1								93.4	(206)
Efficiend	cy of seco	ndary/supp	lementar	y heatin	g systen	ո, %						0	(208)
	Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	<b>⊸</b> ear
		quirement (	<u> </u>		I.		_ 3	1				1	
6	20.95 46	332.5	132.67	32.25	0	0	0	0	187.16	430.21	639.77		
(211)m =	: {[(98)m x	(204)] } x	100 ÷ (20	)6)		•						1	(211)
· · · —	64.82 49	<del>```````</del>	· `	34.53	0	0	0	0	200.38	460.61	684.98		•
		<b>I</b>	1	<u>!</u>	!		Tota	ıl (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<u> </u>	3035.87	(211)
Space h	neatina fu	el (seconda	ry), kWh/	month								<u>l</u>	_
•	Ū	x 100 ÷ (2	• / ·										
(215)m=		0	0	0	0	0	0	0	0	0	0		
	•	*	,		-	_	Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
												_	<del>_</del>

Water heating								
Output from water heater (calculated above)  207.82   183.22   191.55   169.9   164.49   1	44.87 138.8	154.73	156.44	178.14	189.2	202.87	]	
Efficiency of water heater					<u> </u>		80.3	(216)
(217)m= 87.64 87.27 86.43 84.44 81.8	80.3 80.3	80.3	80.3	85.18	87.06	87.74		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
(219)m= 237.14 209.94 221.63 201.21 201.09 1	80.41 172.85	192.69	194.82	209.14	217.34	231.21		_
		Tota	I = Sum(2				2469.47	(219)
Annual totals				k'	Wh/yeaı	ſ	kWh/year	٦
Space heating fuel used, main system 1							3035.87	_
Water heating fuel used							2469.47	
Electricity for pumps, fans and electric keep-hot							_	
central heating pump:						30		(2300
boiler with a fan-assisted flue						45		(230e
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							372.88	(232)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHF						
	<b>Energy</b> kWh/year			Emiss kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	655.75	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	533.41	(264)
Space and water heating	(261) + (262)	+ (263) + (	264) =				1189.15	(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	=	193.52	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		1421.6	(272)

TER =

(273)

16.01

			Hear F	Details:						
A Nlaws	laaanb Tus		USEI L		- N.	l		CTDO	000000	
Assessor Name:	Joseph Tre Stroma FS			Strom					032062 on: 1.0.4.14	
Software Name:	Stioma rs	AP 2012	Duananti	Softwa		rsion:		versio	)H. 1.U.4.14	
A 1 1	0 1 0 -		Property		: A10					
Address:		ardens, Londo	on, NVV6 11	HG						
1. Overall dwelling dime	ensions:		•	4 0)						· ·
Cround floor				a(m²)	l., ,		eight(m)	٦,,	Volume(m <sup>3</sup>	<u> </u>
Ground floor				33.09	(1a) x	2	2.55	(2a) =	211.88	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(	(1d)+(1e)+	(1n) [	33.09	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	211.88	(5)
2. Ventilation rate:										
	main heating	secon heatir		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 - ī	0	x	20 =	0	(6b)
Number of intermittent fa	ans					3	x	10 =	30	(7a)
Number of passive vents	<b>.</b>					0	x	10 =	0	(7b)
•					L		=	40 =		=
Number of flueless gas f	ires					0	^	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimne	evs. flues and fa	ans = (6a)+(6b	)+(7a)+(7b)+	(7c) =	Г	30		÷ (5) =	0.14	(8)
If a pressurisation test has l					_ continue fi			. (0) –	0.14	
Number of storeys in t			, ,			. ,	, ,		0	(9)
Additional infiltration							[(9)	)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber frame	or 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are p deducting areas of openi			g to the grea	ter wall are	ea (after					
If suspended wooden	floor, enter 0.2	(unsealed) o	r 0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	nter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dr	aught strippe	d						0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic me	tres per h	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	)]+(8), otherw	rise (18) =	(16)				0.39	(18)
Air permeability value applie	es if a pressurisation	on test has been	done or a de	gree air pe	rmeability	is being u	ised			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	) x (20) =				0.33	(21)
Infiltration rate modified	for monthly win	d speed							•	
Jan Feb	Mar Apr	May Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Tabl	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a)m (2	22\m : 4									
Wind Factor $(22a)m = (2a)m =$	. <i>∠)</i> III <del>- 4</del>	1.09 0.00	- 0.05	T 0.02		1	1 446	1 440	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Calculate effect	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.37	0.39		
		•	rate for t	he appli	cable ca	se	<u>l</u>		<u> </u>	<u>!</u>			
If mechanica			andis N. (O	2h) (22a	) Fm. /	accetion (N	JEV otho	nuina (OOh	\ (220\		Į	0	(23
If exhaust air he		0		, ,	,	. ,	,, .	`	) = (23a)		Į	0	(23
		-	-	_					2h\ (	00h) [	(22a)	0	(23
a) If balance (24a)m= 0	0	o 0	0	0	0	0	1K) (24a	0	0	230) <b>x</b> [	$\frac{1-(230)}{0}$	<del>-</del> 100]	(24
b) If balance			-										`
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse ext	ract ver	tilation o	or positiv	re input v	ventilatio	n from c	utside	ļ	ļ.			
,	n < 0.5 ×			•	•				5 × (23b	)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural													
<u> </u>	0 = 1, the	<u> </u>			<u> </u>	<del>_</del>	<del>- `</del>				T 1	1	(0
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		(2
Effective air	change <sub>0.59</sub>	rate - en <sub>0.58</sub>	ter (24a <sub>0.57</sub>	or (24b 0.56	o) or (24) 0.55	c) or (24 0.55	d) in box	0.56	0.56	0.57	0.58		(2
25)m= 0.59	0.59	0.56	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.56		(2
3. Heat losses	s and he	at loss p	paramete	er:									
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>K</b> )	k-value kJ/m²·k		AXk <j k<="" td=""></j>
Vindows Type		(111 )	111		4.92				6.52		KJ/III -I		(2
Vindows Type					4.92	=		L	6.52	$\dashv$			(2
Vindows Type					2.39	=	/[1/( 1.4 )+	L	3.17	<b>=</b>			(2
-loor					93.36	_	0.13		12.1368				(2
Walls Type1	74.7	7	12.23		62.54	_	0.18		11.26			7 -	(2
Walls Type2	12.3	_	0			_		╣┇		륵 ¦		3	(2
Total area of e	L				180.4	=	0.18		2.22				(3
Party wall	iomonio,	1			36.38	_	0		0				(3
for windows and	roof windo	ows. use e	ffective wi	ndow U-va			L			L as aiven in	paragraph		(3.
* include the area						a.c.a a.cg	, romana i	1( // 0 1 4 / 4	,	.e g e	paragrapi.	5.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				41.83	(3
	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	16400.1	(3
Heat capacity													
	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium	[	250	(3
Thermal mass For design assess	sments whe	ere the de	tails of the	•			ecisely the				able 1f	250	(3
Thermal mass  For design assess  an be used instea	sments whe	ere the det	tails of the ılation.	constructi	ion are no	t known pr	ecisely the				able 1f		
Thermal mass For design assess an be used instea Thermal bridge	sments whe ad of a det es:S (L	ere the detailed calcu x Y) calc	tails of the ulation. culated u	constructi	ion are not opendix l	t known pr	ecisely the				able 1f	11.05	
Thermal mass for design assess an be used instead for the mall bridges details of thermal	sments who ad of a det es:S(L al bridging	ere the detailed calcu x Y) calc	tails of the ulation. culated u	constructi	ion are not opendix l	t known pr	ecisely the	indicative			able 1f		(3
Heat capacity of the capacity	sments who ad of a det es:S(L al bridging a at loss	ere the detailed calcu x Y) calcu are not kn	tails of the ulation. culated u own (36) =	constructiusing Ap	ion are not opendix l	t known pr	ecisely the	indicative	values of	TMP in Ta	[	11.05	(3
Thermal mass For design assess For the used instead Thermal bridge Thermal bridge Thermal for thermal Total fabric hes	sments who ad of a det es:S(L al bridging a at loss	ere the detailed calcu x Y) calcu are not kn	tails of the ulation. culated u own (36) =	constructiusing Ap	ion are not opendix l	t known pr	ecisely the	indicative	values of (36) =	TMP in Ta	[	11.05	(3
Thermal mass For design assess Fan be used instea Thermal bridge Thermal bridge Total fabric hea Tentilation hea	sments who ad of a det es: S (L al bridging a at loss at loss ca	ere the delated calculated (x Y) calculated	tails of the ulation. culated u own (36) =	constructions and constructions and constructions are constructed as the construction of the construction	ppendix I	t known pr	,	(33) + (38)m	(36) = = 0.33 × (	25)m x (5)	[	11.05	(3
Thermal mass For design assess Fan be used instea Thermal bridge Thermal bridge Total fabric hea Total fabric hea Total Jan	esments who ad of a det es : S (L al bridging a at loss at loss ca Feb	ere the decaded calcolors  x Y) calcolors are not known alculated Mar 40.77	tails of the ulation. culated u own (36) = monthly	constructions are constructed using Ap = 0.15 x (3)	ppendix I	t known pr	Aug	(33) + (38)m Sep 38.83	(36) = = 0.33 × (	25)m x (5) Nov 39.86	Dec	11.05	(3

Heat loss para	matar (l	41 D) \\//	m²K					(40)m	= (39)m ÷	- (A)			
(40)m= 1.13	1.13	1.13	1.11	1.11	1.1	1.1	1.1	1.1	1.11	1.12	1.12		
(40)111= 1.13	1.13	1.13	1.11	1.11	1.1	1.1	1.1			Sum(40) <sub>1</sub> .		1.11	(40)
Number of day	s in mo	nth (Tabl	le 1a)					,	Average =	3um(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)
		ļ							!	!			
4 \\/\ota_{\text{s}} \begin{array}{c} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	ing one		wa 100 a 10 ft									2011	
4. Water heat	ing ene	rgy requi	rement.								kWh/ye	al.	
Assumed 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 ( <sup>-</sup>	TFA -13		52		(42)
Annual average	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.02		(43)
not more that 125	litres per <sub>l</sub>	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	i litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 103.43	99.66	95.9	92.14	88.38	84.62	84.62	88.38	92.14	95.9	99.66	103.43		
F	la = 1 = 1 =			(lab	100 - 1/-/ -		T / 000/			m(44) <sub>112</sub> =		1128.28	(44)
Energy content of		used - cal		ontnly = 4.	190 x Va,r	n x nm x L		) KWN/mor	nth (see Ta		c, 1a)		
(45)m= 153.38	134.14	138.43	120.68	115.8	99.92	92.6	106.25	107.52	125.31	136.78	148.54		<b>_</b>
If instantaneous wa	ater heati	na at noint	of use (no	hot water	· storage)	enter () in	hoves (46		Total = Su	m(45) <sub>112</sub> =	- I	1479.35	(45)
									1 400	00.50	00.00		(46)
(46)m= 23.01 Water storage	20.12 loss:	20.76	18.1	17.37	14.99	13.89	15.94	16.13	18.8	20.52	22.28		(46)
Storage volume		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community he	, ,					_							, ,
Otherwise if no	•			•			` '	ers) ente	er '0' in (	(47)			
Water storage	loss:												
<ul><li>a) If manufacto</li></ul>	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost from	m water	storage	, kWh/ye	ear			(48) x (49)	) =			0		(50)
b) If manufactu			-										
Hot water stora	_			e 2 (KVVI	n/litre/da	ıy)					0		(51)
Volume factor f	•		311 4.3								0		(52)
Temperature fa			2b								0		(53)
Energy lost fro				ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (		•	, 100011/90	Jui			( , ( )	, ( <del></del> , (	,		0		(55)
Water storage	, ,	,	or each	month			((56)m = (	55) × (41):	m				, ,
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains		-		-							_	ix H	(00)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	e H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss				<u> </u>	È	<del></del>	<del></del>			1	1		1	
(61)m= 50.9	96 45.87	48.87	45.44	45.04	41.7	3 43.12	45.	04	45.44	48.87	49.15	50.96	]	(61)
	<del></del>		<del></del>	·			<del>`</del>	_		<u> </u>	<del>ì ´</del>	(57)m +	(59)m + (61)m	
(62)m= 204.	34 180.02	187.3	166.12	160.84	141.0	66 135.72	151	.29	152.96	174.18	185.93	199.5		(62)
Solar DHW inp										r contribu	tion to wate	er heating)		
(add addition	nal lines if	FGHRS	and/or \	WHRS	appl	es, see Ap	pend	) xib	3)				1	
(63)m= 0	0	0	0	0	0	0	C	)	0	0	0	0	]	(63)
Output from	water hea	ter											-	
(64)m= 204.	34 180.02	187.3	166.12	160.84	141.0	66 135.72	151	.29	152.96	174.18	185.93	199.5		7
								Outp	out from wa	ater heate	er (annual) <sub>1</sub>	112	2039.85	(64)
Heat gains	from water	heating,	kWh/m	onth 0.2	5 ´[0.	85 × (45)m	ı + (6	31)m	] + 0.8 x	([(46)m	+ (57)m	+ (59)m	[]	
(65)m= 63.7	(65)m= 63.74 56.07 58.24 51.49 49.76 43.66 41.57 46.59 47.11 53.88 57.77 62.13 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating													
include (5	57)m in cal	culation (	of (65)m	only if c	ylinde	r is in the	dwell	ling	or hot w	ater is f	rom com	munity h	neating	
5. Interna	l gains (see	e Table 5	and 5a	):										
Metabolic o	5. Internal gains (see Table 5 and 5a): etabolic gains (Table 5), Watts													
Ja		Mar	Apr	May	Ju	n Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m= 125.	94 125.94	125.94	125.94	125.94	125.	125.94	125	.94	125.94	125.94	125.94	125.94	1	(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L	or L9a), a	ılso s	ee -	Table 5	ı	•	•	•	
(67)m= 21.3	18.97	15.43	11.68	8.73	7.3	7.97	10.	35	13.9	17.65	20.6	21.96	]	(67)
Appliances	gains (calc	ulated ir	n Append	dix L, ea	uatior	L13 or L1	3a),	also	see Tal	ble 5			1	
(68)m= 225.	<del></del>	222.22	209.65	193.78	178.		166	_	172.47	185.04	200.9	215.82	]	(68)
Cooking ga	ins (calcula	ited in A	ppendix	L. eguat	tion L	 15 or L15a	). als	:0 SE	ee Table	5	1	1	1	
(69)m= 35.5	<del>`</del>	35.59	35.59	35.59	35.5		35.	_	35.59	35.59	35.59	35.59	]	(69)
Pumps and	fans gains	(Table !	 5а)		<u> </u>		<u> </u>						1	
(70)m= 3		3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g.	evanoratio	n (nega	<u> </u>	<u> </u>	ļ		<u> </u>				1		J	
	76 -100.76	-100.76	-100.76	-100.76	-100.	76 -100.76	-100	).76	-100.76	-100.76	-100.76	-100.76	1	(71)
Water heati			100.70	1000	1001		1 .00	0			1	1.000	J	,
(72)m= 85.6	<del> `</del>	78.29	71.51	66.89	60.6	4 55.87	62.	62	65.43	72.42	80.23	83.51	1	(72)
` '		<u> </u>	71.01	00.00	<u> </u>	66)m + (67)n				l		<u> </u>	l	()
<b>Total interi</b> (73)m= 396.	_ <del>_</del>	379.72	356.62	333.18	310.0		303	_	315.58	338.89	365.52	385.06	1	(73)
6. Solar ga		379.72	330.02	333.10	310.	290.55	303		313.30	330.09	303.32	363.00		(70)
	ire calculated	using sola	r flux from	Table 6a	and as	sociated equa	ations	to co	nvert to th	e applical	ble orientat	tion		
Orientation:		_	Area			Flux	2110110	.0 00	g_	о арриса	FF		Gains	
Onomation	Table 6d		m <sup>2</sup>			Γable 6a		Т	able 6b	Т	able 6c		(W)	
East 0.9	9x 1	x	4.9	22	х	19.64	1 x		0.63	x [	0.7		29.53	(76)
East 0.9	_	X	4.9		x	38.42	]		0.63	^     x	0.7		57.77	](76)
East 0.9		^			^ <u> </u>	63.27	] ^ ] x			_  ^ L   x [	0.7		95.14	](76) ](76)
East 0.9		^ ^			H		-	$\vdash$	0.63	_	0.7	=		](76)
					x	92.28	] X ] ,,	_	0.63	╡╞		=	138.75	╡
<b>⊑</b> ası ().	9x 1	X	4.9	92	X	113.09	X		0.63	X	0.7	=	170.05	(76)

East	0.9x	1		x	4.92		x 🗀	115.77	] <sub>x</sub>		0.63	7 x	0.7		174.07	(76)
East	0.9x	1		x	4.92	╡	`  -	110.22	」 ^ ] x		0.63	<b> </b>	0.7	<del>-</del> -	165.73	(76)
East	0.9x	<u>'</u> 1		x	4.92	=	` <u> </u>	94.68	」 ^ ] <sub>x</sub>		0.63	_ ^	0.7	╡ [	142.36	(76)
East	0.9x	<u>'</u> 1	$\equiv$	x	4.92	=	× 🗀	73.59	]		0.63	_ ^	0.7	= =	110.65	(76)
East	0.9x	<u>'</u> 1		x	4.92	=	x	45.59	]		0.63	_ ^	0.7	= =	68.55	(76)
East	0.9x	<u>'</u> 1	=	x	4.92	=	` <u> </u>	24.49	]		0.63	_ ^   _ x	0.7	= -	36.82	(76)
East	0.9x	<u>'</u> 1	=	x	4.92	=	× 🗀	16.15	]		0.63	_ ^	0.7	= =	24.29	(76)
West	0.9x	0.77		x	4.92	=	x	19.64	] x		0.63	x	0.7	= =	29.53	(80)
West	0.9x	0.77		x	2.39	=	x 📙	19.64	] ]		0.63	x	0.7	= =	14.35	(80)
West	0.9x	0.77		x	4.92	=	x $\vdash$	38.42	] ]		0.63	x	0.7	= =	57.77	(80)
West	0.9x	0.77		x	2.39	Ħ,	x $\vdash$	38.42	] ]		0.63	x	0.7	= =	28.06	(80)
West	0.9x	0.77		x	4.92	┪.	, <del> </del>	63.27	]   X		0.63	╡ × ˈ	0.7	= =	95.14	(80)
West	0.9x	0.77	$\equiv$	x	2.39	╡.	x $\vdash$	63.27	] ]		0.63	x	0.7	╡ -	46.22	(80)
West	0.9x	0.77		x	4.92	╡:	,	92.28	]   X		0.63	╡ × ˈ	0.7		138.75	(80)
West	0.9x	0.77		X	2.39	=	x 📙	92.28	]     x		0.63	╡ x	0.7		67.4	(80)
West	0.9x	0.77		x	4.92	╡:	, $\vdash$	113.09	] x		0.63	╡ × ˈ	0.7		170.05	(80)
West	0.9x	0.77		X	2.39	=	x 📙	113.09	] x		0.63	×	0.7		82.6	(80)
West	0.9x	0.77		x	4.92	=	x 🗀	115.77	] x		0.63	×	0.7		174.07	(80)
West	0.9x	0.77		x	2.39	Ħ,	x 📙	115.77	X		0.63	T x	0.7	<del>-</del>	84.56	(80)
West	0.9x	0.77		x	4.92	┪,	x 🗀	110.22	X		0.63	x	0.7	=	165.73	(80)
West	0.9x	0.77		x	2.39	=	× 🗀	110.22	X		0.63	×	0.7	<del>-</del>	80.51	(80)
West	0.9x	0.77		x	4.92	=	× 🗀	94.68	j×		0.63	×	0.7		142.36	(80)
West	0.9x	0.77		x	2.39	<b>=</b>	x 🔚	94.68	X		0.63	x	0.7		69.15	(80)
West	0.9x	0.77		x	4.92	<b>=</b>	x 🔚	73.59	X		0.63	x	0.7		110.65	(80)
West	0.9x	0.77		x	2.39	<b>=</b>	x 🔚	73.59	X		0.63	x	0.7	=	53.75	(80)
West	0.9x	0.77		x	4.92	<b>=</b>	x =	45.59	x		0.63	x	0.7	=	68.55	(80)
West	0.9x	0.77		x	2.39		x 🔚	45.59	x		0.63	x	0.7		33.3	(80)
West	0.9x	0.77		x	4.92		x 📃	24.49	x		0.63	x	0.7		36.82	(80)
West	0.9x	0.77		x	2.39		x _	24.49	X		0.63	x	0.7	=	17.89	(80)
West	0.9x	0.77		x	4.92		x	16.15	X		0.63	x	0.7	=	24.29	(80)
West	0.9x	0.77		x	2.39		x	16.15	X		0.63	x	0.7	=	11.8	(80)
									_							
				$\overline{}$	for each mo				<del></del>	$\overline{}$	um(74)m			1	7	
(83)m=	73.41	143.6	236.4		344.91 422		432.7		353	3.86	275.05	170.4	91.53	60.37	]	(83)
_				_	(84)m = $(73)$	<del>'</del>			T 0==		500.00	500.00	157.05	145.40	7	(0.4)
(84)m=	470	537.92	616.2	1	701.53 755	.88	743.3	708.49	657	7.19	590.63	509.29	457.05	445.43		(84)
					heating sea											
•		_			eriods in the		•		ble 9	, Th	1 (°C)				21	(85)
Utilisa		Ť		$\overline{}$	ving area, h	-	`	<del></del>	<del>.</del>				T		7	
(00)	Jan	Feb	Ma	-	<del> </del>	lay	Jur	_	+	ug	Sep	Oct	+	Dec	4	(86)
(86)m=	1	1	0.99		0.96 0.8		0.72		0.6		0.87	0.98	1	1	J	(00)
				-	ving area T	Ť		<del>i</del>	1				1		7	(07)
(87)m=	19.75	19.89	20.1	5	20.5 20.	.79	20.9	5 20.99	20.	.98	20.86	20.48	20.05	19.73	J	(87)

Tanananatura durina hastina nariada in matafakuallian faran Tahla O. Tho (90)		
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 19.97 19.98 19.98 19.99 19.99 20 20 20 20 19.99	19.99 19.	98 (88)
(88)m= 19.97 19.98 19.98 19.99 19.99 20 20 20 20 19.99	19.99 19.	98 (00)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		
(89)m= 1 1 0.99 0.95 0.84 0.64 0.44 0.49 0.8 0.97	1 1	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 18.3 18.51 18.89 19.39 19.78 19.97 20 20 19.88 19.37	18.75 18.	28 (90)
fLA = Living	area ÷ (4) =	0.42 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		<u></u>
(92)m= 18.9 19.09 19.41 19.85 20.2 20.37 20.41 20.41 20.29 19.83	19.29 18.	88 (92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		
(93)m= 18.9 19.09 19.41 19.85 20.2 20.37 20.41 20.41 20.29 19.83	19.29 18.	88 (93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76	6)m and re-	calculate
the utilisation factor for gains using Table 9a		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov D	ec
Utilisation factor for gains, hm:		
(94)m= 1 0.99 0.98 0.95 0.85 0.67 0.48 0.54 0.82 0.97	0.99 1	(94)
Useful gains, hmGm , W = (94)m x (84)m	-	(0-1)
	454.47 444	.47 (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 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]	4400 00 400	(07)
	1130.86 136	7.85 (97)
Change booting requirement for each month $L(M)$ (month $L(M)$ ) $L(M)$	١	
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)		00
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22	487 686	<del></del>
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22 Total per year (kWh/year)	487 686	12 = 3453.1 (98)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22	487 686	<del></del>
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22 Total per year (kWh/year)	487 686	12 = 3453.1 (98)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year) 3  Space heating requirement in kWh/m²/year  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating:	487 686	12 = 3453.1 (98) 41.56 (99)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year) 3  Space heating requirement in kWh/m²/year  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system	487 686	12 = 3453.1 (98)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year) 3  Space heating requirement in kWh/m²/year  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating:	487 686	12 = 3453.1 (98) 41.56 (99)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year) 3  Space heating requirement in kWh/m²/year  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system	487 686	0 (201)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year)  Space heating requirement in kWh/m²/year  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =	487 686	0 (201) 1 (202)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year) 3  Space heating requirement in kWh/m²/year  9a. Energy requirements — Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =  Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =  Efficiency of main space heating system 1	487 686	0 (201) 1 (202) 1 (204)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year) 3  Space heating requirement in kWh/m²/year  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =  Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %	487 686 = Sum(98) <sub>15,9</sub>	0 (201) 1 (202) 1 (204) 93.4 (206) 0 (208)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year) 3  Space heating requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =  Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct	487 686 = Sum(98) <sub>15,9</sub>	0 (201) 1 (202) 1 (204) 93.4 (206)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year):  Space heating requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =  Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct  Space heating requirement (calculated above)	487 686 = Sum(98) <sub>15,9</sub> Nov D	0 (201) 1 (202) 1 (204) 93.4 (206) 0 (208) ec kWh/year
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year):  Space heating requirement in kWh/m²/year  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =  Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct  Space heating requirement (calculated above)  674.11 535.78 448.69 250.43 103.89 0 0 0 0 0 266.22	487 686 = Sum(98) <sub>15,9</sub>	0 (201) 1 (202) 1 (204) 93.4 (206) 0 (208) ec kWh/year
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22 Total per year (kWh/year) space heating requirement in kWh/m²/year  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =  Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct  Space heating requirement (calculated above)  674.11 535.78 448.69 250.43 103.89 0 0 0 0 0 266.22  (211)m = {[(98)m x (204)] } x 100 ÷ (206)	487 686 = Sum(98) <sub>15,9.</sub> Nov D  487 686	0 (201) 1 (202) 1 (204) 93.4 (206) 0 (208) ec kWh/year
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22 Total per year (kWh/year) 3 Space heating requirement in kWh/m²/year  9a. Energy requirements — Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =  Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct  Space heating requirement (calculated above)  674.11 535.78 448.69 250.43 103.89 0 0 0 0 0 266.22  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  721.74 573.64 480.39 268.13 111.23 0 0 0 0 0 285.03	487 686 = Sum(98) <sub>15,9</sub> .  Nov D  487 686  521.41 735	0 (201) 1 (202) 1 (204) 93.4 (206) 0 (208) ec kWh/year  (211)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22 Total per year (kWh/year) Space heating requirement in kWh/m²/year  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 – (201) =  Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] =  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Space heating requirement (calculated above)  674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22 (211)m = {[(98)m x (204)] } x 100 ÷ (206)  721.74 573.64 480.39 268.13 111.23 0 0 0 0 285.03 Total (kWh/year) =Sum(21)	487 686 = Sum(98) <sub>15,9</sub> .  Nov D  487 686  521.41 735	0 (201) 1 (202) 1 (204) 93.4 (206) 0 (208) ec kWh/year
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22 Total per year (kWh/year)  Space heating requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 – (201) =  Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] =  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct  Space heating requirement (calculated above)  674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  721.74 573.64 480.39 268.13 111.23 0 0 0 0 285.03  Total (kWh/year) =Sum(21)	487 686 = Sum(98) <sub>15,9</sub> .  Nov D  487 686  521.41 735	0 (201) 1 (202) 1 (204) 93.4 (206) 0 (208) ec kWh/year  (211)
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22 Total per year (kWh/year) space heating requirement in kWh/m²/year  9a. Energy requirements — Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) = Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Space heating requirement (calculated above)  674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22 (211)m = {[(98)m x (204)] } x 100 ÷ (206)  721.74 573.64 480.39 268.13 111.23 0 0 0 0 0 285.03  Total (kWh/year) =Sum(21 Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)	Nov D 487 686 521.41 735 1) <sub>15,1012</sub> =	0 (201) 1 (202) 1 (204) 93.4 (206) 0 (208) ec kWh/year  99  (211) .54
(98)m= 674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  Total per year (kWh/year):  Space heating requirement in kWh/m²/year  9a. Energy requirements — Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =  Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Space heating requirement (calculated above)  674.11 535.78 448.69 250.43 103.89 0 0 0 0 266.22  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  721.74 573.64 480.39 268.13 111.23 0 0 0 0 285.03  Total (kWh/year) =Sum(21 Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)	Nov D  487 686  521.41 735  1) 15,1012  0 0	0 (201) 1 (202) 1 (204) 93.4 (206) 0 (208) ec kWh/year  99  (211) .54

Water heating								
Output from water heater (calculated above)  204.34   180.02   187.3   166.12   160.84   1	41.66 135.72	151.29	152.96	174.18	185.93	199.5		
Efficiency of water heater	·	<u> </u>		<u> </u>	l	<u> </u>	80.3	(216)
(217)m= 87.83 87.63 87.17 86.08 83.98	80.3 80.3	80.3	80.3	86.12	87.36	87.91		(217)
Fuel for water heating, kWh/month								
$(219)$ m = $(64)$ m x $100 \div (217)$ m (219)m= $232.65$ $205.43$ $214.86$ $192.98$ $191.51$ $1$	76.41 169.01	188.41	190.49	202.26	212.83	226.93		
		Tota	I = Sum(2	19a) <sub>112</sub> =	<u>I</u>	ļ.	2403.78	(219)
Annual totals				k'	Wh/year	•	kWh/year	-
Space heating fuel used, main system 1							3697.11	]
Water heating fuel used							2403.78	]
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							377.27	(232)
12a. CO2 emissions – Individual heating system	s including m	icro-CHP	ı					
	<b>Energy</b> kWh/year			Emiss kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	798.58	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	519.22	(264)
Space and water heating	(261) + (262)	+ (263) + (	264) =				1317.79	(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	=	195.8	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		1552.52	(272)

TER =

(273)

18.68

		User Details:					
Accesses Noves			N	.h.a.u.	CTDO	022002	
Assessor Name: Software Name:	Joseph Treanor Stroma FSAP 2012		na Num vare Ve			032062 n: 1.0.4.14	
Contware Hame:		operty Address		131011.	V 01010	11. 1.0.1.1	
Address :	, Gondar Gardens, London, N						
1. Overall dwelling dimer							
		Area(m²)		Av. Height	(m)	Volume(m³	)
Ground floor		88.81	(1a) x	2.55	(2a) =	226.47	(3a)
First floor		64.98	(1b) x	3	(2b) =	194.94	(3b)
Second floor		42.74	(1c) x	3	(2c) =	128.22	(3c)
Third floor		31.59	(1d) x	3	(2d) =	94.77	(3d)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1e)+(1n)	228.12	(4)				_
Dwelling volume			(3a)+(3b	)+(3c)+(3d)+(3e	e)+(3n) =	644.4	(5)
2. Ventilation rate:							
	main secondary heating heating	other		total		m³ per hou	r
Number of chimneys		+ 0	= [	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	<b>=</b> [	0	x 20 =	0	(6b)
Number of intermittent fan	s		_ [	4	x 10 =	40	(7a)
Number of passive vents			Ī	0	x 10 =	0	(7b)
Number of flueless gas fire	es		Ī	0	x 40 =	0	(7c)
					Δir ch	anges per ho	r
Infiltration due to chimney	o fluor and fano (62)+(6b)+(72	\_(7b\_(7c) =	Г				_
•	s, flues and fans = $(6a)+(6b)+(7a)$ en carried out or is intended, proceed		continue f	40 rom (9) to (16)	÷ (5) =	0.06	(8)
Number of storeys in the		( /,		(5) ( . 5)		0	(9)
Additional infiltration					[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timber frame or 0	).35 for masor	ry const	ruction	İ	0	(11)
	esent, use the value corresponding to the	he greater wall ar	ea (after		•		
deducting areas of opening	oor, enter 0.2 (unsealed) or 0.1	(sealed) else	e enter 0		ſ	0	(12)
If no draught lobby, enter	· · ·	(000,000), 0.00	, o			0	(13)
•	and doors draught stripped					0	(14)
Window infiltration		0.25 - [0.	2 x (14) ÷ 1	100] =		0	(15)
Infiltration rate		(8) + (10	) + (11) + (	12) + (13) + (15)	) =	0	(16)
Air permeability value, o	50, expressed in cubic metres	per hour per	square m	etre of enve	lope area	5	(17)
•	y value, then (18) = [(17) ÷ 20]+(8).		•			0.31	(18)
Air permeability value applies	if a pressurisation test has been done	or a degree air p	ermeability	is being used	<u> </u>		<b></b> `
Number of sides sheltered	1					2	(19)
Shelter factor		(20) = 1	- [0.075 x (	19)] =		0.85	(20)
Infiltration rate incorporation	ng shelter factor	(21) = (1	8) x (20) =			0.27	(21)
Infiltration rate modified fo	r monthly wind speed						

Jul

Sep

Aug

Oct

Nov

Dec

Mar

Apr

May

Jun

Feb

Jan

Monthl	y avera	ge wind	speed fr	om Tab	le 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 F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Δdinet	ad infiltr	ation rat	e (allowi	na for el	haltar an	d wind s	need) -	· (21a) v	(22a)m		-		-	
Aujusti	0.34	0.33	0.32	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31	1	
	ate effe	ctive air	change .			l			<u> </u>					_
		al ventila		anadan Ni (6	201-) (00-			N/5/\\ - (l		(00-)			0	(23a)
			using Appe							o) = (23a)			0	(23b)
			overy: effic	-	_					2h\m . (	22h) v [	1 – (23c)	0	(23c)
(24a)m=	0			0	0	0	0	1 (24)	$\frac{a)(1) = (2)}{0}$	0	230) <b>x</b> [	0	]	(24a)
			<u> </u>		<u> </u>		<u> </u>			2b)m + (			J	` ,
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If	whole h	ouse ex	tract ver	ntilation o	or positiv	re input	ventilatio	on from	outside	·!			J	
i	f (22b)n	n < 0.5 >	< (23b), t	hen (24	c) = (23k	o); other	wise (24	c) = (22	b) m + 0	.5 × (23b	o)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,			on or wh		•	•				0.51				
(24d)m=		0.55	en (24d) 0.55	0.54	0.54	0.53	0.53	0.5 + [(2	0.54	0.51	0.54	0.55	1	(24d)
` '		<u> </u>	rate - er	<u> </u>	l	l	<u> </u>	L	L	1 -	1	1	J	, ,
(25)m=	0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55	]	(25)
2 ∐0	at losso	c and h	eat loss	aramat	or:	l .							J	
ELEN		Gros		Openir		Net Ar	ea	U-val	ue	AXU		k-value	e AX	. k
		area			1 <sup>2</sup>	A ,r		W/m2		(W/		kJ/m²-l		
Windo	ws Type	<del>2</del> 1				1.36	x1	/[1/( 1.4 )+	- 0.04] =	1.8				(27)
Windo	ws Type	2				2.79	x1	/[1/( 1.4 )+	+ 0.04] =	3.7				(27)
Windo	ws Type	3				2.88	х1	/[1/( 1.4 )+	+ 0.04] =	3.82				(27)
Windo	ws Type	<del>2</del> 4				1.26	x1	/[1/( 1.4 )+	- 0.04] =	1.67				(27)
Windo	ws Type	<del>2</del> 5				1.3	x1	/[1/( 1.4 )+	- 0.04] =	1.72				(27)
Windo	ws Type	6				2.68	x1	/[1/( 1.4 )+	- 0.04] =	3.55				(27)
Windo	ws Type	<del>2</del> 7				2.88	x1	/[1/( 1.4 )+	- 0.04] =	3.82				(27)
Windo	ws Type	8 e				1.21	x1	/[1/( 1.4 )+	- 0.04] =	1.6				(27)
Windo	ws Type	9				2.06	x1	/[1/( 1.4 )+	- 0.04] =	2.73				(27)
Windo	ws Type	10				2.68	x1	/[1/( 1.4 )+	- 0.04] =	3.55				(27)
Windo	ws Type	11				2.7	x1	/[1/( 1.4 )+	+ 0.04] =	3.58				(27)
Windo	ws Type	12				2.87	x1	/[1/( 1.4 )+	+ 0.04] =	3.8				(27)
Windo	ws Type	13				2.72	<sub>X</sub> 1	/[1/( 1.4 )+	- 0.04] =	3.61				(27)
Windo	ws Type	e 14				4.98	<sub>X</sub> 1	/[1/( 1.4 )+	0.04] =	6.6				(27)

			gg				
Windows Type 15	1.28 x1	/[1/( 1.4 )+ 0.0	04] = 1.7				(27)
Windows Type 16	2.09 x1	/[1/( 1.4 )+ 0.0	04] = 2.77	=			(27)
Windows Type 17	2.8 x1	/[1/( 1.4 )+ 0.0	04] = 3.71	=			(27)
Floor	88.81 X	0.13	= 11.545	<u></u>		7	(28)
Walls 321.77 57.01	264.76 X	0.18	= 47.66	T F		<u> </u>	(29)
Roof Type1 23.96 0	23.96 X	0.13	= 3.11	T F		<u> </u>	(30)
Roof Type2 22.13 0	22.13 X	0.13	= 2.88	T F		<u> </u>	(30)
Roof Type3 9.98 0	9.98 X	0.13	= 1.3			7	(30)
Roof Type4 31.59 0	31.59 X	0.13	= 4.11				(30)
Total area of elements, m <sup>2</sup>	498.24						<del></del> (31)
Party wall	65.06 ×	0	= 0				(32)
* for windows and roof windows, use effective window U-va	_	g formula 1/[(1/	//U-value)+0.04] a	as given in p	oaragraph	3.2	_
** include the areas on both sides of internal walls and pan Fabric heat loss, W/K = S (A x U)	titions	(26)(30) + (	(32) =		ĺ	440.40	7(22)
Heat capacity $Cm = S(A \times k)$			((28)(30) + (32)	2) + (32a)	(32e) =	146.18	(33)
Thermal mass parameter (TMP = $Cm \div TFA$ ) in	n kJ/m²K		Indicative Value		.(020) =	29371.34 250	](35)
For design assessments where the details of the construct					l ble 1f	230	_(00)
can be used instead of a detailed calculation.							_
Thermal bridges: S (L x Y) calculated using Ap	•					47.66	(36)
if details of thermal bridging are not known (36) = $0.15 \times (3)$ Total fabric heat loss	1)		(33) + (36) =		i	193.84	(37)
Ventilation heat loss calculated monthly			$(38)$ m = $0.33 \times ($	(25)m x (5)		100.04	
Jan Feb Mar Apr May	Jun Jul	Aug	Sep Oct	Nov	Dec		
(38)m= 118.49 118.02 117.55 115.38 114.97	113.08 113.08	112.73	13.81 114.97	115.79	116.65		(38)
Heat transfer coefficient, W/K			(39)m = (37) + (	38)m			
(39)m= 312.33 311.86 311.39 309.22 308.81	306.92 306.92	306.57 30	308.81	309.64	310.5		_
Heat loss parameter (HLD) W/m2/				Sum(39) <sub>1</sub>	<sub>12</sub> /12=	309.22	(39)
Heat loss parameter (HLP), W/m²K  (40)m= 1.37 1.37 1.37 1.36 1.35	1.35 1.35		(40)m = (39)m ÷ 1.35 1.35	1.36	1.36		
(40)112 1.07 1.07 1.00 1.00	1.00	1.04		Sum(40) <sub>1</sub>		1.36	(40)
Number of days in month (Table 1a)							<b>_</b> ' '
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 heating energy requirement:					kWh/ye	ear:	
Assumed occupancy, N				3.0	)4		(42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.0003	349 x (TFA -13.9	)2)] + 0.001	13 x (TFA -13	.9)		l	
if TFA £ 13.9, N = 1  Annual average hot water usage in litres per da	av Vd.average =	(25 x N) + 3	36	106	36		(43)
Reduce the annual average hot water usage by 5% if the o	lwelling is designed						· -/
not more that 125 litres per person per day (all water use, l	·	<del> </del>	<u> </u>				
Jan Feb Mar Apr May  Hot water usage in litres per day for each month Vd,m = fa	Jun Jul		Sep Oct	Nov	Dec		
(44)m= 117 112.75 108.49 104.24 99.98	95.73 95.73	· <i>·</i>	04.24 108.49	112.75	117		
( <del>)  -</del>	1 33.13	1 00.90   10	UT.27   100.49	1 112.73	1.17	1	

1276.37

Total =  $Sum(44)_{1...12}$  =

(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) 173.51 151.75 156.59 136.52 113.04 104.75 120.2 121.64 141.75 154.74 168.03 (45)m =Total =  $Sum(45)_{1...12}$  = 1673.52 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)26.03 22.76 23.49 20.48 19.65 16.96 15.71 18.25 21.26 23.21 25.21 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): (48)1.7 Temperature factor from Table 2b 0.54 (49)Energy lost from water storage, kWh/year  $(48) \times (49) =$ 0.92 (50)b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) (51)0 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  $(47) \times (51) \times (52) \times (53) =$ (54)0 Enter (50) or (54) in (55) 0.92 (55)Water storage loss calculated for each month  $((56)m = (55) \times (41)m$ 28.48 25.73 28.48 27.57 28.48 27.57 28.48 28.48 27.57 28.48 27.57 28.48 (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 28.48 25.73 28.48 27.57 28.48 27.57 28.48 28.48 27.57 28.48 27.57 28.48 (57)(57)m =(58)Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58)  $\div$  365 x (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)(59)m =23.26 21.01 23.26 23.26 22.51 23.26 23.26 22.51 23.26 22.51 23.26 Combi loss calculated for each month (61)m = (60)  $\div$  365 x (41)m 0 0 0 0 0 0 (61)(61)m =0 0 Total heat required for water heating calculated for each month  $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$ 225.25 198.49 208.34 171.95 171.71 193.5 (62)186.6 182.74 163.12 156.49 204.81 219.78 (62)m =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)(63)m =0 0 0 0 0 0 0 Output from water heater 225.25 198.49 163.12 (64)m =208.34 186.6 182.74 156.49 171.95 171.71 193.5 204.81 219.78 (64)Output from water heater (annual) 1...12 2282.79 Heat gains from water heating, kWh/month  $0.25 (0.85 \times (45)) + (61) + 0.8 \times ((46)) + (57) + (59) +$ 81.36 (65)(65)m =99.09 93.46 85.46 84.95 77.65 76.23 80.51 88.53 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=	151.92	151.92	151.92	151.92	151.92	151.92	151.92	151.92	151.92	151.92	151.92	151.92		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equati	ion L9 o	r L9a), a	lso see	Table 5				_	
(67)m=	35.4	31.44	25.57	19.36	14.47	12.22	13.2	17.16	23.03	29.24	34.13	36.38		(67)
Appliar	nces gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Tal	ole 5			_	
(68)m=	397.04	401.16	390.78	368.68	340.78	314.55	297.04	292.92	303.3	325.4	353.3	379.53		(68)
Cookin	g gains	(calcula	ted in Ap	ppendix	L, equat	ion L15	or L15a)	, also se	ee Table	5			_	
(69)m=	38.19	38.19	38.19	38.19	38.19	38.19	38.19	38.19	38.19	38.19	38.19	38.19		(69)
Pumps	and far	ns gains	(Table 5	āa)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)							_	
(71)m=	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54		(71)
Water	heating	gains (T	able 5)											
(72)m=	133.18	130.73	125.62	118.69	114.18	107.84	102.45	109.36	111.81	118.99	127.1	130.74		(72)
Total i	nternal	gains =		·		(66)	m + (67)m	+ (68)m +	+ (69)m + (	70)m + (7	1)m + (72)	m		
(73)m=	637.2	634.91	613.55	578.3	541.01	506.19	484.27	491.01	509.72	545.21	586.11	618.22		(73)
6. Sol	ar gains	8:												

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)	
East	0.9x	1	x	4.98	x	19.64	x	0.63	x	0.7	=	29.89	(76)
East	0.9x	4	x	1.28	x	19.64	x	0.63	x	0.7	=	30.73	(76)
East	0.9x	2	x	2.09	X	19.64	X	0.63	x	0.7	=	25.09	(76)
East	0.9x	1	x	2.8	X	19.64	x	0.63	x	0.7	=	16.81	(76)
East	0.9x	1	x	4.98	x	38.42	x	0.63	x	0.7	=	58.47	(76)
East	0.9x	4	x	1.28	x	38.42	x	0.63	x	0.7	=	60.12	(76)
East	0.9x	2	x	2.09	x	38.42	x	0.63	x	0.7	=	49.08	(76)
East	0.9x	1	x	2.8	x	38.42	x	0.63	x	0.7	=	32.88	(76)
East	0.9x	1	x	4.98	x	63.27	x	0.63	x	0.7	=	96.3	(76)
East	0.9x	4	x	1.28	x	63.27	x	0.63	x	0.7	=	99.01	(76)
East	0.9x	2	x	2.09	x	63.27	x	0.63	x	0.7	=	80.83	(76)
East	0.9x	1	x	2.8	x	63.27	x	0.63	x	0.7	=	54.14	(76)
East	0.9x	1	x	4.98	x	92.28	x	0.63	x	0.7	=	140.45	(76)
East	0.9x	4	x	1.28	x	92.28	x	0.63	x	0.7	=	144.39	(76)
East	0.9x	2	x	2.09	x	92.28	x	0.63	x	0.7	=	117.88	(76)
East	0.9x	1	x	2.8	x	92.28	x	0.63	x	0.7	=	78.97	(76)
East	0.9x	1	x	4.98	x	113.09	x	0.63	x	0.7	=	172.12	(76)
East	0.9x	4	x	1.28	x	113.09	x	0.63	x	0.7	=	176.96	(76)
East	0.9x	2	x	2.09	X	113.09	x	0.63	x	0.7	=	144.47	(76)
East	0.9x	1	x	2.8	x	113.09	x	0.63	x	0.7	=	96.78	(76)
East	0.9x	1	x	4.98	x	115.77	x	0.63	X	0.7	=	176.2	(76)

East				_		_		_				_		_
East 0.0x 1 x 2.8 x 1115.77 x 0.063 x 0.7 = 99.07 (%)  East 0.0x 4 x 1.28 x 1110.22 x 0.63 x 0.7 = 1167.75 (%)  East 0.0x 4 x 1.28 x 1110.22 x 0.63 x 0.7 = 1167.75 (%)  East 0.0x 4 x 1.28 x 1110.22 x 0.63 x 0.7 = 1167.75 (%)  East 0.0x 2 x 2.08 x 1110.22 x 0.63 x 0.7 = 140.8 (%)  East 0.0x 1 x 2.8 x 1110.22 x 0.63 x 0.7 = 140.8 (%)  East 0.0x 1 x 2.8 x 1110.22 x 0.63 x 0.7 = 140.8 (%)  East 0.0x 4 x 1.28 x 94.68 x 0.63 x 0.7 = 144.09 (%)  East 0.0x 4 x 1.28 x 94.68 x 0.63 x 0.7 = 144.09 (%)  East 0.0x 1 x 2.8 x 94.68 x 0.63 x 0.7 = 144.09 (%)  East 0.0x 1 x 2.8 x 94.68 x 0.63 x 0.7 = 144.09 (%)  East 0.0x 1 x 2.8 x 94.68 x 0.63 x 0.7 = 144.09 (%)  East 0.0x 1 x 2.8 x 94.68 x 0.63 x 0.7 = 144.09 (%)  East 0.0x 1 x 2.8 x 94.68 x 0.63 x 0.7 = 144.09 (%)  East 0.0x 1 x 2.8 x 73.59 x 0.63 x 0.7 = 144.09 (%)  East 0.0x 1 x 2.8 x 73.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 1.28 x 73.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 1.28 x 73.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 1.28 x 73.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 1.28 x 73.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 1.28 x 73.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 2.2 x 2.00 x 73.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 1 x 2.8 x 73.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 1 x 2.8 x 2.0 x 73.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 1.28 x 4.45.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 1.28 x 4.45.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 1.28 x 4.45.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 2.2 x 2.00 x 4.45.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 2.2 x 2.00 x 4.45.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 4 x 2.2 x 2.00 x 4.45.59 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 1 x 2.2 x 2.00 x 2.449 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 1 x 2.2 x 2.00 x 2.449 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 1 x 2.2 x 2.00 x 2.449 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 1 x 2.2 x 2.00 x 2.449 x 0.63 x 0.7 = 141.02 (%)  East 0.0x 0.7 x 2.2 x 2.0 x 1.10 (%)  East 0.0x 0.7 x 2.2 x 2.0 x 1.10 (%)  East 0.0x 0.7 x 2.2 x 2.0 x 1.10 (%)  East 0.0x 0.7 x 2.2 x 2.0 x	East	0.9x	4	X	1.28	X	115.77	X	0.63	X	0.7	=	181.15	(76)
East	East	0.9x	2	X	2.09	X	115.77	x	0.63	X	0.7	=	147.89	(76)
Fig.   Section   Continue   Co	East	0.9x	1	X	2.8	X	115.77	X	0.63	X	0.7	=	99.07	(76)
Fig.   Color   Colo	East	0.9x	1	X	4.98	X	110.22	x	0.63	X	0.7	=	167.75	(76)
East	East	0.9x	4	X	1.28	X	110.22	x	0.63	X	0.7	=	172.46	(76)
East	East	0.9x	2	X	2.09	X	110.22	X	0.63	X	0.7	=	140.8	(76)
East	East	0.9x	1	x	2.8	X	110.22	x	0.63	X	0.7	=	94.32	(76)
East	East	0.9x	1	X	4.98	X	94.68	x	0.63	X	0.7	=	144.09	(76)
East	East	0.9x	4	X	1.28	X	94.68	X	0.63	x	0.7	=	148.14	(76)
East	East	0.9x	2	X	2.09	X	94.68	X	0.63	X	0.7	=	120.94	(76)
East	East	0.9x	1	X	2.8	X	94.68	x	0.63	x	0.7	=	81.02	(76)
East	East	0.9x	1	X	4.98	X	73.59	X	0.63	x	0.7	=	112	(76)
East	East	0.9x	4	x	1.28	X	73.59	x	0.63	X	0.7	=	115.15	(76)
East	East	0.9x	2	X	2.09	X	73.59	X	0.63	X	0.7	=	94.01	(76)
East	East	0.9x	1	X	2.8	X	73.59	X	0.63	x	0.7	=	62.97	(76)
East 0.9x 2 x 2.09 x 45.59 x 0.63 x 0.7 = 58.24 769  East 0.9x 1 x 4.98 x 24.49 x 0.63 x 0.7 = 39.01 769  East 0.9x 1 x 4.98 x 24.49 x 0.63 x 0.7 = 37.77 769  East 0.9x 2 x 2.09 x 24.49 x 0.63 x 0.7 = 38.32 76  East 0.9x 1 x 2.8 x 24.49 x 0.63 x 0.7 = 38.32 76  East 0.9x 1 x 2.8 x 24.49 x 0.63 x 0.7 = 31.28 76  East 0.9x 1 x 2.8 x 24.49 x 0.63 x 0.7 = 31.28 76  East 0.9x 1 x 4.98 x 16.15 x 0.63 x 0.7 = 20.96 76  East 0.9x 1 x 4.98 x 16.15 x 0.63 x 0.7 = 24.58 76  East 0.9x 1 x 2.8 x 16.15 x 0.63 x 0.7 = 25.27 769  East 0.9x 1 x 2.8 x 16.15 x 0.63 x 0.7 = 25.27 769  East 0.9x 2 x 2.09 x 16.15 x 0.63 x 0.7 = 25.27 769  East 0.9x 1 x 2.8 x 16.15 x 0.63 x 0.7 = 25.27 769  East 0.9x 2 x 2.09 x 16.15 x 0.63 x 0.7 = 30.59 779  Southeast 0.9x 0.77 x 2.72 x 36.79 x 0.63 x 0.7 = 30.59 777  Southeast 0.9x 0.77 x 2.72 x 86.75 x 0.63 x 0.7 = 71.28 771  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.33 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 94.69 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 57.58 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 57.58 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 57.58 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 57.58 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 57.58 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 57.58 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 57.58 777  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 57.58 777	East	0.9x	1	X	4.98	X	45.59	x	0.63	X	0.7	=	69.38	(76)
East	East	0.9x	4	X	1.28	X	45.59	x	0.63	X	0.7	=	71.34	(76)
East 0.9x 1	East	0.9x	2	X	2.09	X	45.59	X	0.63	x	0.7	=	58.24	(76)
East	East	0.9x	1	X	2.8	X	45.59	X	0.63	x	0.7	=	39.01	(76)
East	East	0.9x	1	X	4.98	X	24.49	X	0.63	X	0.7	=	37.27	(76)
East	East	0.9x	4	X	1.28	X	24.49	X	0.63	x	0.7	=	38.32	(76)
East 0.9x 1 x 4.98 x 16.15 x 0.63 x 0.7 = 24.58 (76)  East 0.9x 4 x 1.28 x 16.15 x 0.63 x 0.7 = 25.27 (76)  East 0.9x 2 x 2.09 x 16.15 x 0.63 x 0.7 = 20.63 (76)  East 0.9x 1 x 2.8 x 16.15 x 0.63 x 0.7 = 20.63 (76)  East 0.9x 1 x 2.8 x 16.15 x 0.63 x 0.7 = 20.63 (76)  Southeast 0.9x 0.77 x 2.72 x 36.79 x 0.63 x 0.7 = 30.59 (77)  Southeast 0.9x 0.77 x 2.72 x 85.75 x 0.63 x 0.7 = 52.1 (77)  Southeast 0.9x 0.77 x 2.72 x 106.25 x 0.63 x 0.7 = 71.28 (77)  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 88.32 (77)  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 (77)  Southeast 0.9x 0.77 x 2.72 x 118.15 x 0.63 x 0.7 = 98.93 (77)  Southeast 0.9x 0.77 x 2.72 x 118.15 x 0.63 x 0.7 = 98.21 (77)  Southeast 0.9x 0.77 x 2.72 x 113.91 x 0.63 x 0.7 = 94.69 (77)  Southeast 0.9x 0.77 x 2.72 x 113.91 x 0.63 x 0.7 = 94.69 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 94.69 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 94.69 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 77.18 (77)  Southeast 0.9x 0.77 x 2.72 x 69.27 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 44.07 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 44.07 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 44.07 x 0.63 x 0.7 = 57.58 (77)	East	0.9x	2	X	2.09	X	24.49	X	0.63	X	0.7	=	31.28	(76)
East 0.9x 4 x 1.28 x 16.15 x 0.63 x 0.7 = 25.27 (76)  East 0.9x 2 x 2.09 x 16.15 x 0.63 x 0.7 = 20.63 (76)  East 0.9x 1 x 2.8 x 16.15 x 0.63 x 0.7 = 20.63 (76)  Southeast 0.9x 0.77 x 2.72 x 36.79 x 0.63 x 0.7 = 30.59 (77)  Southeast 0.9x 0.77 x 2.72 x 62.67 x 0.63 x 0.7 = 52.1 (77)  Southeast 0.9x 0.77 x 2.72 x 85.75 x 0.63 x 0.7 = 52.1 (77)  Southeast 0.9x 0.77 x 2.72 x 106.25 x 0.63 x 0.7 = 71.28 (77)  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 88.32 (77)  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 (77)  Southeast 0.9x 0.77 x 2.72 x 118.15 x 0.63 x 0.7 = 98.21 (77)  Southeast 0.9x 0.77 x 2.72 x 113.91 x 0.63 x 0.7 = 94.69 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 94.69 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 86.78 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 77.18 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 57.58 (77)	East	0.9x	1	X	2.8	X	24.49	X	0.63	X	0.7	=	20.96	(76)
East 0.9x 2 x 2.09 x 16.15 x 0.63 x 0.7 = 20.63 (76)  East 0.9x 1 x 2.8 x 16.15 x 0.63 x 0.7 = 13.82 (76)  Southeast 0.9x 0.77 x 2.72 x 36.79 x 0.63 x 0.7 = 30.59 (77)  Southeast 0.9x 0.77 x 2.72 x 85.75 x 0.63 x 0.7 = 52.1 (77)  Southeast 0.9x 0.77 x 2.72 x 106.25 x 0.63 x 0.7 = 71.28 (77)  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 88.32 (77)  Southeast 0.9x 0.77 x 2.72 x 118.15 x 0.63 x 0.7 = 98.93 (77)  Southeast 0.9x 0.77 x 2.72 x 118.15 x 0.63 x 0.7 = 98.91 (77)  Southeast 0.9x 0.77 x 2.72 x 113.91 x 0.63 x 0.7 = 94.69 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 86.78 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 86.78 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 77.18 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 77.18 (77)  Southeast 0.9x 0.77 x 2.72 x 92.85 x 0.63 x 0.7 = 77.18 (77)  Southeast 0.9x 0.77 x 2.72 x 69.27 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 444.07 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 31.49 x 0.63 x 0.7 = 26.17 (77)  Southeast 0.9x 0.77 x 2.72 x 31.49 x 0.63 x 0.7 = 26.17 (77)  Southeast 0.9x 0.77 x 2.72 x 31.49 x 0.63 x 0.7 = 26.17 (77)	East	0.9x	1	X	4.98	X	16.15	x	0.63	X	0.7	=	24.58	(76)
East 0.9x 1 x 2.8 x 16.15 x 0.63 x 0.7 = 13.82 (76)  Southeast 0.9x 0.77 x 2.72 x 36.79 x 0.63 x 0.7 = 30.59 (77)  Southeast 0.9x 0.77 x 2.72 x 62.67 x 0.63 x 0.7 = 52.1 (77)  Southeast 0.9x 0.77 x 2.72 x 62.67 x 0.63 x 0.7 = 71.28 (77)  Southeast 0.9x 0.77 x 2.72 x 106.25 x 0.63 x 0.7 = 88.32 (77)  Southeast 0.9x 0.77 x 2.72 x 119.01 x 0.63 x 0.7 = 98.93 (77)  Southeast 0.9x 0.77 x 2.72 x 118.15 x 0.63 x 0.7 = 98.21 (77)  Southeast 0.9x 0.77 x 2.72 x 113.91 x 0.63 x 0.7 = 98.21 (77)  Southeast 0.9x 0.77 x 2.72 x 113.91 x 0.63 x 0.7 = 94.69 (77)  Southeast 0.9x 0.77 x 2.72 x 114.39 x 0.63 x 0.7 = 94.69 (77)  Southeast 0.9x 0.77 x 2.72 x 104.39 x 0.63 x 0.7 = 77.18 (77)  Southeast 0.9x 0.77 x 2.72 x 69.27 x 0.63 x 0.7 = 77.18 (77)  Southeast 0.9x 0.77 x 2.72 x 69.27 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 69.27 x 0.63 x 0.7 = 57.58 (77)  Southeast 0.9x 0.77 x 2.72 x 44.07 x 0.63 x 0.7 = 36.63 (77)  Southeast 0.9x 0.77 x 2.72 x 44.07 x 0.63 x 0.7 = 26.17 (77)  Southeast 0.9x 0.77 x 2.72 x 44.07 x 0.63 x 0.7 = 26.17 (77)  Southeast 0.9x 0.77 x 2.72 x 44.07 x 0.63 x 0.7 = 26.17 (77)  Southeast 0.9x 0.77 x 2.72 x 44.07 x 0.63 x 0.7 = 26.17 (77)	East	0.9x	4	X	1.28	X	16.15	X	0.63	X	0.7	=	25.27	(76)
Southeast 0.9x         0.77         x         2.72         x         36.79         x         0.63         x         0.7         =         30.59         (77)           Southeast 0.9x         0.77         x         2.72         x         62.67         x         0.63         x         0.7         =         52.1         (77)           Southeast 0.9x         0.77         x         2.72         x         85.75         x         0.63         x         0.7         =         71.28         (77)           Southeast 0.9x         0.77         x         2.72         x         119.01         x         0.63         x         0.7         =         88.32         (77)           Southeast 0.9x         0.77         x         2.72         x         119.01         x         0.63         x         0.7         =         98.93         (77)           Southeast 0.9x         0.77         x         2.72         x         113.91         x         0.63         x         0.7         =         98.21         (77)           Southeast 0.9x         0.77         x         2.72         x         104.39         x         0.63         x         0.7	East	0.9x	2	X	2.09	X	16.15	X	0.63	X	0.7	=	20.63	(76)
Southeast 0.9x         0.77         x         2.72         x         62.67         x         0.63         x         0.7         =         52.1         (77)           Southeast 0.9x         0.77         x         2.72         x         85.75         x         0.63         x         0.7         =         71.28         (77)           Southeast 0.9x         0.77         x         2.72         x         119.01         x         0.63         x         0.7         =         88.32         (77)           Southeast 0.9x         0.77         x         2.72         x         119.01         x         0.63         x         0.7         =         98.93         (77)           Southeast 0.9x         0.77         x         2.72         x         113.91         x         0.63         x         0.7         =         98.93         (77)           Southeast 0.9x         0.77         x         2.72         x         113.91         x         0.63         x         0.7         =         94.69         (77)           Southeast 0.9x         0.77         x         2.72         x         104.39         x         0.63         x         0.7	East	0.9x	1	X	2.8	X	16.15	x	0.63	X	0.7	=	13.82	(76)
Southeast 0.9x         0.77         x         2.72         x         85.75         x         0.63         x         0.7         =         71.28         (77)           Southeast 0.9x         0.77         x         2.72         x         106.25         x         0.63         x         0.7         =         88.32         (77)           Southeast 0.9x         0.77         x         2.72         x         119.01         x         0.63         x         0.7         =         98.93         (77)           Southeast 0.9x         0.77         x         2.72         x         118.15         x         0.63         x         0.7         =         98.93         (77)           Southeast 0.9x         0.77         x         2.72         x         113.91         x         0.63         x         0.7         =         94.69         (77)           Southeast 0.9x         0.77         x         2.72         x         104.39         x         0.63         x         0.7         =         94.69         (77)           Southeast 0.9x         0.77         x         2.72         x         92.85         x         0.63         x         0.7	Southeas	st <sub>0.9x</sub>	0.77	X	2.72	X	36.79	x	0.63	X	0.7	=	30.59	(77)
Southeast 0.9x       0.77       x       2.72       x       106.25       x       0.63       x       0.7       =       88.32       (77)         Southeast 0.9x       0.77       x       2.72       x       119.01       x       0.63       x       0.7       =       98.93       (77)         Southeast 0.9x       0.77       x       2.72       x       118.15       x       0.63       x       0.7       =       98.21       (77)         Southeast 0.9x       0.77       x       2.72       x       113.91       x       0.63       x       0.7       =       94.69       (77)         Southeast 0.9x       0.77       x       2.72       x       104.39       x       0.63       x       0.7       =       94.69       (77)         Southeast 0.9x       0.77       x       2.72       x       92.85       x       0.63       x       0.7       =       77.18       (77)         Southeast 0.9x       0.77       x       2.72       x       44.07       x       0.63       x       0.7       =       57.58       (77)         Southeast 0.9x       0.77       x       2.72 <t< td=""><td>Southeas</td><td>st <sub>0.9x</sub></td><td>0.77</td><td>X</td><td>2.72</td><td>X</td><td>62.67</td><td>X</td><td>0.63</td><td>X</td><td>0.7</td><td>=</td><td>52.1</td><td>(77)</td></t<>	Southeas	st <sub>0.9x</sub>	0.77	X	2.72	X	62.67	X	0.63	X	0.7	=	52.1	(77)
Southeast 0.9x       0.77       x       2.72       x       119.01       x       0.63       x       0.7       =       98.93       (77)         Southeast 0.9x       0.77       x       2.72       x       118.15       x       0.63       x       0.7       =       98.21       (77)         Southeast 0.9x       0.77       x       2.72       x       113.91       x       0.63       x       0.7       =       94.69       (77)         Southeast 0.9x       0.77       x       2.72       x       104.39       x       0.63       x       0.7       =       86.78       (77)         Southeast 0.9x       0.77       x       2.72       x       69.27       x       0.63       x       0.7       =       57.58       (77)         Southeast 0.9x       0.77       x       2.72       x       44.07       x       0.63       x       0.7       =       36.63       (77)         Southeast 0.9x       0.77       x       2.72       x       31.49       x       0.63       x       0.7       =       26.17       (77)         Southeast 0.9x       0.77       x       2.72 <td< td=""><td>Southeas</td><td>st 0.9x</td><td>0.77</td><td>X</td><td>2.72</td><td>X</td><td>85.75</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td>=</td><td>71.28</td><td>(77)</td></td<>	Southeas	st 0.9x	0.77	X	2.72	X	85.75	x	0.63	x	0.7	=	71.28	(77)
Southeast 0.9x       0.77       x       2.72       x       118.15       x       0.63       x       0.7       =       98.21       (77)         Southeast 0.9x       0.77       x       2.72       x       113.91       x       0.63       x       0.7       =       94.69       (77)         Southeast 0.9x       0.77       x       2.72       x       104.39       x       0.63       x       0.7       =       86.78       (77)         Southeast 0.9x       0.77       x       2.72       x       69.27       x       0.63       x       0.7       =       57.58       (77)         Southeast 0.9x       0.77       x       2.72       x       44.07       x       0.63       x       0.7       =       57.58       (77)         Southeast 0.9x       0.77       x       2.72       x       44.07       x       0.63       x       0.7       =       36.63       (77)         Southeast 0.9x       0.77       x       2.72       x       31.49       x       0.63       x       0.7       =       26.17       (77)         South 0.9x       0.77       x       1.26       x <td>Southeas</td> <td>st <sub>0.9x</sub></td> <td>0.77</td> <td>X</td> <td>2.72</td> <td>X</td> <td>106.25</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>88.32</td> <td>(77)</td>	Southeas	st <sub>0.9x</sub>	0.77	X	2.72	X	106.25	X	0.63	X	0.7	=	88.32	(77)
Southeast 0.9x       0.77       x       2.72       x       113.91       x       0.63       x       0.7       =       94.69       (77)         Southeast 0.9x       0.77       x       2.72       x       104.39       x       0.63       x       0.7       =       86.78       (77)         Southeast 0.9x       0.77       x       2.72       x       92.85       x       0.63       x       0.7       =       77.18       (77)         Southeast 0.9x       0.77       x       2.72       x       69.27       x       0.63       x       0.7       =       57.58       (77)         Southeast 0.9x       0.77       x       2.72       x       44.07       x       0.63       x       0.7       =       36.63       (77)         Southeast 0.9x       0.77       x       2.72       x       31.49       x       0.63       x       0.7       =       26.17       (77)         South 0.9x       0.77       x       1.26       x       46.75       x       0.63       x       0.7       =       18       (78)	Southeas	st <sub>0.9x</sub>	0.77	X	2.72	X	119.01	X	0.63	X	0.7	=	98.93	(77)
Southeast 0.9x       0.77       x       2.72       x       104.39       x       0.63       x       0.7       =       86.78       (77)         Southeast 0.9x       0.77       x       2.72       x       92.85       x       0.63       x       0.7       =       77.18       (77)         Southeast 0.9x       0.77       x       2.72       x       69.27       x       0.63       x       0.7       =       57.58       (77)         Southeast 0.9x       0.77       x       2.72       x       44.07       x       0.63       x       0.7       =       36.63       (77)         Southeast 0.9x       0.77       x       2.72       x       31.49       x       0.63       x       0.7       =       26.17       (77)         South 0.9x       0.77       x       1.26       x       46.75       x       0.63       x       0.7       =       18       (78)	Southeas	st 0.9x	0.77	x	2.72	X	118.15	x	0.63	x	0.7	=	98.21	(77)
Southeast 0.9x       0.77       x       2.72       x       92.85       x       0.63       x       0.7       =       77.18       (77)         Southeast 0.9x       0.77       x       2.72       x       69.27       x       0.63       x       0.7       =       57.58       (77)         Southeast 0.9x       0.77       x       2.72       x       44.07       x       0.63       x       0.7       =       36.63       (77)         Southeast 0.9x       0.77       x       2.72       x       31.49       x       0.63       x       0.7       =       26.17       (77)         South 0.9x       0.77       x       1.26       x       46.75       x       0.63       x       0.7       =       18       (78)	Southeas	st <sub>0.9x</sub>	0.77	X	2.72	X	113.91	X	0.63	X	0.7	=	94.69	(77)
Southeast 0.9x       0.77       x       2.72       x       69.27       x       0.63       x       0.7       =       57.58       (77)         Southeast 0.9x       0.77       x       2.72       x       44.07       x       0.63       x       0.7       =       36.63       (77)         Southeast 0.9x       0.77       x       2.72       x       31.49       x       0.63       x       0.7       =       26.17       (77)         South       0.9x       0.77       x       1.26       x       46.75       x       0.63       x       0.7       =       18       (78)	Southeas	st <sub>0.9x</sub>	0.77	X	2.72	X	104.39	X	0.63	X	0.7	=	86.78	(77)
Southeast 0.9x       0.77       x       2.72       x       44.07       x       0.63       x       0.7       =       36.63       (77)         Southeast 0.9x       0.77       x       2.72       x       31.49       x       0.63       x       0.7       =       26.17       (77)         South       0.9x       0.77       x       1.26       x       46.75       x       0.63       x       0.7       =       18       (78)	Southeas	st <sub>0.9x</sub>	0.77	x	2.72	x	92.85	x	0.63	x	0.7	=	77.18	(77)
Southeast 0.9x 0.77 x 2.72 x 31.49 x 0.63 x 0.7 = 26.17 (77) South 0.9x 0.77 x 1.26 x 46.75 x 0.63 x 0.7 = 18 (78)	Southeas	st <sub>0.9x</sub>	0.77	x	2.72	x	69.27	x	0.63	x	0.7	=	57.58	(77)
South 0.9x 0.77 x 1.26 x 46.75 x 0.63 x 0.7 = 18 (78)	Southeas	st <sub>0.9x</sub>	0.77	x	2.72	x	44.07	x	0.63	x	0.7	=	36.63	(77)
0.11	Southeas	st <sub>0.9x</sub>	0.77	x	2.72	x	31.49	x	0.63	x	0.7	=	26.17	(77)
South 0.9x 0.77 x 1.21 x 46.75 x 0.63 x 0.7 = 17.29 (78)	South	0.9x	0.77	x	1.26	x	46.75	x	0.63	x	0.7	=	18	(78)
	South	0.9x	0.77	X	1.21	x	46.75	x	0.63	x	0.7	=	17.29	(78)

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South	0.9x	0.77	X	2.68	X	46.75	X	0.63	X	0.7	=	38.29	(78)
South	0.9x	0.77	X	2.7	x	46.75	X	0.63	X	0.7	=	38.58	(78)
South	0.9x	0.77	X	2.87	X	46.75	X	0.63	X	0.7	=	41.01	(78)
South	0.9x	0.77	X	1.26	X	76.57	X	0.63	X	0.7	=	29.48	(78)
South	0.9x	0.77	X	1.21	X	76.57	X	0.63	X	0.7	=	28.31	(78)
South	0.9x	0.77	X	2.68	X	76.57	X	0.63	X	0.7	=	62.71	(78)
South	0.9x	0.77	X	2.7	x	76.57	X	0.63	X	0.7	=	63.18	(78)
South	0.9x	0.77	X	2.87	x	76.57	x	0.63	x	0.7	=	67.16	(78)
South	0.9x	0.77	X	1.26	X	97.53	X	0.63	x	0.7	=	37.56	(78)
South	0.9x	0.77	X	1.21	x	97.53	x	0.63	x	0.7	=	36.07	(78)
South	0.9x	0.77	X	2.68	x	97.53	X	0.63	x	0.7	=	79.88	(78)
South	0.9x	0.77	X	2.7	x	97.53	X	0.63	x	0.7	=	80.48	(78)
South	0.9x	0.77	X	2.87	x	97.53	X	0.63	x	0.7	=	85.55	(78)
South	0.9x	0.77	X	1.26	x	110.23	X	0.63	x	0.7	=	42.45	(78)
South	0.9x	0.77	X	1.21	x	110.23	x	0.63	x	0.7	] =	40.76	(78)
South	0.9x	0.77	X	2.68	x	110.23	x	0.63	x	0.7	=	90.29	(78)
South	0.9x	0.77	X	2.7	x	110.23	x	0.63	x	0.7	] =	90.96	(78)
South	0.9x	0.77	X	2.87	x	110.23	x	0.63	x	0.7	] =	96.69	(78)
South	0.9x	0.77	X	1.26	x	114.87	x	0.63	x	0.7	] =	44.23	(78)
South	0.9x	0.77	X	1.21	x	114.87	x	0.63	x	0.7	] =	42.48	(78)
South	0.9x	0.77	X	2.68	x	114.87	x	0.63	x	0.7	j =	94.08	(78)
South	0.9x	0.77	X	2.7	x	114.87	x	0.63	x	0.7	j =	94.79	(78)
South	0.9x	0.77	X	2.87	x	114.87	x	0.63	x	0.7	] =	100.75	(78)
South	0.9x	0.77	X	1.26	x	110.55	x	0.63	x	0.7	j =	42.57	(78)
South	0.9x	0.77	X	1.21	x	110.55	x	0.63	x	0.7	j =	40.88	(78)
South	0.9x	0.77	X	2.68	x	110.55	x	0.63	x	0.7	] =	90.54	(78)
South	0.9x	0.77	X	2.7	x	110.55	x	0.63	x	0.7	] =	91.22	(78)
South	0.9x	0.77	x	2.87	x	110.55	x	0.63	x	0.7	] =	96.96	(78)
South	0.9x	0.77	X	1.26	x	108.01	x	0.63	x	0.7	] =	41.59	(78)
South	0.9x	0.77	X	1.21	x	108.01	x	0.63	x	0.7	] =	39.94	(78)
South	0.9x	0.77	x	2.68	x	108.01	x	0.63	x	0.7	] =	88.47	(78)
South	0.9x	0.77	x	2.7	x	108.01	x	0.63	x	0.7	] =	89.13	(78)
South	0.9x	0.77	x	2.87	x	108.01	x	0.63	x	0.7	j =	94.74	(78)
South	0.9x	0.77	x	1.26	x	104.89	x	0.63	x	0.7	] =	40.39	(78)
South	0.9x	0.77	x	1.21	x	104.89	x	0.63	x	0.7	=	38.79	(78)
South	0.9x	0.77	X	2.68	x	104.89	x	0.63	x	0.7	j =	85.91	(78)
South	0.9x	0.77	x	2.7	x	104.89	x	0.63	x	0.7	] =	86.55	(78)
South	0.9x	0.77	X	2.87	x	104.89	x	0.63	x	0.7	j =	92	(78)
South	0.9x	0.77	X	1.26	x	101.89	x	0.63	x	0.7	j =	39.23	(78)
South	0.9x	0.77	X	1.21	x	101.89	x	0.63	x	0.7	] =	37.68	(78)
South	0.9x	0.77	X	2.68	x	101.89	x	0.63	x	0.7	j =	83.45	(78)
	_		-		'		•		'		•		_

South 0.8		_		,				,		ı				_
South 0.8x 0.77 x 1.26 x 82.59 x 0.63 x 0.77 = 31.8 (78) South 0.8x 0.77 x 12.11 x 82.59 x 0.63 x 0.77 = 30.54 (78) South 0.8x 0.77 x 2.268 x 82.59 x 0.63 x 0.77 = 66.15 (78) South 0.8x 0.77 x 2.27 x 82.59 x 0.63 x 0.77 = 66.15 (78) South 0.8x 0.77 x 2.27 x 82.59 x 0.63 x 0.77 = 66.15 (78) South 0.8x 0.77 x 1.21 x 82.59 x 0.63 x 0.77 = 66.15 (78) South 0.8x 0.77 x 1.26 x 55.42 x 0.63 x 0.77 = 72.44 (79) South 0.8x 0.77 x 1.21 x 55.42 x 0.63 x 0.77 = 72.44 (79) South 0.8x 0.77 x 2.28 x 55.42 x 0.63 x 0.77 = 72.44 (79) South 0.8x 0.77 x 2.26 x 55.42 x 0.63 x 0.77 = 72.44 (79) South 0.8x 0.77 x 2.68 x 55.42 x 0.63 x 0.77 = 72.44 (79) South 0.8x 0.77 x 2.68 x 55.42 x 0.63 x 0.77 = 72.44 (79) South 0.8x 0.77 x 2.68 x 55.42 x 0.63 x 0.77 = 74.53 (78) South 0.8x 0.77 x 2.28 x 55.42 x 0.63 x 0.77 = 74.53 (78) South 0.8x 0.77 x 1.26 x 0.40 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 1.26 x 0.40 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 1.26 x 0.40 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 1.26 x 0.40 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 1.26 x 0.40 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 1.26 x 0.40 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 2.28 x 0.40 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 2.28 x 0.40 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 2.28 x 0.40 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 2.28 x 0.40 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.61 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.62 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.62 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.68 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.68 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.68 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.68 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.68 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.68 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.68 (78) South 0.8x 0.77 x 2.28 x 19.84 x 0.63 x 0.77 = 74.68 (78) South 0.8x 0.77 x 2.28 x	South	0.9x	0.77	X	2.7	X	101.89	X	0.63	X	0.7	=	84.07	(78)
South 0.8 0.77 x 1.21 x 2.25 x 0.63 x 0.77 = 30.54 (78) South 0.9 0.77 x 2.26 x 82.59 x 0.63 x 0.77 = 67.64 (78) South 0.9 0.77 x 2.27 x 82.59 x 0.63 x 0.77 = 67.64 (78) South 0.9 0.77 x 2.27 x 82.59 x 0.63 x 0.77 = 67.64 (78) South 0.9 0.77 x 2.27 x 82.59 x 0.63 x 0.77 = 721.34 (78) South 0.9 0.77 x 2.27 x 65.62 x 0.63 x 0.77 = 721.34 (78) South 0.9 0.77 x 1.21 x 55.42 x 0.63 x 0.77 = 721.34 (78) South 0.9 0.77 x 1.21 x 55.42 x 0.63 x 0.77 = 721.34 (78) South 0.9 0.77 x 1.21 x 55.42 x 0.63 x 0.77 = 721.34 (78) South 0.9 0.77 x 1.21 x 55.42 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.21 x 55.42 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.22 x 56.42 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x 1.26 x 40.4 x 0.63 x 0.77 = 748.59 (78) South 0.9 0.77 x 1.26 x	South	0.9x	0.77	X	2.87	X	101.89	X	0.63	X	0.7	=	89.36	(78)
South         0.8x         0.77         x         2.68         x         62.59         x         0.63         x         0.77         control         78           South         0.3x         0.77         x         2.287         x         82.59         x         0.63         x         0.77         control         78         72.44         (78)           South         0.3x         0.77         x         1.26         x         55.42         x         0.63         x         0.7         control         77.244         (78)           South         0.3x         0.77         x         1.26         x         55.42         x         0.63         x         0.7         control         2.040         (78)           South         0.3x         0.77         x         1.26         x         55.42         x         0.63         x         0.7         45.33         (78)           South         0.3x         0.77         x         1.26         x         40.4         x         0.63         x         0.7         45.33         (78)           South         0.3x         0.77         x         1.28         x         40.4         x	South	0.9x	0.77	X	1.26	X	82.59	x	0.63	X	0.7	=	31.8	(78)
South         0.0x         0.77         x         2.27         x         82.59         x         0.63         x         0.77         c         68.15         78           South         0.3x         0.77         x         2.287         x         82.59         x         0.63         x         0.77         c         12.34         (78)           South         0.3x         0.77         x         1.26         x         55.42         x         0.63         x         0.77         c         2.24         (78)           South         0.3x         0.77         x         2.28         x         55.42         x         0.63         x         0.77         c         45.73         (78)           South         0.3x         0.77         x         2.27         x         55.42         x         0.63         x         0.77         c         45.73         (78)           South         0.3x         0.77         x         1.26         x         55.42         x         0.63         x         0.7         45.53         (78)           South         0.3x         0.77         x         1.26         x         40.4         x	South	0.9x	0.77	X	1.21	X	82.59	X	0.63	X	0.7	=	30.54	(78)
South 0.5x 0.77 x 2.287 x 88.259 x 0.633 x 0.7 = 72.44 (78) South 0.9x 0.77 x 1.21 x 55.42 x 0.63 x 0.7 = 21.34 (78) South 0.9x 0.77 x 2.288 x 55.42 x 0.63 x 0.7 = 20.49 (78) South 0.9x 0.77 x 2.288 x 55.42 x 0.63 x 0.7 = 44.61 (78) South 0.9x 0.77 x 2.287 x 55.42 x 0.63 x 0.7 = 44.61 (78) South 0.9x 0.77 x 2.287 x 55.42 x 0.63 x 0.7 = 44.61 (78) South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 44.61 (78) South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 44.61 (78) South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 14.64 (78) South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 14.64 (78) South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 14.64 (78) South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 14.64 (78) South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 14.64 (78) South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 14.64 (78) South 0.9x 0.77 x 1.36 x 19.64 x 0.63 x 0.7 = 14.64 (78) South 0.9x 0.77 x 1.36 x 19.64 x 0.63 x 0.7 = 16.33 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 16.33 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 16.33 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 16.33 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 16.23 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 16.23 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 16.23 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.288 x 19.65 x 0.63 x 0.7 = 17.29	South	0.9x	0.77	X	2.68	X	82.59	X	0.63	X	0.7	=	67.64	(78)
South	South	0.9x	0.77	X	2.7	X	82.59	X	0.63	X	0.7	=	68.15	(78)
South	South	0.9x	0.77	X	2.87	X	82.59	X	0.63	X	0.7	=	72.44	(78)
South 0.9% 0.77 x 2.88 x 55.42 x 0.63 x 0.7 = 45.39 (78) South 0.9% 0.77 x 2.87 x 55.42 x 0.63 x 0.7 = 445.39 (78) South 0.9% 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 448.61 (78) South 0.9% 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 15.56 (78) South 0.9% 0.77 x 1.21 x 40.4 x 0.63 x 0.7 = 15.56 (78) South 0.9% 0.77 x 1.21 x 40.4 x 0.63 x 0.7 = 15.56 (78) South 0.9% 0.77 x 1.22 x 40.4 x 0.63 x 0.7 = 14.94 (78) South 0.9% 0.77 x 1.22 x 40.4 x 0.63 x 0.7 = 33.39 (78) South 0.9% 0.77 x 1.22 x 40.4 x 0.63 x 0.7 = 33.39 (78) South 0.9% 0.77 x 1.22 x 40.4 x 0.63 x 0.7 = 33.39 (78) South 0.9% 0.77 x 1.36 x 19.64 x 0.63 x 0.7 = 16.33 (80) West 0.9% 0.77 x 1.36 x 19.64 x 0.63 x 0.7 = 16.63 (80) West 0.9% 0.77 x 1.3 x 19.64 x 0.63 x 0.7 = 16.63 (80) West 0.9% 0.77 x 1.3 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 1.3 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 1.3 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 1.3 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 1.3 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 1.3 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 1.3 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 1.3 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 1.3 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.288 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.288 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.288 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.288 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9% 0.77 x 2.288 x 38.42	South	0.9x	0.77	X	1.26	x	55.42	x	0.63	x	0.7	=	21.34	(78)
South 0.9% 0.77 x 2.87 x 40.4 x 0.63 x 0.7 = 448.61 (78) South 0.9% 0.77 x 1.21 x 40.4 x 0.63 x 0.7 = 145.56 (78) South 0.9% 0.77 x 1.21 x 40.4 x 0.63 x 0.7 = 145.66 (78) South 0.9% 0.77 x 1.21 x 40.4 x 0.63 x 0.7 = 149.4 (78) South 0.9% 0.77 x 2.68 x 40.4 x 0.63 x 0.7 = 149.4 (78) South 0.9% 0.77 x 2.68 x 40.4 x 0.63 x 0.7 = 149.4 (78) South 0.9% 0.77 x 2.68 x 40.4 x 0.63 x 0.7 = 149.4 (78) South 0.9% 0.77 x 2.68 x 40.4 x 0.63 x 0.7 = 149.4 (78) South 0.9% 0.77 x 2.68 x 40.4 x 0.63 x 0.7 = 149.4 (78) South 0.9% 0.77 x 2.68 x 19.64 x 0.63 x 0.7 = 146.33 (80) West 0.9% 0.77 x 2.79 x 19.64 x 0.63 x 0.7 = 16.55 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 16.55 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.82 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.92 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.92 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.92 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.92 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.92 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.92 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.92 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.92 (80) West 0.9% 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 146.92 (80) W	South	0.9x	0.77	X	1.21	X	55.42	X	0.63	X	0.7	=	20.49	(78)
South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 14.94 (78) South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 14.94 (78) South 0.9x 0.77 x 1.21 x 40.4 x 0.63 x 0.7 = 14.94 (78) South 0.9x 0.77 x 2.68 x 40.4 x 0.63 x 0.7 = 33.09 (78) South 0.9x 0.77 x 2.87 x 40.4 x 0.63 x 0.7 = 33.09 (78) South 0.9x 0.77 x 2.87 x 40.4 x 0.63 x 0.7 = 33.33 (78) South 0.9x 0.77 x 2.87 x 40.4 x 0.63 x 0.7 = 35.43 (78) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 16.75 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 16.75 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 14.94 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 14.94 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 14.94 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 14.94 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 14.94 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 14.94 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 12.36 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 33.82 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 33.82 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 33.82 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 32.76 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 32.76 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 33.82 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 38.42	South	0.9x	0.77	X	2.68	X	55.42	X	0.63	X	0.7	=	45.39	(78)
South 0.9x 0.77 x 1.26 x 40.4 x 0.63 x 0.7 = 15.56 (78) South 0.9x 0.77 x 1.21 x 40.4 x 0.63 x 0.7 = 14.94 (78) South 0.9x 0.77 x 2.68 x 40.4 x 0.63 x 0.7 = 33.09 (78) South 0.9x 0.77 x 2.87 x 40.4 x 0.63 x 0.7 = 33.33 (78) South 0.9x 0.77 x 2.87 x 40.4 x 0.63 x 0.7 = 33.33 (78) West 0.9x 0.77 x 1.36 x 19.64 x 0.63 x 0.7 = 16.33 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 16.75 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80)	South	0.9x	0.77	X	2.7	x	55.42	x	0.63	x	0.7	=	45.73	(78)
South 0.9x 0.77 x 1.21 x 40.4 x 0.63 x 0.7 = 144.94 (78) South 0.9x 0.77 x 2.68 x 40.4 x 0.63 x 0.7 = 33.09 (78) South 0.9x 0.77 x 2.68 x 40.4 x 0.63 x 0.7 = 33.09 (78) South 0.9x 0.77 x 2.287 x 40.4 x 0.63 x 0.7 = 35.43 (78) West 0.9x 0.77 x 1.36 x 19.64 x 0.63 x 0.7 = 35.43 (78) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 16.75 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.6	South	0.9x	0.77	X	2.87	x	55.42	X	0.63	x	0.7	=	48.61	(78)
South 0.9x 0.77 x 2.68 x 40.4 x 0.63 x 0.7 = 33.09 (78) South 0.9x 0.77 x 2.287 x 40.4 x 0.63 x 0.7 = 33.33 (78) South 0.9x 0.77 x 2.287 x 40.4 x 0.63 x 0.7 = 35.43 (78) West 0.9x 0.77 x 1.36 x 19.64 x 0.63 x 0.7 = 16.33 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 16.33 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 16.75 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 16.75 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.68 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 17.29 (80)	South	0.9x	0.77	X	1.26	x	40.4	x	0.63	x	0.7	=	15.56	(78)
South 0.9x 0.77	South	0.9x	0.77	X	1.21	x	40.4	X	0.63	X	0.7	=	14.94	(78)
South 0.9x 0.77	South	0.9x	0.77	X	2.68	x	40.4	X	0.63	x	0.7	=	33.09	(78)
West         0.9x         0.77         x         1.36         x         19.64         x         0.63         x         0.7         =         16.33         (80)           West         0.9x         0.77         x         2.79         x         19.64         x         0.63         x         0.7         =         16.33         (80)           West         0.9x         0.77         x         2.88         x         19.64         x         0.63         x         0.7         =         16.32         (80)           West         0.9x         0.77         x         2.88         x         19.64         x         0.63         x         0.7         =         46.82         (80)           West         0.9x         0.77         x         2.68         x         19.64         x         0.63         x         0.7         =         46.82         (80)           West         0.9x         0.77         x         2.288         x         19.64         x         0.63         x         0.7         =         17.29         (80)           West         0.9x         0.77         x         2.28         x         38.42	South	0.9x	0.77	X	2.7	X	40.4	x	0.63	X	0.7	=	33.33	(78)
West 0.9x 0.77	South	0.9x	0.77	X	2.87	X	40.4	x	0.63	X	0.7	=	35.43	(78)
West 0.9x 0.77	West	0.9x	0.77	X	1.36	x	19.64	X	0.63	x	0.7	=	16.33	(80)
West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 46.82 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 17.29 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 12.36 (80) West 0.9x 0.77 x 2.88 x 19.64 x 0.63 x 0.7 = 12.36 (80) West 0.9x 0.77 x 2.06 x 13.6 x 38.42 x 0.63 x 0.7 = 32.76 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 32.76 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 32.76 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 32.76 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 91.59 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 62.94 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 62.94 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 62.94 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 52.6 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 52.6 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 52.6 (80) West 0.9x 0.77 x 2.88 x 38.42 x 0.63 x 0.7 = 52.6 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 53.95 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 53.95 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80) West 0.9x 0.77 x 2.88 x 63.27 x 0.63 x 0.7 = 55.69 (80)	West	0.9x	0.77	X	2.79	X	19.64	x	0.63	X	0.7	=	16.75	(80)
West         0.9x         0.77         x         2.68         x         19.64         x         0.63         x         0.7         =         32.17         (80)           West         0.9x         0.77         x         2.88         x         19.64         x         0.63         x         0.7         =         17.29         (80)           West         0.9x         0.77         x         2.06         x         19.64         x         0.63         x         0.7         =         17.29         (80)           West         0.9x         0.77         x         1.36         x         38.42         x         0.63         x         0.7         =         12.36         (80)           West         0.9x         0.77         x         2.79         x         38.42         x         0.63         x         0.7         =         32.76         (80)           West         0.9x         0.77         x         2.88         x         38.42         x         0.63         x         0.7         =         91.59         (80)           West         0.9x         0.77         x         2.68         x         38.42	West	0.9x	0.77	X	2.88	X	19.64	x	0.63	X	0.7	=	17.29	(80)
West 0.9x 0.77	West	0.9x	0.77	X	1.3	x	19.64	X	0.63	x	0.7	=	46.82	(80)
West 0.9x 0.77	West	0.9x	0.77	X	2.68	X	19.64	x	0.63	x	0.7	=	32.17	(80)
West         0.9x         0.77         x         1.36         x         38.42         x         0.63         x         0.7         =         31.94         (80)           West         0.9x         0.77         x         2.79         x         38.42         x         0.63         x         0.7         =         32.76         (80)           West         0.9x         0.77         x         2.88         x         38.42         x         0.63         x         0.7         =         33.82         (80)           West         0.9x         0.77         x         1.3         x         38.42         x         0.63         x         0.7         =         91.59         (80)           West         0.9x         0.77         x         2.68         x         38.42         x         0.63         x         0.7         =         62.94         (80)           West         0.9x         0.77         x         2.68         x         38.42         x         0.63         x         0.7         =         62.94         (80)           West         0.9x         0.77         x         2.06         x         38.42         <	West	0.9x	0.77	X	2.88	X	19.64	X	0.63	X	0.7	=	17.29	(80)
West         0.9x         0.77         x         2.79         x         38.42         x         0.63         x         0.7         =         32.76         (80)           West         0.9x         0.77         x         2.88         x         38.42         x         0.63         x         0.7         =         33.82         (80)           West         0.9x         0.77         x         2.68         x         38.42         x         0.63         x         0.7         =         91.59         (80)           West         0.9x         0.77         x         2.68         x         38.42         x         0.63         x         0.7         =         91.59         (80)           West         0.9x         0.77         x         2.68         x         38.42         x         0.63         x         0.7         =         62.94         (80)           West         0.9x         0.77         x         2.06         x         38.42         x         0.63         x         0.7         =         52.6         (80)           West         0.9x         0.77         x         2.79         x         63.27         <	West	0.9x	0.77	X	2.06	X	19.64	x	0.63	X	0.7	=	12.36	(80)
West         0.9x         0.77         x         2.88         x         38.42         x         0.63         x         0.7         =         33.82         (80)           West         0.9x         0.77         x         1.3         x         38.42         x         0.63         x         0.7         =         91.59         (80)           West         0.9x         0.77         x         2.68         x         38.42         x         0.63         x         0.7         =         62.94         (80)           West         0.9x         0.77         x         2.88         x         38.42         x         0.63         x         0.7         =         62.94         (80)           West         0.9x         0.77         x         2.88         x         38.42         x         0.63         x         0.7         =         52.6         (80)           West         0.9x         0.77         x         2.79         x         63.27         x         0.63         x         0.7         =         53.95         (80)           West         0.9x         0.77         x         2.88         x         63.27 <t< td=""><td>West</td><td>0.9x</td><td>0.77</td><td>X</td><td>1.36</td><td>X</td><td>38.42</td><td>x</td><td>0.63</td><td>X</td><td>0.7</td><td>=</td><td>31.94</td><td>(80)</td></t<>	West	0.9x	0.77	X	1.36	X	38.42	x	0.63	X	0.7	=	31.94	(80)
West         0.9x         0.77         x         1.3         x         38.42         x         0.63         x         0.7         =         91.59         (80)           West         0.9x         0.77         x         2.68         x         38.42         x         0.63         x         0.7         =         62.94         (80)           West         0.9x         0.77         x         2.88         x         38.42         x         0.63         x         0.7         =         62.94         (80)           West         0.9x         0.77         x         2.06         x         38.42         x         0.63         x         0.7         =         24.19         (80)           West         0.9x         0.77         x         2.06         x         38.42         x         0.63         x         0.7         =         24.19         (80)           West         0.9x         0.77         x         2.06         x         63.27         x         0.63         x         0.7         =         53.95         (80)           West         0.9x         0.77         x         2.88         x         63.27         <	West	0.9x	0.77	X	2.79	x	38.42	X	0.63	x	0.7	=	32.76	(80)
West         0.9x         0.77         x         2.68         x         38.42         x         0.63         x         0.7         =         62.94         (80)           West         0.9x         0.77         x         2.88         x         38.42         x         0.63         x         0.7         =         62.94         (80)           West         0.9x         0.77         x         2.06         x         38.42         x         0.63         x         0.7         =         24.19         (80)           West         0.9x         0.77         x         1.36         x         63.27         x         0.63         x         0.7         =         52.6         (80)           West         0.9x         0.77         x         2.79         x         63.27         x         0.63         x         0.7         =         53.95         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         2.88         x         63.27         <	West	0.9x	0.77	X	2.88	x	38.42	X	0.63	x	0.7	=	33.82	(80)
West         0.9x         0.77         x         2.88         x         38.42         x         0.63         x         0.7         =         33.82         (80)           West         0.9x         0.77         x         2.06         x         38.42         x         0.63         x         0.7         =         24.19         (80)           West         0.9x         0.77         x         1.36         x         63.27         x         0.63         x         0.7         =         52.6         (80)           West         0.9x         0.77         x         2.79         x         63.27         x         0.63         x         0.7         =         53.95         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         150.83         (80)           West         0.9x         0.77         x         2.88         x         63.27	West	0.9x	0.77	X	1.3	X	38.42	X	0.63	X	0.7	=	91.59	(80)
West         0.9x         0.77         x         2.06         x         38.42         x         0.63         x         0.7         =         24.19         (80)           West         0.9x         0.77         x         1.36         x         63.27         x         0.63         x         0.7         =         52.6         (80)           West         0.9x         0.77         x         2.79         x         63.27         x         0.63         x         0.7         =         53.95         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         2.68         x         63.27         x         0.63         x         0.7         =         150.83         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         150.83         (80)           West         0.9x         0.77         x         2.88         x         63.27	West	0.9x	0.77	X	2.68	X	38.42	X	0.63	X	0.7	=	62.94	(80)
West         0.9x         0.77         x         1.36         x         63.27         x         0.63         x         0.7         =         52.6         (80)           West         0.9x         0.77         x         2.79         x         63.27         x         0.63         x         0.7         =         53.95         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         2.68         x         63.27         x         0.63         x         0.7         =         150.83         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         150.83         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         2.06         x         63.27	West	0.9x	0.77	X	2.88	X	38.42	x	0.63	X	0.7	=	33.82	(80)
West         0.9x         0.77         x         2.79         x         63.27         x         0.63         x         0.7         =         53.95         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         1.3         x         63.27         x         0.63         x         0.7         =         150.83         (80)           West         0.9x         0.77         x         2.68         x         63.27         x         0.63         x         0.7         =         150.83         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         150.83         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         2.06         x         63.27	West	0.9x	0.77	X	2.06	X	38.42	x	0.63	X	0.7	=	24.19	(80)
West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         1.3         x         63.27         x         0.63         x         0.7         =         150.83         (80)           West         0.9x         0.77         x         2.68         x         63.27         x         0.63         x         0.7         =         103.65         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         2.06         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         1.36         x         92.28         x         0.63         x         0.7         =         76.71         (80)           West         0.9x         0.77         x         2.79         x         92.28	West	0.9x	0.77	X	1.36	X	63.27	x	0.63	X	0.7	=	52.6	(80)
West         0.9x         0.77         x         1.3         x         63.27         x         0.63         x         0.7         =         150.83         (80)           West         0.9x         0.77         x         2.68         x         63.27         x         0.63         x         0.7         =         103.65         (80)           West         0.9x         0.77         x         2.88         x         63.27         x         0.63         x         0.7         =         55.69         (80)           West         0.9x         0.77         x         2.06         x         63.27         x         0.63         x         0.7         =         39.83         (80)           West         0.9x         0.77         x         1.36         x         92.28         x         0.63         x         0.7         =         76.71         (80)           West         0.9x         0.77         x         2.79         x         92.28         x         0.63         x         0.7         =         78.68         (80)	West	0.9x	0.77	X	2.79	X	63.27	x	0.63	X	0.7	=	53.95	(80)
West       0.9x       0.77       x       2.68       x       63.27       x       0.63       x       0.7       =       103.65       (80)         West       0.9x       0.77       x       2.88       x       63.27       x       0.63       x       0.7       =       55.69       (80)         West       0.9x       0.77       x       2.06       x       63.27       x       0.63       x       0.7       =       39.83       (80)         West       0.9x       0.77       x       1.36       x       92.28       x       0.63       x       0.7       =       76.71       (80)         West       0.9x       0.77       x       2.79       x       92.28       x       0.63       x       0.7       =       78.68       (80)	West	0.9x	0.77	X	2.88	X	63.27	X	0.63	X	0.7	=	55.69	(80)
West       0.9x       0.77       x       2.88       x       63.27       x       0.63       x       0.7       =       55.69       (80)         West       0.9x       0.77       x       2.06       x       63.27       x       0.63       x       0.7       =       39.83       (80)         West       0.9x       0.77       x       1.36       x       92.28       x       0.63       x       0.7       =       76.71       (80)         West       0.9x       0.77       x       2.79       x       92.28       x       0.63       x       0.7       =       78.68       (80)	West	0.9x	0.77	X	1.3	X	63.27	X	0.63	x	0.7	=	150.83	(80)
West       0.9x       0.77       x       2.06       x       63.27       x       0.63       x       0.7       =       39.83       (80)         West       0.9x       0.77       x       1.36       x       92.28       x       0.63       x       0.7       =       76.71       (80)         West       0.9x       0.77       x       2.79       x       92.28       x       0.63       x       0.7       =       78.68       (80)	West	0.9x	0.77	X	2.68	x	63.27	x	0.63	x	0.7	=	103.65	(80)
West       0.9x       0.77       x       1.36       x       92.28       x       0.63       x       0.7       =       76.71       (80)         West       0.9x       0.77       x       2.79       x       92.28       x       0.63       x       0.7       =       78.68       (80)	West	0.9x	0.77	X	2.88	x	63.27	x	0.63	x	0.7	=	55.69	(80)
West 0.9x 0.77 x 2.79 x 92.28 x 0.63 x 0.7 = 78.68 (80)	West	0.9x	0.77	X	2.06	x	63.27	x	0.63	x	0.7	=	39.83	(80)
	West	0.9x	0.77	x	1.36	x	92.28	x	0.63	x	0.7	=	76.71	(80)
West 0.9x 0.77 x 2.88 x 92.28 x 0.63 x 0.7 = 81.22 (80)	West	0.9x	0.77	X	2.79	x	92.28	x	0.63	x	0.7	=	78.68	(80)
	West	0.9x	0.77	X	2.88	x	92.28	X	0.63	x	0.7	=	81.22	(80)

Vest   O.S.	West	م م د ا		1		1		1		l		1		٦,,,,,,
West		0.9x	0.77	X	1.3	X	92.28	X	0.63	X	0.7	= 	219.98	(80)
West		늗		1		] ]		1		 		= 		╡ .
West		<u> </u>		1		] ]		] ]				! 		╡
West		<u> </u>		X		X		X		X		= 		╡
West         0.5x         0.77         x         2.88         x         113.09         x         0.63         x         0.7         y         2.88         x         113.09         x         0.63         x         0.7         z         269.59         (80)           West         0.9x         0.77         x         2.88         x         113.09         x         0.63         x         0.7         z         269.59         (80)           West         0.9x         0.77         x         2.88         x         113.09         x         0.63         x         0.7         z         269.54         (80)           West         0.9x         0.77         x         2.288         x         115.77         x         0.63         x         0.7         y         2.64         (80)           West         0.9x         0.77         x         2.288         x         115.77         x         0.63         x         0.7         y         2.88         x         115.77         x         0.63         x         0.7         y         2.88         x         115.77         x         0.63         x         0.7         y         2.88		늗	0.77	X	1.36	X	113.09	X	0.63	X	0.7	=	94.01	╡
West         0.5k         0.77         x         1.3         x         113.09         x         0.63         x         0.7         y         268.59         (80)           West         0.9k         0.777         x         2.68         x         113.09         x         0.63         x         0.7         y         2.68         x         113.09         x         0.63         x         0.7         y         2.288         x         113.09         x         0.63         x         0.7         y         99.54         (80)           West         0.9k         0.777         x         2.268         x         115.77         x         0.63         x         0.7         y         98.71         (80)           West         0.9k         0.77         x         2.288         x         115.77         x         0.63         x         0.7         y         2.88         x         115.77         x         0.63         x         0.7         y         2.88         x         115.77         x         0.63         x         0.7         y         1.0         80           West         0.9k         0.77         x         2.288 <t< td=""><td></td><td><u> </u></td><td>0.77</td><td>X</td><td>2.79</td><td>X</td><td>113.09</td><td>X</td><td>0.63</td><td>X</td><td>0.7</td><td>  =</td><td>96.43</td><td>╡</td></t<>		<u> </u>	0.77	X	2.79	X	113.09	X	0.63	X	0.7	=	96.43	╡
West         0.9k         0.77         x         2.68         x         113.09         x         0.63         x         0.77         y         2.68         x         113.09         x         0.63         x         0.77         y         2.88         x         113.09         x         0.63         x         0.77         y         2.68         x         113.09         x         0.63         x         0.77         y         2.06         x         113.09         x         0.63         x         0.77         y         2.06         x         115.77         x         0.63         x         0.77         y         2.077         x         2.28         x         115.77         x         0.63         x         0.77         y         2.28         x         115.77         x         0.63         x         0.77         y         1.33         x         115.77         x         0.63         x         0.77         y         1.36         x         115.77         x         0.63         x         0.77         y         1.36         x         115.77         x         0.63         x         0.77         y         1.94         (80           West <td></td> <td><u> </u></td> <td>0.77</td> <td>X</td> <td></td> <td>X</td> <td></td> <td>X</td> <td>0.63</td> <td>Х</td> <td>0.7</td> <td>  =</td> <td>99.54</td> <td>╡</td>		<u> </u>	0.77	X		X		X	0.63	Х	0.7	=	99.54	╡
West         0.9%         0.77         x         2.88         x         113.09         x         0.63         x         0.7         g99.54         (80)           West         0.9%         0.77         x         2.06         x         113.09         x         0.63         x         0.7         =         71.2         (80)           West         0.9%         0.77         x         2.79         x         115.77         x         0.63         x         0.7         =         98.24         (80)           West         0.9%         0.77         x         2.288         x         115.77         x         0.63         x         0.7         =         98.71         (80)           West         0.9%         0.77         x         2.288         x         115.77         x         0.63         x         0.7         =         119.96         (80)           West         0.9%         0.77         x         2.268         x         115.77         x         0.63         x         0.7         =         119.96         (80)           West         0.9%         0.77         x         2.288         x         110.22         x<		늗	0.77	X	1.3	X	113.09	X	0.63	X		=	269.59	╡
West         0.9x         0.77         x         2.06         x         113.09         x         0.63         x         0.7         gest (80)           West         0.9x         0.77         x         1.36         x         115.77         x         0.63         x         0.7         y         98.24         (80)           West         0.9x         0.77         x         2.288         x         115.77         x         0.63         x         0.7         y         2.88         x         115.77         x         0.63         x         0.7         y         2.88         x         115.77         x         0.63         x         0.7         y         2.88         x         115.77         x         0.63         x         0.7         y         2.288         x         115.77         x         0.63         x         0.7         y         2.288         x         115.77         x         0.63         x         0.7         y         1.88         (80)           West         0.9x         0.77         x         2.288         x         110.22         x         0.63         x         0.7         y         2.88         (80) <td></td> <td><u> </u></td> <td>0.77</td> <td>X</td> <td>2.68</td> <td>X</td> <td>113.09</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>  =</td> <td>185.26</td> <td>╡</td>		<u> </u>	0.77	X	2.68	X	113.09	X	0.63	X	0.7	=	185.26	╡
West         0.9x         0.77         x         1.36         x         1.15,77         x         0.63         x         0.7         =         98,24         (80)           West         0.9x         0.77         x         2.79         x         115,77         x         0.63         x         0.7         =         98,71         (80)           West         0.9x         0.77         x         2.88         x         115,77         x         0.63         x         0.7         =         101.9         (80)           West         0.9x         0.77         x         2.88         x         115,77         x         0.63         x         0.7         =         275.97         (80)           West         0.9x         0.77         x         2.88         x         115,77         x         0.63         x         0.7         =         110.9         (80)           West         0.9x         0.77         x         2.06         x         110.22         x         0.63         x         0.7         =         191.62         (80)           West         0.9x         0.77         x         2.79         x         110.22 <td></td> <td><u> </u></td> <td>0.77</td> <td>X</td> <td></td> <td>X</td> <td></td> <td>X</td> <td></td> <td>X</td> <td></td> <td>  =</td> <td></td> <td>╡</td>		<u> </u>	0.77	X		X		X		X		=		╡
West         0.9x         0.77         x         2.79         x         115,77         x         0.63         x         0.7         =         98,71         (80)           West         0.9x         0.77         x         2.88         x         115,77         x         0.63         x         0.7         =         101.9         (80)           West         0.9x         0.77         x         2.68         x         115,77         x         0.63         x         0.7         =         275,97         (80)           West         0.9x         0.77         x         2.68         x         115,77         x         0.63         x         0.7         =         189,64         (80)           West         0.9x         0.77         x         2.28         x         115,77         x         0.63         x         0.7         =         110.9         (80)           West         0.9x         0.77         x         2.29         x         110.22         x         0.63         x         0.7         =         97.01         (80)           West         0.9x         0.77         x         2.28         x         110.22		<u> </u>	0.77	X	2.06	X	113.09	X	0.63	X	0.7	=	71.2	╡
West         0.8x         0.77         x         2.88         x         116,777         x         0.63         x         0.7         =         101,9         (80)           West         0.9x         0.77         x         1.3         x         115,777         x         0.63         x         0.7         =         275,97         (80)           West         0.9x         0.77         x         2.68         x         115,77         x         0.63         x         0.7         =         189,64         (80)           West         0.9x         0.77         x         2.88         x         115,77         x         0.63         x         0.7         =         101,9         (80)           West         0.9x         0.77         x         2.06         x         110,22         x         0.63         x         0.7         =         72,88         (80)           West         0.9x         0.77         x         2.88         x         110,22         x         0.63         x         0.7         =         97,01         (80)           West         0.9x         0.77         x         2.88         x         110,22 <td></td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.36</td> <td>X</td> <td>115.77</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>96.24</td> <td>╡</td>		0.9x	0.77	X	1.36	X	115.77	X	0.63	X	0.7	=	96.24	╡
Vest		0.9x	0.77	X	2.79	X	115.77	X	0.63	X	0.7	=	98.71	╡
West		<u> </u>	0.77	X	2.88	X	115.77	X	0.63	X		=	101.9	╡
West         0.9x         0.77         x         2.88         x         115.77         x         0.63         x         0.7         =         101.9         (80)           West         0.9x         0.77         x         2.06         x         115.77         x         0.63         x         0.7         =         72.88         (80)           West         0.9x         0.77         x         2.79         x         110.22         x         0.63         x         0.7         =         91.62         (80)           West         0.9x         0.77         x         2.79         x         110.22         x         0.63         x         0.7         =         93.98         (80)           West         0.9x         0.77         x         2.88         x         110.22         x         0.63         x         0.7         =         97.01         (80)           West         0.9x         0.77         x         2.88         x         110.22         x         0.63         x         0.7         =         262.74         (80)           West         0.9x         0.77         x         2.88         x         110.22		<u> </u>	0.77	X	1.3	X	115.77	X	0.63	X	0.7	=	275.97	╡
West 0.9x 0.77 x 2.06 x 115.77 x 0.63 x 0.7 = 79.162 (80) West 0.9x 0.77 x 2.79 x 11.36 x 110.22 x 0.63 x 0.7 = 91.62 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 97.01 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 97.01 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 97.01 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 180.55 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 97.01 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 97.01 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 97.01 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 97.01 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 80.73 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 83.33 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 155.09 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 155.09 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 155.09 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 83.33 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 83.33 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 155.09 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 155.09 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 61.17 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 61.17 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 61.17 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80)		<u> </u>	0.77	X	2.68	X	115.77	X	0.63	X	0.7	=	189.64	╡
West 0.9x 0.77		0.9x	0.77	X	2.88	X	115.77	X	0.63	X	0.7	=	101.9	(80)
West 0.9x 0.77		0.9x	0.77	X	2.06	X	115.77	X	0.63	X	0.7	=	72.88	(80)
West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 97.01 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 262.74 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 180.55 (80) West 0.9x 0.77 x 2.88 x 110.22 x 0.63 x 0.7 = 69.39 (80) West 0.9x 0.77 x 2.06 x 110.22 x 0.63 x 0.7 = 69.39 (80) West 0.9x 0.77 x 2.79 x 94.68 x 0.63 x 0.7 = 69.39 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 83.33 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 255.69 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 83.33 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 255.69 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 155.09 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 59.6 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 59.6 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 59.6 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 59.6 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 59.6 (80) West 0.9x 0.77 x 2.88 x 94.68 x 0.63 x 0.7 = 59.6 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 61.17 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 175.42 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80) West 0.9x 0.77 x 2.88 x 73.59 x 0.63 x 0.7 = 64.77 (80)		0.9x	0.77	X	1.36	X	110.22	X	0.63	X	0.7	=	91.62	(80)
West         0.9x         0.77         x         1.3         x         110.22         x         0.63         x         0.7         =         262.74         (80)           West         0.9x         0.777         x         2.68         x         110.22         x         0.63         x         0.7         =         180.55         (80)           West         0.9x         0.777         x         2.88         x         110.22         x         0.63         x         0.7         =         97.01         (80)           West         0.9x         0.777         x         2.06         x         110.22         x         0.63         x         0.7         =         97.01         (80)           West         0.9x         0.777         x         1.36         x         94.68         x         0.63         x         0.7         =         78.7         (80)           West         0.9x         0.777         x         2.88         x         94.68         x         0.63         x         0.7         =         80.73         (80)           West         0.9x         0.777         x         1.3         x         94.68		0.9x	0.77	X	2.79	X	110.22	X	0.63	X	0.7	=	93.98	(80)
West 0.9x 0.77		0.9x	0.77	X	2.88	X	110.22	Х	0.63	X	0.7	=	97.01	(80)
West         0.9x         0.77         x         2.88         x         110.22         x         0.63         x         0.7         =         97.01         (80)           West         0.9x         0.77         x         2.06         x         110.22         x         0.63         x         0.7         =         69.39         (80)           West         0.9x         0.77         x         2.79         x         94.68         x         0.63         x         0.7         =         80.73         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         80.73         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         80.73         (80)           West         0.9x         0.77         x         2.68         x         94.68         x         0.63         x         0.7         =         225.69         (80)           West         0.9x         0.77         x         2.88         x         94.68	West	0.9x	0.77	X	1.3	x	110.22	X	0.63	X	0.7	=	262.74	(80)
West         0.9x         0.77         x         2.06         x         110.22         x         0.63         x         0.7         =         69.39         (80)           West         0.9x         0.77         x         1.36         x         94.68         x         0.63         x         0.7         =         78.7         (80)           West         0.9x         0.77         x         2.79         x         94.68         x         0.63         x         0.7         =         80.73         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         80.73         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         225.69         (80)           West         0.9x         0.77         x         2.68         x         94.68         x         0.63         x         0.7         =         155.09         (80)           West         0.9x         0.77         x         2.68         x         94.68	West	0.9x	0.77	X	2.68	x	110.22	X	0.63	X	0.7	=	180.55	(80)
West         0.9x         0.77         x         1.36         x         94.68         x         0.63         x         0.7         =         78.7         (80)           West         0.9x         0.77         x         2.79         x         94.68         x         0.63         x         0.7         =         80.73         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         83.33         (80)           West         0.9x         0.77         x         2.68         x         94.68         x         0.63         x         0.7         =         225.69         (80)           West         0.9x         0.77         x         2.68         x         94.68         x         0.63         x         0.7         =         155.09         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         83.33         (80)           West         0.9x         0.77         x         2.06         x         94.68	West	0.9x	0.77	X	2.88	X	110.22	X	0.63	X	0.7	=	97.01	(80)
West         0.9x         0.77         x         2.79         x         94.68         x         0.63         x         0.7         =         80.73         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         83.33         (80)           West         0.9x         0.77         x         1.3         x         94.68         x         0.63         x         0.7         =         225.69         (80)           West         0.9x         0.77         x         2.68         x         94.68         x         0.63         x         0.7         =         225.69         (80)           West         0.9x         0.77         x         2.68         x         94.68         x         0.63         x         0.7         =         155.09         (80)           West         0.9x         0.77         x         2.06         x         94.68         x         0.63         x         0.7         =         59.6         (80)           West         0.9x         0.77         x         2.79         x         73.59	West	0.9x	0.77	X	2.06	X	110.22	X	0.63	X	0.7	=	69.39	(80)
West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         83.33         (80)           West         0.9x         0.77         x         1.3         x         94.68         x         0.63         x         0.7         =         225.69         (80)           West         0.9x         0.77         x         2.68         x         94.68         x         0.63         x         0.7         =         155.09         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         83.33         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         83.33         (80)           West         0.9x         0.77         x         2.06         x         94.68         x         0.63         x         0.7         =         59.6         (80)           West         0.9x         0.77         x         2.79         x         73.59	West	0.9x	0.77	X	1.36	x	94.68	X	0.63	X	0.7	=	78.7	(80)
West         0.9x         0.77         x         1.3         x         94.68         x         0.63         x         0.7         =         225.69         (80)           West         0.9x         0.77         x         2.68         x         94.68         x         0.63         x         0.7         =         155.09         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         83.33         (80)           West         0.9x         0.77         x         2.06         x         94.68         x         0.63         x         0.7         =         59.6         (80)           West         0.9x         0.77         x         2.06         x         94.68         x         0.63         x         0.7         =         59.6         (80)           West         0.9x         0.77         x         2.06         x         73.59         x         0.63         x         0.7         =         62.75         (80)           West         0.9x         0.77         x         2.88         x         73.59         <	West	0.9x	0.77	X	2.79	X	94.68	X	0.63	X	0.7	=	80.73	(80)
West         0.9x         0.77         x         2.68         x         94.68         x         0.63         x         0.7         =         155.09         (80)           West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         83.33         (80)           West         0.9x         0.77         x         2.06         x         94.68         x         0.63         x         0.7         =         59.6         (80)           West         0.9x         0.77         x         1.36         x         73.59         x         0.63         x         0.7         =         61.17         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.88         x         73.59	West	0.9x	0.77	X	2.88	X	94.68	X	0.63	X	0.7	=	83.33	(80)
West         0.9x         0.77         x         2.88         x         94.68         x         0.63         x         0.7         =         83.33         (80)           West         0.9x         0.77         x         2.06         x         94.68         x         0.63         x         0.7         =         59.6         (80)           West         0.9x         0.77         x         1.36         x         73.59         x         0.63         x         0.7         =         61.17         (80)           West         0.9x         0.77         x         2.79         x         73.59         x         0.63         x         0.7         =         62.75         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.68         x         73.59         x         0.63         x         0.7         =         175.42         (80)           West         0.9x         0.77         x         2.88         x         73.59	West	0.9x	0.77	X	1.3	X	94.68	X	0.63	X	0.7	=	225.69	(80)
West         0.9x         0.77         x         2.06         x         94.68         x         0.63         x         0.7         =         59.6         (80)           West         0.9x         0.77         x         1.36         x         73.59         x         0.63         x         0.7         =         61.17         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.68         x         73.59         x         0.63         x         0.7         =         120.55         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.88         x         73.59	West	0.9x	0.77	X	2.68	X	94.68	X	0.63	X	0.7	=	155.09	(80)
West         0.9x         0.77         x         1.36         x         73.59         x         0.63         x         0.7         =         61.17         (80)           West         0.9x         0.77         x         2.79         x         73.59         x         0.63         x         0.7         =         62.75         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.68         x         73.59         x         0.63         x         0.7         =         175.42         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         120.55         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.06         x         73.59	West	0.9x	0.77	X	2.88	X	94.68	х	0.63	X	0.7	=	83.33	(80)
West         0.9x         0.77         x         2.79         x         73.59         x         0.63         x         0.7         =         62.75         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.68         x         73.59         x         0.63         x         0.7         =         175.42         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         120.55         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.06         x         73.59         x         0.63         x         0.7         =         46.33         (80)           West         0.9x         0.77         x         1.36         x         45.59	West	0.9x	0.77	X	2.06	X	94.68	X	0.63	X	0.7	=	59.6	(80)
West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         1.3         x         73.59         x         0.63         x         0.7         =         175.42         (80)           West         0.9x         0.77         x         2.68         x         73.59         x         0.63         x         0.7         =         120.55         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.06         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.06         x         73.59         x         0.63         x         0.7         =         46.33         (80)           West         0.9x         0.77         x         1.36         x         45.59	West	0.9x	0.77	X	1.36	X	73.59	X	0.63	X	0.7	=	61.17	(80)
West         0.9x         0.77         x         1.3         x         73.59         x         0.63         x         0.7         =         175.42         (80)           West         0.9x         0.77         x         2.68         x         73.59         x         0.63         x         0.7         =         120.55         (80)           West         0.9x         0.77         x         2.88         x         73.59         x         0.63         x         0.7         =         64.77         (80)           West         0.9x         0.77         x         2.06         x         73.59         x         0.63         x         0.7         =         46.33         (80)           West         0.9x         0.77         x         1.36         x         45.59         x         0.63         x         0.7         =         37.9         (80)	West	0.9x	0.77	X	2.79	x	73.59	x	0.63	X	0.7	=	62.75	(80)
West       0.9x       0.77       x       2.68       x       73.59       x       0.63       x       0.7       =       120.55       (80)         West       0.9x       0.77       x       2.88       x       73.59       x       0.63       x       0.7       =       64.77       (80)         West       0.9x       0.77       x       2.06       x       73.59       x       0.63       x       0.7       =       46.33       (80)         West       0.9x       0.77       x       1.36       x       45.59       x       0.63       x       0.7       =       37.9       (80)	West	0.9x	0.77	X	2.88	x	73.59	X	0.63	X	0.7	=	64.77	(80)
West       0.9x       0.77       x       2.88       x       73.59       x       0.63       x       0.7       =       64.77       (80)         West       0.9x       0.77       x       2.06       x       73.59       x       0.63       x       0.7       =       46.33       (80)         West       0.9x       0.77       x       1.36       x       45.59       x       0.63       x       0.7       =       37.9       (80)	West	0.9x	0.77	X	1.3	x	73.59	x	0.63	X	0.7	=	175.42	(80)
West       0.9x       0.77       x       2.06       x       73.59       x       0.63       x       0.7       =       46.33       (80)         West       0.9x       0.77       x       1.36       x       45.59       x       0.63       x       0.7       =       37.9       (80)	West	0.9x	0.77	X	2.68	x	73.59	x	0.63	X	0.7	=	120.55	(80)
West 0.9x 0.77 x 1.36 x 45.59 x 0.63 x 0.7 = 37.9 (80)	West	0.9x	0.77	X	2.88	x	73.59	x	0.63	x	0.7	=	64.77	(80)
100 1000 000 000 000	West	0.9x	0.77	X	2.06	x	73.59	x	0.63	x	0.7	=	46.33	(80)
West 0.9x 0.77 x 2.79 x 45.59 x 0.63 x 0.7 = 38.87 (80)	West	0.9x	0.77	X	1.36	x	45.59	x	0.63	x	0.7	=	37.9	(80)
	West	0.9x	0.77	x	2.79	x	45.59	x	0.63	X	0.7	=	38.87	(80)

	West 0.9x 0.77 x 2.88 x 45.59 x 0.63 x 0.7 = 40.13 (80)														
West	0.9x	0.77	X	2.8	38	X	4	5.59	X	0.63	X	0.7	=	40.13	(80)
West	0.9x	0.77	X	1.	3	X	4	5.59	X	0.63	X	0.7	=	108.67	(80)
West	0.9x	0.77	X	2.6	88	X	4	5.59	X	0.63	X	0.7	=	74.68	(80)
West	0.9x	0.77	X	2.8	38	X	4	5.59	X	0.63	X	0.7	=	40.13	(80)
West	0.9x	0.77	X	2.0	)6	X	4	5.59	X	0.63	X	0.7	=	28.7	(80)
West	0.9x	0.77	X	1.3	36	X	2	4.49	x	0.63	x	0.7	=	20.36	(80)
West	0.9x	0.77	X	2.7	79	x	2	4.49	x	0.63	x	0.7	=	20.88	(80)
West	0.9x	0.77	X	2.8	38	X	2	4.49	x	0.63	x	0.7	=	21.55	(80)
West	0.9x	0.77	X	1.	3	X	2	4.49	x	0.63	X	0.7	=	58.38	(80)
West	0.9x	0.77	X	2.6	88	X	2	4.49	x	0.63	x	0.7	=	40.12	(80)
West	0.9x	0.77	X	2.8	38	X	2	4.49	X	0.63	x	0.7	=	21.55	(80)
West	0.9x	0.77	X	2.0	)6	X	2	4.49	X	0.63	x	0.7	=	15.42	(80)
West	0.9x	0.77	X	1.3	36	x	1	6.15	x	0.63	x	0.7	=	13.43	(80)
West	0.9x	0.77	X	2.7	79	X	1	6.15	X	0.63	x	0.7	=	13.77	(80)
West	0.9x	0.77	X	2.8	38	x	1	6.15	x	0.63	×	0.7		14.22	(80)
West	0.9x	0.77	X	1.	3	X	1	6.15	x	0.63	x	0.7		38.5	(80)
West	0.9x	0.77	X	2.6	88	x	1	6.15	x	0.63	x	0.7	=	26.46	(80)
West	0.9x	0.77	X	2.8	38	x	1	6.15	x	0.63	×	0.7		14.22	(80)
West	0.9x	0.77	X	2.0	)6	x	1	6.15	х	0.63	x	0.7	=	10.17	(80)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m= 445.27 814.54 1233.34 1678.23 1981.16 2001.94 1916.17 1691.09 1390.86 935.19 544.28 373.59  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 1082.48 1449.45 1846.89 2256.53 2522.17 2508.13 2400.44 2182.1 1900.58 1480.4 1130.38 991.81 (84)															
		nal temp		`						<b>-</b> : . (2.2)					<b>—</b>
•		J	٠.			·			ole 9,	Th1 (°C)				21	(85)
Utilisa <sup>.</sup> Г		tor for ga				Ť								7	
(96)~	Jan	Feb	Mar	Apr	May	+	Jun	Jul	<del>                                     </del>	ug Sep	Oct		Dec		(86)
(86)m=	1	1	0.99	0.95	0.86		).71	0.54	0.6	!	0.98	1	1		(00)
Г		l tempera			r `	1		i	1			T		7	(07)
(87)m=	19.36	19.58	19.93	20.37	20.73	2	0.92	20.98	20.9	97 20.8	20.3	19.74	19.32		(87)
Tempe	erature	during h	eating p	eriods ii	rest of	dw	elling	from Ta	able 9	), Th2 (°C)		- <del>1</del>	1	_	
(88)m=	19.79	19.79	19.79	19.8	19.8	1	9.81	19.81	19.	19.8	19.8	19.8	19.79		(88)
Utilisa	tion fac	tor for ga	ains for	rest of d	welling,	h2,	m (se	e Table	9a)	_		_		_	
(89)m=	1	1	0.98	0.94	0.81		0.6	0.41	0.4	7 0.78	0.97	1	1		(89)
Mean	interna	l tempera	ature in	the rest	of dwell	ling	T2 (f	ollow ste	eps 3	to 7 in Tabl	e 9c)				
(90)m=	17.61	17.93	18.44	19.07	19.54	1	9.76	19.8	19.	79 19.65	18.98	18.17	17.56		(90)
_										f	LA = Li	ving area ÷ (	4) =	0.29	(91)
Mean	interna	l tempera	ature (fo	or the wh	ole dwe	ellino	g) = fl	_A × T1	+ (1	– fLA) × T2					
(92)m=	18.12	18.41	18.87	19.44	19.88	$\overline{}$	0.09	20.14	20.	<del></del>	19.37	7 18.62	18.07	٦	(92)
Apply	adjustr	nent to th	ne mear	interna	l tempe	ratu	re fro	m Table	4e,	where appro	priate	<u> </u>	<u> </u>	_	

(00)		40.07	10.11	40.00				40.00	40.07	1 40 00	40.07		(93)
(93)m= 18.12	18.41	18.87	19.44	19.88	20.09	20.14	20.13	19.98	19.37	18.62	18.07		(93)
8. Space hea	·			ro obtoin	ad at at	on 11 of	Table 0	o oo tha	tTim (	76\m an	d ro oolo	uloto	
the utilisation					eu ai sii	ep 11 01	Table 9	o, so ina	t 11,111=(	, o) III ali	u re-caic	uiale	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	:								•		
(94)m= 1	0.99	0.98	0.93	0.82	0.63	0.45	0.51	0.8	0.97	1	1		(94)
Useful gains,	1	<u> </u>	<u> </u>				1	ı		1	I		
(95)m= 1080.58		1808.1		2058.36		1068.86	1112.82	1511.61	1431.98	1125.52	990.62		(95)
Monthly aver		1					<u> </u>			<del></del>	I		(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			al tempe 3260.4			<del>-``</del>	<del>- `                                   </del>	<del></del>		0507.55	4000 44		(07)
. ,	4213.21	3853.27		2525.97		1086.71	l		2706.85		4306.11		(97)
Space heatin (98)m= 2406.62	<del></del>		r eacn n 836.84	347.9		I		)m – (95 0	)MJ X (4 948.5	·	2466.73		
(96)M= 2406.62	1003.19	1521.61	030.04	347.9	0	0	0 				<u> </u>	40440.04	7,000
							Tota	l per year	(kwh/yeai	r) = Sum(9	8) <sub>15,912</sub> =	12149.64	(98)
Space heatin	g require	ement in	kWh/m²	/year								53.26	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space heating	ng:												_
Fraction of sp	ace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of sp	ace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 – (	(203)] =			1	(204)
Efficiency of	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficiency of	seconda	ry/supple	ementar	y heating	g system	ո, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin				d above)			,	1		,	1		
2406.62	1863.19	1521.61	836.84	347.9	0	0	0	0	948.5	1758.26	2466.73		
(211)m = {[(98	)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
2573.92	1992.72	1627.39	895.01	372.08	0	0	0	0		1880.49			_
							Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	12994.27	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month									<del>_</del>
$= \{[(98) \text{m x } (20)]$	)1)]	00 ÷ (20	8)			ı							
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)
Water heating	3												
Output from w								1			1		
225.25	198.49	208.34	186.6	182.74	163.12	156.49	171.95	171.71	193.5	204.81	219.78		_
Efficiency of w	r						,			,		79.8	(216)
(217)m= 89.47	89.35	89.06	88.34	86.51	79.8	79.8	79.8	79.8	88.49	89.25	89.52		(217)
Fuel for water	•												
(219)m = (64) (219)m = 251.76	m x 100 222.16	233.93	m 211.23	211.25	204.41	196.11	215.47	215.18	218.67	229.48	245.51		
(210)111- 201.70	1 222.10	200.90	211.20	211.20	2V7.41	1 130.11		I = Sum(2		1 220.40	2-10.01	2655.15	(219)
Annual totals							. 0 10			Whkiss			
Space heating		ed, main	system	1					ĸ	Wh/year		kWh/year 12994.27	٦
,9		,	,										_

Water heating fuel used			2655.15
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			625.12 (232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	2806.76 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	573.51 (264)
Space and water heating	(261) + (262) + (263) + (264) =		3380.28 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	324.44 (268)
Total CO2, kg/year	sum	of (265)(271) =	3743.64 (272)
TER =			16.41 (273)

		User Details:				
Access an Norman				CTDO	022002	
Assessor Name: Software Name:	Joseph Treanor Stroma FSAP 2012	Stroma N Software			032062 n: 1.0.4.14	
Software Name.		operty Address: H2	Version.	V C1310	11. 1.0.4.14	
Address :	, Gondar Gardens, London, N	· · · ·				
1. Overall dwelling dime						
		Area(m²)	Av. Heigh	t(m)	Volume(m <sup>3</sup>	)
Ground floor		71.45 (1a)	x 2.55	(2a) =	182.2	(3a)
First floor		71.77 (1b)	<b>x</b> 3	(2b) =	215.31	(3b)
Second floor		36.89 (1c)	х 3	(2c) =	110.67	(3c)
Third floor		35.72 (1d)	x 3	(2d) =	107.16	(3d)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	215.83 (4)				
Dwelling volume		(3a)	+(3b)+(3c)+(3d)+(3	e)+(3n) =	615.34	(5)
2. Ventilation rate:				· ·		
	main secondary heating heating	other	total		m³ per hou	r
Number of chimneys	heating heating  0 + 0	+ 0	= 0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	= 0	x 20 =	0	(6b)
Number of intermittent fa	ans		4	x 10 =	40	(7a)
Number of passive vents	5		0	x 10 =	0	(7b)
Number of flueless gas f	ïres		0	x 40 =	0	(7c)
				١		
				Air ch	anges per ho	our —
	eys, flues and fans = $(6a)+(6b)+(7a)$		40	÷ (5) =	0.07	(8)
Number of storeys in t	been carried out or is intended, proceed	to (17), otherwise contin	nue from (9) to (16)	i		(9)
Additional infiltration	ile dweiling (113)			[(9)-1]x0.1 =	0	(10)
	0.25 for steel or timber frame or 0	) 35 for masonry co	nstruction	[(0) 1]x0.1 =	0	(11)
	present, use the value corresponding to t	•		l		()
If suspended wooden	floor, enter 0.2 (unsealed) or 0.1	(sealed), else ente	er O		0	(12)
If no draught lobby, er	nter 0.05, else enter 0				0	(13)
Percentage of window	s and doors draught stripped			İ	0	(14)
Window infiltration		0.25 - [0.2 x (14	4) ÷ 100] =	i	0	(15)
Infiltration rate		(8) + (10) + (11	) + (12) + (13) + (15	5) =	0	(16)
Air permeability value,	, q50, expressed in cubic metres	per hour per squar	e metre of enve	elope area	5	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] + (8)$	, otherwise (18) = (16)			0.32	(18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permea	bility is being used	•		
Number of sides sheltered	ed	(00)	- (40)I		2	(19)
Shelter factor		(20) = 1 - [0.07			0.85	(20)
Infiltration rate incorpora	_	$(21) = (18) \times (21)$	0) =		0.27	(21)
Infiltration rate modified	for monthly wind speed					

Jul

Sep

Aug

Oct

Nov

Dec

Mar

Apr

May

Jun

Feb

Jan

<u> </u>	rage wind	speed f	om Tab		1 20	2.0	3.7	<u> </u>	4.2	4.5	4.7	1
2)m= 5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	
ind Factor	(22a)m =	(22)m ÷	4									
2a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]
djusted infi	Itration rat	e (allow	ing for sl	nelter an	nd wind s	peed) =	(21a) x	(22a)m				
0.34	1	0.33	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31	
<i>alcul<mark>ate ef</mark></i> If mechan	<i>fective air</i> ical ventila	-	rate for t	he appli	cable ca	se				-		0 (3
	r heat pump		endix N, (2	23b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	o) = (23a)			0 ((
If balanced v	vith heat reco	overy: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h	) =				0 (2
a) If balan	ced mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (2	2b)m + (	23b) × [	1 – (23c)	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0	(:
b) If balan	ced mech	anical ve	entilation	without	heat red	overy (N	ЛV) (24b	o)m = (2	2b)m + (2	23b)		· -
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	(:
,	house ex			•	•				- (00)	`		
	o)m < 0.5 >	(23b), i	then (24)	C) = (230)	o); other	vise (24	c) = (22t)	o) m + 0	$.5 \times (23b)$	0	0	] (;
-	al ventilation								0	U	0	1
,	ar verillalio )m = 1, th				•				0.5]			
4d)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(:
Effective a	air change	rate - ei	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				_
5)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(:
3. Heat los	ses and he	eat loss	paramet	er:								
LEMEN	<b>F</b> Gros		Openin m	igs 1 <sup>2</sup>	Net Ar A ,r		U-val W/m2		A X U (W/I	<)	k-value kJ/m²-ł	
indows Ty	pe 1				1.93	х1	/[1/( 1.4 )+	0.04] =	2.56			(2
indows Ty	pe 2				3.62	x1.	/[1/( 1.4 )+	0.04] =	4.8			(2
indows Ty	pe 3				1.83	x1.	/[1/( 1.4 )+	0.04] =	2.43			(2
indows Ty	pe 4				1.76	х1	/[1/( 1.4 )+	0.04] =	2.33			(2
indows Ty	pe 5				1.73	х1	/[1/( 1.4 )+	0.04] =	2.29			(2
indows Ty	pe 6				1.33	х1	/[1/( 1.4 )+	0.04] =	1.76			(2
indows Ty	pe 7				1.94	x1	/[1/( 1.4 )+	0.04] =	2.57			(2
indows Ty	pe 8				1.73	x1	/[1/( 1.4 )+	0.04] =	2.29			(2
indows Ty	•				3.45	x1	/[1/( 1.4 )+	0.04] =	4.57			(2
indows Ty	pe 10				6.76	x1	/[1/( 1.4 )+	0.04] =	8.96			(;
oor					71.45	x	0.13	=	9.28849	9		(;
/alls	187	.5	53.9	6	133.5	4 ×	0.18	=	24.04			(;
oof Type1	35.2	25	0		35.25	, x	0.13	=	4.58	$\neg$		(:
•												

Total area of elements, m<sup>2</sup> (31)329.92 Party wall (32)190.02 \* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S(A \times U)$ (33)114.09 Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)25061.53 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Medium (35)250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)29.83 if details of thermal bridging are not known (36) =  $0.15 \times (31)$ Total fabric heat loss (33) + (36) =143.92 (37)Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Feb May Jul Jan Mar Apr Jun Aug Sep Oct Nov Dec 113.36 112.9 108.1 108.1 111.58 (38)112.45 110.34 109.94 107.76 108.81 109.94 110.74 (38)m =Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =257.29 256.83 256.38 254.26 253.87 252.02 252.02 251.68 252.73 253.87 254.67 255.5 (39)Average =  $Sum(39)_{1...12}/12=$ 254.26 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.19 (40)m =1.19 1.18 1.18 1.17 1.17 1.17 1.17 1.18 1.18 1.18 (40)Average =  $Sum(40)_{1...12}/12=$ 1.18 Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sen Oct Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement kWh/year: Assumed occupancy, N 3.02 (42)if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 105.98 (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 Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =116.58 112.34 108.1 103.86 99.63 95.39 95.39 99.63 103.86 108.1 112.34 116.58 (44)Total =  $Sum(44)_{1...12}$  = 1271.81 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 =172.89 151.21 156.04 136.04 130.53 112.64 104.37 119.77 121.2 141.25 154.18 167.43 Total =  $Sum(45)_{1...12}$  = 1667.55 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)(46)m =25.93 22.68 23.41 20.41 19.58 16.9 15.66 17.97 18.18 21.19 23.13 25.12 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 manufacturar's declared loss factor is known (k)/lh/day):												
a) If manufacturer's declared loss factor is known (kWh/day):		1.7		(48)								
Temperature factor from Table 2b		0.54		(49)								
Energy lost from water storage, kWh/year	$(48) \times (49) =$	0.92		(50)								
b) If manufacturer's declared cylinder loss factor is not known	1:		1	(54)								
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3		0	1	(51)								
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)								
Enter (50) or (54) in (55)		0.92	ł	(55)								
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$											
(56)m= 28.48 25.73 28.48 27.57 28.48 27.57 28.48	28.48 27.57 28.48	27.57 28.48	] (	(56)								
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷			I lix H									
(57)m= 28.48 25.73 28.48 27.57 28.48 27.57 28.48	28.48 27.57 28.48	27.57 28.48	] (	(57)								
		0	1 1 ,	(58)								
Primary circuit loss (annual) from Table 3  Primary circuit loss calculated for each month (59)m = (58) ÷ 3	365 v (41)m	0	l '	(30)								
(modified by factor from Table H5 if there is solar water hea	` '	ostat)										
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	<del></del>	22.51 23.26	]	(59)								
	1)m	l l	l									
Combi loss calculated for each month (61)m = (60) $\div$ 365 × (4 (61)m= $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$	0 0 0	0 0	1 ,	(61)								
				(01)								
Total heat required for water heating calculated for each mont (62)m= 224.64 197.95 207.78 186.11 182.28 162.71 156.12	<del>-                                    </del>	<del>` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` </del>	1 ` ′ ′	(62)								
` '			·	(02)								
Solar DHW input calculated using Appendix G or Appendix H (negative quan (add additional lines if FGHRS and/or WWHRS applies, see A		ion to water neating)										
(63)m= 0 0 0 0 0 0 0 0		0 0	1 (	(63)								
Output from water heater			<u> </u>	()								
(64)m= 224.64 197.95 207.78 186.11 182.28 162.71 156.12	2 171.52 171.28 193	204.26 219.18	1									
(04)11= 224.04 197.93 207.76 100.11 102.20 102.71 130.12	Output from water heate		2276.82	(64)								
Light point from water booting 1/Mb/month 0.25 (10.05 v. (45)	•	,		(01)								
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45) (65)m= 98.88 87.67 93.28 85.29 84.8 77.51 76.1	81.22 80.36 88.36	91.33 97.07	1	(65)								
				(00)								
include (57)m in calculation of (65)m only if cylinder is in the			('									
	e dwelling of not water is if	rom community h	eating									
5. Internal gains (see Table 5 and 5a):	e dwelling of not water is if	rom community h	neating									
Metabolic gains (Table 5), Watts		,	neating									
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec		(66)								
Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul         (66)m=       151.13       151.13       151.13       151.13       151.13       151.13       151.13	Aug         Sep         Oct           3         151.13         151.13         151.13	,		(66)								
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         151.13         151.13         151.13         151.13         151.13         151.13         151.13         151.13         151.13         151.13         151.13           Lighting gains (calculated in Appendix L, equation L9 or L9a),         150.13         <	Aug Sep Oct 3 151.13 151.13 151.13 also see Table 5	Nov Dec 151.13										
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         151.13	Aug Sep Oct 3 151.13 151.13 151.13 also see Table 5 16.67 22.38 28.42	Nov Dec		(66) (67)								
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         151.13	Aug Sep Oct 3 151.13 151.13 151.13 also see Table 5 16.67 22.38 28.42 13a), also see Table 5	Nov Dec 151.13 151.13 33.16 35.36		(67)								
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         151.13	Aug Sep Oct 3 151.13 151.13 151.13 also see Table 5 16.67 22.38 28.42 13a), also see Table 5 6 284.66 294.75 316.23	Nov Dec 151.13										
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         151.13	Aug Sep Oct 3 151.13 151.13 151.13 also see Table 5 16.67 22.38 28.42 13a), also see Table 5 6 284.66 294.75 316.23	Nov Dec 151.13 151.13 33.16 35.36 343.34 368.83		(67)								
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         151.13	Aug Sep Oct 3 151.13 151.13 151.13 also see Table 5 16.67 22.38 28.42 13a), also see Table 5 6 284.66 294.75 316.23	Nov Dec 151.13 151.13 33.16 35.36		(67)								
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         151.13	Aug Sep Oct 3 151.13 151.13 151.13 also see Table 5 16.67 22.38 28.42 13a), also see Table 5 5 284.66 294.75 316.23 a), also see Table 5	Nov Dec 151.13 151.13 33.16 35.36 343.34 368.83		(67)								
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul           (66)m=         151.13	Aug Sep Oct 3 151.13 151.13 151.13 also see Table 5 16.67 22.38 28.42 13a), also see Table 5 5 284.66 294.75 316.23 a), also see Table 5	Nov Dec 151.13 151.13 33.16 35.36 343.34 368.83		(67)								

Losses e.g. evaporation (negative values) (Table 5)														
(71)m=	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	]	(71)
Water	Water heating gains (Table 5)													
(72)m=	132.91	130.46	125.37	118.46	113.98	107.66	102.29	109.17	111.61	118.77	126.84	130.47	]	(72)
Total i	nternal	gains =		-		(66)	m + (67)m	+ (68)m +	- (69)m + (	(70)m + (7	1)m + (72)	m	•	
(73)m=	624.5	622.21	601.33	566.9	530.55	496.55	475.12	481.84	500.08	534.75	574.69	605.99		(73)
6. Solar gains:														

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

		Access Facto Table 6d		Area m²	a ana	Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	1	x	1.94	x	19.64	x	0.63	x	0.7	=	11.64	(76)
East	0.9x	3	X	1.73	x	19.64	x	0.63	x	0.7	=	31.15	(76)
East	0.9x	3	X	3.45	x	19.64	x	0.63	X	0.7	=	62.12	(76)
East	0.9x	1	X	1.94	x	38.42	x	0.63	x	0.7	=	22.78	(76)
East	0.9x	3	x	1.73	x	38.42	x	0.63	x	0.7	=	60.94	(76)
East	0.9x	3	x	3.45	x	38.42	x	0.63	x	0.7	=	121.53	(76)
East	0.9x	1	x	1.94	x	63.27	x	0.63	x	0.7	=	37.51	(76)
East	0.9x	3	x	1.73	x	63.27	X	0.63	x	0.7	=	100.36	(76)
East	0.9x	3	X	3.45	X	63.27	X	0.63	X	0.7	=	200.14	(76)
East	0.9x	1	x	1.94	x	92.28	x	0.63	x	0.7	=	54.71	(76)
East	0.9x	3	X	1.73	X	92.28	X	0.63	X	0.7	=	146.37	(76)
East	0.9x	3	X	3.45	X	92.28	X	0.63	X	0.7	=	291.89	(76)
East	0.9x	1	X	1.94	X	113.09	X	0.63	X	0.7	=	67.05	(76)
East	0.9x	3	X	1.73	X	113.09	X	0.63	X	0.7	=	179.38	(76)
East	0.9x	3	X	3.45	x	113.09	X	0.63	X	0.7	=	357.72	(76)
East	0.9x	1	X	1.94	X	115.77	X	0.63	X	0.7	=	68.64	(76)
East	0.9x	3	X	1.73	X	115.77	X	0.63	X	0.7	=	183.63	(76)
East	0.9x	3	X	3.45	x	115.77	X	0.63	X	0.7	=	366.19	(76)
East	0.9x	1	X	1.94	x	110.22	X	0.63	X	0.7	=	65.35	(76)
East	0.9x	3	x	1.73	x	110.22	x	0.63	X	0.7	=	174.82	(76)
East	0.9x	3	x	3.45	x	110.22	x	0.63	X	0.7	=	348.63	(76)
East	0.9x	1	X	1.94	X	94.68	X	0.63	X	0.7	=	56.13	(76)
East	0.9x	3	x	1.73	x	94.68	x	0.63	x	0.7	=	150.17	(76)
East	0.9x	3	x	3.45	x	94.68	X	0.63	x	0.7	=	299.47	(76)
East	0.9x	1	X	1.94	X	73.59	X	0.63	X	0.7	=	43.63	(76)
East	0.9x	3	X	1.73	X	73.59	X	0.63	X	0.7	=	116.72	(76)
East	0.9x	3	X	3.45	X	73.59	X	0.63	X	0.7	=	232.77	(76)
East	0.9x	1	X	1.94	X	45.59	X	0.63	X	0.7	=	27.03	(76)
East	0.9x	3	X	1.73	x	45.59	x	0.63	x	0.7	=	72.31	(76)
East	0.9x	3	х	3.45	X	45.59	X	0.63	X	0.7	=	144.2	(76)

	_		,		1		1		ı		1		_
East	0.9x	1	X	1.94	Х	24.49	X	0.63	X	0.7	=	14.52	(76)
East	0.9x	3	X	1.73	X	24.49	X	0.63	X	0.7	=	38.84	(76)
East	0.9x	3	X	3.45	X	24.49	X	0.63	X	0.7	=	77.46	(76)
East	0.9x	1	X	1.94	X	16.15	X	0.63	X	0.7	=	9.58	(76)
East	0.9x	3	X	1.73	X	16.15	X	0.63	X	0.7	=	25.62	(76)
East	0.9x	3	X	3.45	X	16.15	X	0.63	X	0.7	=	51.09	(76)
South	0.9x	0.77	X	1.73	X	46.75	X	0.63	X	0.7	=	24.72	(78)
South	0.9x	0.77	X	1.33	X	46.75	X	0.63	X	0.7	=	19	(78)
South	0.9x	0.77	X	6.76	X	46.75	X	0.63	X	0.7	=	193.17	(78)
South	0.9x	0.77	X	1.73	x	76.57	X	0.63	X	0.7	=	40.48	(78)
South	0.9x	0.77	X	1.33	X	76.57	x	0.63	x	0.7	=	31.12	(78)
South	0.9x	0.77	X	6.76	x	76.57	x	0.63	x	0.7	=	316.37	(78)
South	0.9x	0.77	X	1.73	x	97.53	X	0.63	x	0.7	=	51.57	(78)
South	0.9x	0.77	X	1.33	x	97.53	X	0.63	x	0.7	=	39.64	(78)
South	0.9x	0.77	X	6.76	x	97.53	X	0.63	X	0.7	=	403	(78)
South	0.9x	0.77	x	1.73	x	110.23	x	0.63	x	0.7	=	58.28	(78)
South	0.9x	0.77	x	1.33	x	110.23	x	0.63	x	0.7	] =	44.81	(78)
South	0.9x	0.77	X	6.76	x	110.23	x	0.63	x	0.7	j =	455.48	(78)
South	0.9x	0.77	X	1.73	x	114.87	x	0.63	x	0.7	j =	60.73	(78)
South	0.9x	0.77	X	1.33	x	114.87	X	0.63	x	0.7	j =	46.69	(78)
South	0.9x	0.77	X	6.76	x	114.87	x	0.63	x	0.7	j =	474.63	(78)
South	0.9x	0.77	X	1.73	x	110.55	x	0.63	x	0.7	] =	58.45	(78)
South	0.9x	0.77	X	1.33	x	110.55	X	0.63	x	0.7	=	44.93	(78)
South	0.9x	0.77	X	6.76	x	110.55	x	0.63	x	0.7	j =	456.77	(78)
South	0.9x	0.77	X	1.73	x	108.01	x	0.63	x	0.7	j =	57.11	(78)
South	0.9x	0.77	X	1.33	x	108.01	X	0.63	x	0.7	=	43.9	(78)
South	0.9x	0.77	X	6.76	x	108.01	x	0.63	x	0.7	j =	446.29	(78)
South	0.9x	0.77	x	1.73	х	104.89	x	0.63	x	0.7	j =	55.46	(78)
South	0.9x	0.77	X	1.33	x	104.89	x	0.63	x	0.7	j =	42.64	(78)
South	0.9x	0.77	X	6.76	x	104.89	x	0.63	x	0.7	j =	433.41	(78)
South	0.9x	0.77	X	1.73	x	101.89	x	0.63	x	0.7	j =	53.87	(78)
South	0.9x	0.77	X	1.33	x	101.89	x	0.63	x	0.7	j =	41.41	(78)
South	0.9x	0.77	X	6.76	x	101.89	x	0.63	x	0.7	j =	420.98	(78)
South	0.9x	0.77	X	1.73	x	82.59	X	0.63	x	0.7	] =	43.66	(78)
South	0.9x	0.77	X	1.33	x	82.59	X	0.63	x	0.7	=	33.57	(78)
South	0.9x	0.77	X	6.76	x	82.59	X	0.63	x	0.7	=	341.23	(78)
South	0.9x	0.77	X	1.73	×	55.42	X	0.63	x	0.7	=	29.3	(78)
South	0.9x	0.77	X	1.33	x	55.42	X	0.63	x	0.7	=	22.53	(78)
South	0.9x	0.77	X	6.76	x	55.42	X	0.63	x	0.7	=	228.98	(78)
South	0.9x	0.77	X	1.73	x	40.4	X	0.63	x	0.7	=	21.36	(78)
South	0.9x	0.77	X	1.33	x	40.4	X	0.63	x	0.7	]   =	16.42	(78)
	L		_		I		j l		I		1	<u> </u>	<b>_</b> ` ′

South	0.04		1	0.70	1 .,	40.4	1	0.00	۱.,		1	400.00	7(70)
West	0.9x	0.77	] X	6.76	X	40.4	X	0.63	X	0.7	] = 1	166.92	(78)
West	0.9x	0.77	] X ]	1.93	] X ]	19.64	X 1	0.63	X	0.7	] = ]	11.58	(80)
West	0.9x	0.77	] X ]	3.62	] X ]	19.64	] X ]	0.63	X	0.7	] = 1	65.19	(80)
West	0.9x	0.77	X	1.83	X	19.64	J X 1	0.63	X	0.7	] = 1	10.98	(80)
	0.9x	0.77	X	1.76	J X I	19.64	J X 1	0.63	X	0.7	] = 1	31.69	(80)
West	0.9x	0.77	X 1	1.93	J X	38.42	X	0.63	X	0.7	] = 1	22.66	(80)
West West	0.9x	0.77	X T	3.62	] X	38.42	] X ]	0.63	X	0.7	] = 1	127.52	(80)
West	0.9x	0.77	X	1.83	X	38.42	X	0.63	X	0.7	] = 1	21.49	(80)
	0.9x	0.77	X T	1.76	X	38.42	J X 1	0.63	X	0.7	] = 1	62	(80)
West	0.9x	0.77	X	1.93	X	63.27	J X 1	0.63	Х	0.7	] = 1	37.32	(80)
West	0.9x	0.77	」 X T	3.62	X	63.27	X	0.63	Х	0.7	] = 1	210	(80)
West	0.9x	0.77	」 X ¬	1.83	X	63.27	X	0.63	X	0.7	] =	35.39	(80)
West	0.9x	0.77	X	1.76	X	63.27	X	0.63	Х	0.7	=	102.1	(80)
West	0.9x	0.77	X	1.93	X	92.28	X	0.63	Х	0.7	=	54.43	(80)
West	0.9x	0.77	X	3.62	X	92.28	X	0.63	Х	0.7	=	306.27	(80)
West	0.9x	0.77	X	1.83	X	92.28	X	0.63	Х	0.7	=	51.61	(80)
West	0.9x	0.77	X	1.76	X	92.28	X	0.63	Х	0.7	=	148.91	(80)
West	0.9x	0.77	X	1.93	X	113.09	X	0.63	X	0.7	=	66.71	(80)
West	0.9x	0.77	X	3.62	X	113.09	X	0.63	х	0.7	=	375.35	(80)
West	0.9x	0.77	X	1.83	X	113.09	X	0.63	Х	0.7	=	63.25	(80)
West	0.9x	0.77	X	1.76	X	113.09	X	0.63	Х	0.7	=	182.49	(80)
West	0.9x	0.77	X	1.93	X	115.77	X	0.63	X	0.7	=	68.29	(80)
West	0.9x	0.77	X	3.62	X	115.77	X	0.63	X	0.7	=	384.24	(80)
West	0.9x	0.77	X	1.83	X	115.77	X	0.63	X	0.7	=	64.75	(80)
West	0.9x	0.77	X	1.76	X	115.77	х	0.63	X	0.7	=	186.81	(80)
West	0.9x	0.77	X	1.93	X	110.22	х	0.63	X	0.7	=	65.01	(80)
West	0.9x	0.77	X	3.62	X	110.22	х	0.63	X	0.7	=	365.81	(80)
West	0.9x	0.77	X	1.83	X	110.22	X	0.63	X	0.7	=	61.64	(80)
West	0.9x	0.77	X	1.76	X	110.22	X	0.63	X	0.7	=	177.85	(80)
West	0.9x	0.77	X	1.93	X	94.68	X	0.63	X	0.7	=	55.84	(80)
West	0.9x	0.77	X	3.62	X	94.68	X	0.63	X	0.7	=	314.23	(80)
West	0.9x	0.77	X	1.83	X	94.68	X	0.63	X	0.7	=	52.95	(80)
West	0.9x	0.77	X	1.76	X	94.68	X	0.63	X	0.7	=	152.77	(80)
West	0.9x	0.77	X	1.93	X	73.59	X	0.63	X	0.7	=	43.41	(80)
West	0.9x	0.77	X	3.62	X	73.59	X	0.63	X	0.7	=	244.24	(80)
West	0.9x	0.77	x	1.83	x	73.59	x	0.63	x	0.7	=	41.16	(80)
West	0.9x	0.77	x	1.76	x	73.59	x	0.63	x	0.7	=	118.75	(80)
West	0.9x	0.77	X	1.93	x	45.59	x	0.63	x	0.7	=	26.89	(80)
West	0.9x	0.77	×	3.62	x	45.59	x	0.63	x	0.7	=	151.31	(80)
West	0.9x	0.77	x	1.83	x	45.59	x	0.63	x	0.7	=	25.5	(80)
West	0.9x	0.77	x	1.76	x	45.59	x	0.63	x	0.7	=	73.56	(80)

West	0.9x	0.77	х	1.9	93	х	2	4.49	x		0.63	х	0.7		- [	14.44	(80)
West	0.9x	0.77	x	3.6	32	х	2	4.49	x		0.63	x	0.7	╗ -	• F	81.28	(80)
West	0.9x	0.77	x	1.8	33	х	2	4.49	x		0.63	x	0.7	╡ =	· $\Gamma$	13.7	(80)
West	0.9x	0.77	x	1.7	76	х	2	4.49	x		0.63	_ x _	0.7	╡ =	• <u> </u>	39.52	(80)
West	0.9x	0.77	x	1.9	93	х	1	6.15	х		0.63	x	0.7	╡:	• <u> </u>	9.53	(80)
West	0.9x	0.77	х	3.6	52	х	1	6.15	x		0.63	x	0.7	<u> </u>	- ┌	53.61	(80)
West	0.9x	0.77	x	1.8	33	х	1	6.15	х		0.63	x	0.7		•	9.03	(80)
West	0.9x	0.77	x	1.7	76	x	1	6.15	х		0.63	x	0.7		- T	26.06	(80)
	_					-											
Solar (	gains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m			_		
(83)m=	461.26	826.88	1217.03	1612.76	1874.01	188	82.69	1806.42	1613	3.07	1356.93	939.27	560.56	389.2 <sup>-</sup>	1		(83)
-		nternal a		<u> </u>		<u> </u>									_		
(84)m=	1085.76	1449.09	1818.36	2179.65	2404.56	237	79.25	2281.53	209	4.9	1857.01	1474.02	1135.25	995.2	!		(84)
7. Me	an inter	nal temp	erature	(heating	season	)											
Temp	erature	during h	eating p	eriods ir	n the livi	ng a	area f	rom Tab	ole 9,	, Th′	1 (°C)					21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(se	е Та	ble 9a)									
	Jan	Feb	Mar	Apr	May	,	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	2		
(86)m=	1	1	0.98	0.94	0.82	0	.64	0.48	0.5	54	0.8	0.97	1	1			(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollov	w ste	ps 3 to 7	' in T	able	e 9c)						
(87)m=	19.61	19.84	20.17	20.55	20.84	20	0.96	20.99	20.9	99	20.89	20.48	19.96	19.57			(87)
Temr	erature	during h	eating p	eriods ir	rest of	dwe	ellina	from Ta	ble 9	 9. Th	n2 (°C)			•			
(88)m=	19.93	19.93	19.93	19.94	19.94	_	9.95	19.95	19.9		19.94	19.94	19.94	19.93			(88)
l Itilie:	ation fac	tor for g	ains for	rest of d	welling	h2 r	m (sa	e Table	(Pa)	!							
(89)m=	1	0.99	0.98	0.92	0.77	_	.55	0.37	0.4	12	0.72	0.96	1	1			(89)
	intorno			!	!					<del></del>	!	- O-		<u>!</u>			
(90)m=	18.07	l temper	18.88	19.43	19.78	Ť	9.92	19.94	19.9		19.86	19.33	18.58	18.02			(90)
(30)111=	10.07	10.4	10.00	10.40	13.70		J.JZ	10.04	10	<del>от</del> [			g area ÷ (4		╁	0.14	(91)
													`	,	L	0.14	(0.)
		l temper	<u> </u>	1	i -	$\overline{}$			<del>`</del>	$\overline{}$		40.5	40.70	1 40 04	$\neg$		(02)
(92)m=	18.29	18.6	19.06	19.59	19.94		0.07	20.09	20.0		20.01	19.5	18.78	18.24			(92)
(93)m=	18.29	nent to th	19.06	19.59	19.94	_	0.07	20.09	20.0		20.01	19.5	18.78	18.24			(93)
		ting requ		L	10.04		3.07	20.00	20.	00	20.01	10.0	10.70	10.24			(00)
•		mean int			re obtair	ned	at ste	ep 11 of	Tabl	e 9b	o, so tha	t Ti.m=(	76)m an	d re-ca	alcul	ate	
		factor fo		•			u. 0	ур т т от			,, 00 1110	, (					
	Jan	Feb	Mar	Apr	May	,	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec			
Utilisa	ation fac	tor for g	ains, hm	1:	•									•	_		
(94)m=	1	0.99	0.97	0.91	0.77	0	.56	0.38	0.4	4	0.73	0.95	0.99	1			(94)
		hmGm ,	· `	r ·											_		
(95)m=		1437.92		<u> </u>	1848.15	Ь	38.93	875.78	920	.15	1356.58	1406.39	1129.11	993.87	7		(95)
	<del></del>	age exte		<del>i                                     </del>				15.5	, -	, ,	1	45.5			7		(00)
(96)m=	4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.		14.1	10.6	7.1	4.2			(96)
Heat (97)m=	3599.64	e for mea 3519.7	an intern 3220.6	<del></del>	2090.74	_	_	=[(39)m : 880.58	x [(93 929	Ť	- (96)m 1493.23		2974.14	3597.0	55		(97)
(31)111=	5555.04	5518.7	JZZU.0	2111.40	2030.74	13	. 3.11	000.00	929	.02	1430.23	2230.30	2314.14	3307.2			(01)

Space heating require	ment fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m= 1871.95 1398.96	1080.38	530.75	180.49	0	0	0	0	634.33	1328.42	1929.48		_
						Tota	l per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	8954.75	(98)
Space heating require	ement in	kWh/m²	<sup>2</sup> /year								41.49	(99)
9a. Energy requiremen	ts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:			, .							_		¬,,,,
Fraction of space hea				mentary	system		(204)			Ļ	0	(201)
Fraction of space hea			, ,			(202) = 1	` '	(000)1		Ļ	1	(202)
Fraction of total heatir	_	-				(204) = (2	02) × [1 –	(203)] =		Ļ	1	(204)
Efficiency of main spa										Ĺ	93.5	(206)
Efficiency of secondar	y/supple	ementar	y heating	g systen	ո, % • • • • • •						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating require					I 0			004.00	1000 40	4000 40		
1871.95 1398.96	1080.38	530.75	180.49	0	0	0	0	634.33	1328.42	1929.48		
$(211)m = \{[(98)m \times (2002.09)] + (496.21)\}$		00 ÷ (20 567.65	193.03	0	0	0	0	678.43	1420.77	2063.61		(211)
2002.09 1490.21	1155.49	307.03	193.03						211) <sub>15.1012</sub>		9577.28	(211)
Space heating fuel (se = {[(98)m x (201)]} x 10	-		month					(	715,1012	L	3377.20	(=++/
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0	0	0	0	0	0	0	0	0	0		
` '					ļ	Tota	l I (kWh/yea	ı ar) =Sum(2	1 215) <sub>15,1012</sub>	=	0	(215)
Water heating										L		
Output from water heat				1			1	1				
224.64 197.95	207.78	186.11	182.28	162.71	156.12	171.52	171.28	193	204.26	219.18		7,
Efficiency of water hea		07.40	0.4.70	70.0	T 70.0	T 70 0	70.0	07.70	00.04	00.00	79.8	(216)
(217)m= 89.22 89.02	88.58	87.46	84.79	79.8	79.8	79.8	79.8	87.76	88.91	89.28		(217)
Fuel for water heating, $(219)m = (64)m \times 100$												
(219)m= 251.78 222.36	234.56	212.81	214.98	203.9	195.64	214.93	214.64	219.92	229.74	245.5		
						Tota	I = Sum(2	19a) <sub>112</sub> =			2660.77	(219)
Annual totals								k'	Wh/year		kWh/yea	<u>r</u>
Space heating fuel use	•	system	1							Ļ	9577.28	╛
Water heating fuel use	d									L	2660.77	
Electricity for pumps, fa	ans and	electric	keep-ho	t								
central heating pump:										30		(2300
boiler with a fan-assis	ted flue									45		(230
Total electricity for the	above, k	:Wh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting	•	-								L F	607.5	(232)
=.sourion, for lighting										L	007.0	

Energy

kWh/year

Stroma FSAP 2012 Version: 1.0.4.14 (SAP 9.92) - http://www.stroma.com

**Emissions** 

kg CO2/year

**Emission factor** 

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	2068.69	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	574.73	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2643.42	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	315.29	(268)
Total CO2, kg/year	sum	of (265)(271) =		2997.63	(272)

TER =

(273)

13.89

		l lser I	Details:						
Assessor Name:	Joseph Treanor	<u> </u>	Strom	a Num	ber:		STRO	032062	
Software Name:	Stroma FSAP 2012		Softwa	are Ve	rsion:		Versio	n: 1.0.4.14	
			Address	: P1					
Address :	, Gondar Gardens, London,	NW6 1	HG						
1. Overall dwelling dime	ensions:	Δro	ea(m²)		Δν Ηο	ight(m)		Volume(m	3)
Basement			119.63	(1a) x		.55	(2a) =	305.06	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1i	n)	119.63	] [(4)			1		
Dwelling volume		/ <u></u>	110.00	J	)+(3c)+(3c	d)+(3e)+	.(3n) =	305.06	(5)
				(00)	,,,(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	., (		305.06	(3)
2. Ventilation rate:	main seconda	y	other		total			m³ per hou	ır
Number of chimneys	heating heating  0 + 0	<b>-</b> + F	0	7 = [	0	x 4	40 =	0	(6a)
Number of open flues		╣    -  -	0	_	0	x 2	20 =	0	(6b)
Number of intermittent fa		J L				x 1	10 =		╡`′
				L	4		10 =	40	(7a)
Number of passive vents				Ļ	0			0	(7b)
Number of flueless gas f	ires				0	X 2	40 =	0	(7c)
							Air ch	anges per he	our
Infiltration due to chimne	eys, flues and fans = $(6a)+(6b)+(7a)$	<sup>7</sup> a)+(7b)+	(7c) =	Г	40		÷ (5) =	0.13	(8)
If a pressurisation test has l	been carried out or is intended, procee	d to (17),	otherwise (	continue fr	rom (9) to		, ,		``
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration	) OF for atoal or timber from a	. 0 25 fa	r maaan	m ( aanatı	nuction.	[(9)-	-1]x0.1 =	0	(10)
	0.25 for steel or timber frame on present, use the value corresponding to			•	uction			0	(11)
deducting areas of openi	ings); if equal user 0.35								_
•	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	rs and doors draught stripped							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(14)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) ·	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metre	s per h	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] + ($	8), otherw	vise (18) =	(16)				0.38	(18)
	es if a pressurisation test has been do	ne or a de	egree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed		(20) = 1 -	[0.075 x (*	19)] =			0.85	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18		-71			0.83	(21)
Infiltration rate modified	_		` , ,	, , ,				0.02	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7	•		•	•	•			
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (20c) (2	(2)m : 4							-	
Wind Factor (22a)m = (2 $(22a)m = 1.27$ 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]	
(ΣΣα)ΠΤ 1.21 1.20	1.20 1.11 1.00 0.95	1 0.95	0.32	<u> </u>	1.00	1.14	1.10	I	

0.41   Calculate effec If mechanica	0.4	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38		
	live all	change i					1 0.0	0.02	0.00	1 0.00		l	
												0	(2
If exhaust air he		0		, ,	, ,	. ,	,, .	`	) = (23a)		Į	0	(2
If balanced with		-	-	_								0	(2
a) If balanced					<b>.</b>	<u> </u>	<del>- ^ `</del>	<del>```</del>	<del> </del>	<del></del>	<del>``</del>	÷ 100]	(0
24a)m= 0	0		0	0	0	0	0	0	0	0	0		(2
b) If balance					i		<del>- ^ ` ` </del>	<del>í `</del>	<del>r ´       `</del>	<del>-                                    </del>		l	(2
24b)m= 0	0	0	0	0		0	0	0	0	0	0		(2
c) If whole ho if (22b)m				•					5 v (23h	<b>5)</b>			
$\frac{11(220)111}{24c)m=0}$	0.5 \( \)	0	0	0	0	0	0	0	0	0	0		(2
d) If natural v			,		<u> </u>			<u> </u>					•
if (22b)m				•	•				0.5]				
24d)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(2
2 Hoot lossed	and he	oot loog r	paramata	or:						•			
3. Heat losses		•			Not Am		اميرا		A V I I		مريامين ا		V L
LEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·k		λ X k J/K
Vindows Type		,			4.92		/[1/( 1.4 )+	0.04] =	6.52	<u></u>			(2
Vindows Type	2				4.92	x1	/[1/( 1.4 )+	0.04] =	6.52				(2
Vindows Type	3				2.39	x1	/[1/( 1.4 )+	0.04] =	3.17				(2
loor					119.6	3 x	0.13	:  -  -	15.5519	9 [		7 [	(2
Valls Type1	74.7	7	12.23	3	62.54	=	0.18	╡┇	11.26	<b>=</b>		7 =	(2
Valls Type2	12.3		0		12.35	=	0.18	<b>=</b>	2.22	<b>=</b>		<b>i</b>	<u> </u>
otal area of el					206.7	=							` (3
Party wall		,			36.38	=	0		0	<b>—</b> [		<b>–</b>	(3
for windows and i	roof winde	ows. use e	ffective wi	ndow U-va						l L as aiven in	paragraph		(``
* include the areas								•	, ,	Ü	, , ,		
abric heat loss	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				45.25	(3
leat capacity C	2m = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	19289.8	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
For design assessi				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
<i>an be used instea</i> Thermal bridge				ısina Ar	nendix k	<b>(</b>					ſ	11.05	(3
details of thermal						`					l	11.05	(
otal fabric hea		aro not ar	omii (00) =	- 0.70 % (0	'/			(33) +	(36) =			56.3	(3
	t loss ca	alculated	l monthly	/				(38)m	= 0.33 × (	(25)m x (5)	)		
entilation heaf		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
entilation hear	Feb				_				_	_			
	58.59	58.26	56.73	56.44	55.1	55.1	54.85	55.62	56.44	57.02	57.63		(3
Jan	58.59	58.26	56.73	56.44	55.1	55.1	54.85	<u> </u>	56.44 = (37) + (		57.63		(3

at loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
m= 0.96	0.96	0.96	0.94	0.94	0.93	0.93	0.93	0.94	0.94	0.95	0.95		
mber of day	s in moi	oth (Tah	la 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.94	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
Water heat	ing enei	rgy requi	rement:								kWh/yea	ar:	
sumed occu f TFA > 13.9 f TFA £ 13.9	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13.		86		(4
nual averag luce the annua more that 125	l average	hot water	usage by	5% if the a	welling is	designed t			se target o		2.17		(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
water usage ir	i litres per	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)						
m= 112.39	108.3	104.21	100.13	96.04	91.95	91.95	96.04	100.13	104.21	108.3	112.39		<b>—</b> ,
ergy content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1226.03	(4
m= 166.67	145.77	150.42	131.14	125.83	108.58	100.62	115.46	116.84	136.16	148.63	161.41		
								-	Total = Su	m(45) <sub>112</sub> =	=	1607.52	(
stantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,	) to (61)					
m= 25	21.87	22.56	19.67	18.87	16.29	15.09	17.32	17.53	20.42	22.3	24.21		(
iter storage orage volum		includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(
ommunity h	` ,					ŭ					<u> </u>		`
nerwise if no	stored	hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
ter storage					4.144	/ I \							
If manufact				or is kno	wn (kWh	n/day):					0		(
mperature fa											0		(
ergy lost fro If manufact		-	-				(48) x (49)	) =			0		(
t water stora			-								0		(
ommunity h	•			- (	.,	-57					<u> </u>		`
ume factor	from Ta	ble 2a									0		(
mperature fa	actor fro	m Table	2b								0		(
ergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(
ter (50) or (	54) in (5	55)									0		(
iter storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)ı	m				
m= 0	0	0	0	0	0	0	0	0	0	0	0		(
linder contains	dedicate	d solar sto	rage, (57)r	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (57	7)m = (56)	m where (	H11) is fro	m Appendix	Н	
m= 0	0	0	0	0	0	0	0	0	0	0	0		(
mory circuit	loss (ar	nual) fro	m Table	3							0		(
Halv Circuit	1000 101		nn rabii										
mary circuit	•	•			59)m = (	(58) ÷ 36	65 × (41)	m					
•	loss cal	culated f	or each	month (	•	. ,	, ,		r thermo	estat)			

0 1:1				(0.4)	(00)	.05 (44								
Combi loss (				<del>`                                    </del>	,	<del>`</del>	<u> </u>	<u> </u>	10.00	50.00	T 40.00		1	(61)
(61)m= 50.96		50.96	49.32	48.94	45.35	46.86	48.		49.32	50.96	49.32	50.96	(50) (04)	(01)
	<del></del>						<del>`</del>	_			<del>`</del>	<del>`´</del>	(59)m + (61)m 1	(60)
(62)m= 217.6		201.38	180.45	174.77	153.93	147.48	164		166.15	187.12	197.95	212.37		(62)
Solar DHW inpu										r contribu	tion to wate	er heating)		
(add addition (63)m= 0		0	0	0	applie:	s, see Ap	pend		0	0	0	0	1	(63)
` /			0		0	1 -			0	0			l	(00)
Output from (64)m= 217.6		201.38	180.45	174.77	153.93	147.48	164	14	166.15	187.12	197.95	212.37	1	
(04)111= 217.0	2 191.79	201.30	100.43	174.77	100.90	147.40	<u> </u>				er (annual)	ļ	2195.42	(64)
Heat going f	rom water	hooting	Id M/b /m	anth 0 2	= ′ [O O!	(4E) m								](0.)
Heat gains f	_	62.75	55.93	54.07	47.44	45.17	50.0	<del>_</del>	51.18	58.01	61.75	66.41	] 	(65)
` '						ı	L				<u> </u>			(00)
include (5	<u> </u>		. ,		yiiridei	is in the c	uweii	ing (	or not w	aler is i	rom com	irriuriity r	leating	
5. Internal	,			):										
Metabolic ga					1	1	١ ٨.		0	0-4	Nan		1	
Jar		Mar	Apr	May	Jun	Jul	_	ug	Sep	Oct	Nov	Dec		(66)
(66)m= 143.0		143.09	143.09	143.09	143.09	143.09	143		143.09	143.09	143.09	143.09	l	(66)
Lighting gair				<del></del>		<del> </del>	1			0.1.1	1 00 40		1	(67)
(67)m= 29.18		21.07	15.95	11.93	10.07	10.88	14.		18.98	24.1	28.13	29.99		(67)
Appliances (	<u> </u>					1	<del>r ´</del>				1	Γ	1	(22)
(68)m= 284.7	_	280.24	264.39	244.38	225.58	213.01	210		217.5	233.35	253.36	272.17		(68)
Cooking gair	<del>_`</del>			<del></del>		<del> </del>	_	_			<del>-</del>	i	1	
(69)m= 37.3°	37.31	37.31	37.31	37.31	37.31	37.31	37.	31	37.31	37.31	37.31	37.31		(69)
Pumps and	ans gains	(Table 5	ōa)										1	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3		(70)
Losses e.g.											1	T	1	
(71)m= -114.4	7 -114.47	-114.47	-114.47	-114.47	-114.47	-114.47	-114	.47	-114.47	-114.47	-114.47	-114.47		(71)
Water heating	ıg gains (⅂	able 5)									_			
(72)m= 91.6°	89.25	84.35	77.68	72.68	65.89	60.71	68.	05	71.08	77.98	85.76	89.26		(72)
Total intern	al gains =	:			(66	6)m + (67)m	า + (68	3)m +	· (69)m + (	(70)m + (7	71)m + (72)	)m		
(73)m= 474.4	4 471.77	454.59	426.96	397.91	370.46	353.53	361	.17	376.49	404.36	436.18	460.34		(73)
6. Solar ga														
Solar gains ar		•				·	ations	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²		Flo	ux ible 6a		т.	g_ able 6b	т	FF able 6c		Gains (W)	
							,			_ '	able oc		` '	,
East 0.9		X	4.9	92	X	19.64	X		0.63	_  ×	0.7	=	29.53	(76)
East 0.9		X	4.9	92	X	38.42	X		0.63	_  ×	0.7	=	57.77	(76)
East 0.9		X	4.9	92	X	63.27	X		0.63	×	0.7	=	95.14	(76)
East 0.93		X	4.9	92	X	92.28	X		0.63	x	0.7	=	138.75	(76)
East 0.9	1	×	4.9	92	X ·	113.09	X		0.63	X	0.7	=	170.05	(76)

	_					_			-			_				_
East	0.9x	1	:	x	4.92	X	1	15.77	X		0.63	X	0.7	=	174.07	(76)
East	0.9x	1		x	4.92	X	1	10.22	X		0.63	X	0.7	=	165.73	(76)
East	0.9x	1		x	4.92	X	Ś	94.68	X		0.63	X	0.7	=	142.36	(76)
East	0.9x	1		x	4.92	X	7	'3.59	X		0.63	X	0.7	=	110.65	(76)
East	0.9x	1		x	4.92	x	4	5.59	X		0.63	X	0.7	=	68.55	(76)
East	0.9x	1	:	x	4.92	x	2	24.49	X		0.63	x	0.7	=	36.82	(76)
East	0.9x	1	:	x	4.92	x	1	6.15	X		0.63	x	0.7	=	24.29	(76)
West	0.9x	0.77	:	x	4.92	x	,	9.64	X		0.63	X	0.7	=	29.53	(80)
West	0.9x	0.77		x	2.39	x	1	9.64	X		0.63	X	0.7	=	14.35	(80)
West	0.9x	0.77		x	4.92	x	3	88.42	X		0.63	X	0.7	=	57.77	(80)
West	0.9x	0.77	:	x	2.39	x	3	88.42	X		0.63	X	0.7	=	28.06	(80)
West	0.9x	0.77	:	x	4.92	x	(	3.27	X		0.63	X	0.7	=	95.14	(80)
West	0.9x	0.77	:	x	2.39	x	(	3.27	x		0.63	x	0.7		46.22	(80)
West	0.9x	0.77		x	4.92	×	9	2.28	x		0.63	x	0.7	<u> </u>	138.75	(80)
West	0.9x	0.77	:	x	2.39	×	9	2.28	x		0.63	х	0.7	=	67.4	(80)
West	0.9x	0.77	<del></del>	x	4.92	x	1	13.09	x		0.63	x	0.7	=	170.05	(80)
West	0.9x	0.77	===	x	2.39	×	1	13.09	x		0.63	x	0.7	=	82.6	(80)
West	0.9x	0.77	:	x	4.92	×	1	15.77	x		0.63	х	0.7	=	174.07	(80)
West	0.9x	0.77	:	x	2.39	x	1	15.77	x		0.63	x	0.7	=	84.56	(80)
West	0.9x	0.77	:	x	4.92	×	1	10.22	x		0.63	х	0.7	<u> </u>	165.73	(80)
West	0.9x	0.77	:	x	2.39	×	1	10.22	x		0.63	х	0.7	=	80.51	(80)
West	0.9x	0.77	<u> </u>	x	4.92	x	9	94.68	x		0.63	x	0.7	=	142.36	(80)
West	0.9x	0.77	===	x	2.39	x	9	94.68	x		0.63	х	0.7	=	69.15	(80)
West	0.9x	0.77	:	x	4.92	j x	7	73.59	x		0.63	х	0.7	=	110.65	(80)
West	0.9x	0.77		x	2.39	×	7	73.59	x		0.63	x	0.7	=	53.75	(80)
West	0.9x	0.77	:	x	4.92	×	4	15.59	x		0.63	х	0.7	<u> </u>	68.55	(80)
West	0.9x	0.77	<u> </u>	x	2.39	×	4	5.59	x		0.63	x	0.7	<del>-</del>	33.3	(80)
West	0.9x	0.77	=	x	4.92	Īx	2	24.49	x		0.63	x	0.7	<del>-</del>	36.82	(80)
West	0.9x	0.77	:	x	2.39	x	2	24.49	x		0.63	х	0.7	=	17.89	(80)
West	0.9x	0.77	<u> </u>	x	4.92	×		6.15	x		0.63	x	0.7	<del>-</del>	24.29	(80)
West	0.9x	0.77	=	x	2.39	Īx	7	6.15	x		0.63	x	0.7	<del>-</del>	11.8	(80)
	_								-							
Solar g	ains in	watts, ca	alculate	d	for each mon	th			(83)m	n = Si	um(74)m .	(82)m			_	
(83)m=	73.41	143.6	236.49		344.91 422.7		432.71	411.96	353	.86	275.05	170.4	91.53	60.37		(83)
Ĭ				_	(84)m = $(73)$ r	_	, ,						_	1	7	
(84)m=	547.85	615.38	691.08		771.87 820.6	2	803.17	765.49	715	.04	651.54	574.7	5 527.71	520.71	]	(84)
7. Me	an inter	nal temp	erature	e (I	heating seas	on)										
Temp	erature	during h	eating	ре	eriods in the li	iving	g area	from Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains fo	r liv	ving area, h1	,m (	see Ta	ble 9a)							-	
	Jan	Feb	Mar	$\downarrow$	Apr Ma	у	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	1	
(86)m=	1	1	1		0.98 0.94		8.0	0.62	0.6	88	0.92	0.99	1	1	]	(86)
Mean	interna	l temper	ature ir	ı li	ving area T1	(foll	ow ste	ps 3 to 7	7 in T	able	e 9c)				_	
(87)m=	19.88	20	20.21		20.5 20.77	7	20.94	20.99	20.	98	20.86	20.51	20.15	19.87	]	(87)
•															_	

Composition   Composition	Tompor	ratura d	urina h	eating n	oriode ir	rest of	dwelling	ı from Ta	blo 0 T	h2 (°C)					
Begin	· · · · ·							1	1	<u> </u>	20.13	20.13	20.12		(88)
Begin	Utilisatio	on facto	or for a	ains for i	rest of d	wellina.	h2.m (se	ee Table	9a)					I	
(90)  18.6   18.77   19.08   19.52   19.89   20.1   20.14   20.13   20.01   19.53   18.99   18.58   (90)  18.4   Living area + (4) =		- 1	<u>_</u>				<del>```</del>	1	<del></del>	0.87	0.99	1	1		(89)
(90)  18.6   18.77   19.08   19.52   19.89   20.1   20.14   20.13   20.01   19.53   18.99   18.58   (90)  18.4   Living area + (4) =	∟ Mean ir	nternal t	emper	ature in	the rest	of dwelli	ina T2 (f	ollow ste	ens 3 to	7 in Tabl	e 9c)			I	
Man intermal temperature (flor the whole dwelling) = fLA x T1 + (1 - fLA) x T2   (92)m							<del>` ` `</del>	i	<u> </u>			18.99	18.58		(90)
(92)me 8.833 19.08 19.38 19.78 20.12 20.32 20.36 20.36 20.23 19.78 19.3 18.92 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate  93)me 18.93 19.09 19.38 19.78 20.12 20.32 20.36 20.38 20.23 19.78 19.3 18.92 (93)  8.52ace heating requirement  Set Tit 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, sim:  (94)me 1 1 0.99 0.98 0.91 0.74 0.54 0.6 0.88 0.99 1 1 1 (94)  Useful gains, hmGm, W = (94)m x (84)m (96)m (96)m (96)m (96)m (96)m (96)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m	<u> </u>	I_	!				<u>!</u>	<u>!</u>	<u>I</u>	<u> </u>	LA = Livin	g area ÷ (4	1) =	0.26	(91)
(92)me 8.833 19.08 19.38 19.78 20.12 20.32 20.36 20.36 20.23 19.78 19.3 18.92 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate  93)me 18.93 19.09 19.38 19.78 20.12 20.32 20.36 20.38 20.23 19.78 19.3 18.92 (93)  8.52ace heating requirement  Set Tit 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, sim:  (94)me 1 1 0.99 0.98 0.91 0.74 0.54 0.6 0.88 0.99 1 1 1 (94)  Useful gains, hmGm, W = (94)m x (84)m (96)m (96)m (96)m (96)m (96)m (96)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m (96)m (97)m	Mean in	nternal t	emner:	ature (fo	r the wh	awb alwa	lling) – f	ΙΔ <b>ν</b> Τ1	⊥ (1 _ fl	Δ) <b>v</b> T2					
Sample   18,93   19,08   19,38   19,78   20,12   20,32   20,36   20,36   20,23   19,78   19,3   18,92   (83)			<del></del>	<u> </u>					<del></del>		19.78	19.3	18.92		(92)
Set 71 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		ıdjustme	ent to th	ne mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate			l	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 1 1 0 99 0.98 0.91 0.74 0.54 0.6 0.88 0.99 1 1 1 (94) 0.99 0.98 0.91 0.74 0.54 0.6 0.88 0.99 1 1 1 (95)m= 547.31 614.05 886.65 752.64 746.53 595.95 413.63 430.24 571.57 566.74 526.59 520.33 (95) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	· · · · · —	<del>-</del> -	i				1	ì		· · ·	·	19.3	18.92		(93)
The utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	8. Spac	e heatir	ng requ	uirement											
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec					•		ned at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Utilisation factor for gains, hm:   (94)m   1			1				<del> </del>	Ι					_	l	
(94)   (94)   (94)   (94)   (95)   (94)   (94)   (94)   (94)   (95)   (95)   (95)   (97)   (9					· ·	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	İ	
Useful gains, hmGm, W = (94)m x (84)m  (95)m= 547.31 614.05 686.85 752.64 746.53 595.95 413.63 430.24 571.57 566.74 526.59 520.33  (95)mMonthly 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  Heat loss rate for mean internal temperature, Lm, W = [(39)m x   (93)m - (96)m ]  (97)m= 1686.07 1630.06 1474.98   1229.12 949.24 637.22 418.91 439.8   686.13   1035.36   1382.02   1676.64  Space heating requirement for each month, kWh/month = 0.024 x   (97)m - (95)m   x (41)m  (98)m= 847.24 682.76 586.52 343.06   150.82 0 0 0 0 0 348.65   615.91   860.3  Space heating requirement in kWh/m²/year  37.07 (99)  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system (\$ (202) = 1 - (201) =						0.91	0.74	0.54	0.6	0.88	n aa	1	1	1	(94)
(95)me   547.31   614.05   686.65   752.64   746.53   595.95   413.63   430.24   571.57   566.74   526.59   520.33   (95)							0.74	0.54	0.0	0.00	0.55	'	'		(01)
Monthly average external temperature from Table 8 (96)m= 4.3			1	`	<u> </u>		595.95	413.63	430.24	571.57	566.74	526.59	520.33		(95)
(96)me	` '		ie exte	rnal tem	perature	from Ta	L able 8	ļ	<u> </u>	<u> </u>				l	
(97)me   1686.07   1630.06   1474.98   1229.12   949.24   637.22   1418.89   439.8   686.13   1035.36   1382.02   1676.64   Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m    (98)me   847.24   682.76   586.52   343.06   150.82   0   0   0   0   348.65   615.91   860.3    Total per year (kWh/year) = Sum(98)48.12   4435.25   (98)    Space heating requirement in kWh/m²/year   37.07   (99)  9a. Energy requirements — Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system   0   (201)    Fraction of space heat from main system(s)   (202) = 1 - (201) =   1   (202)    Fraction of total heating from main system 1   (204) = (202) × [1 - (203)] =   1   (204)    Efficiency of main space heating system 1   (204) = (202) × [1 - (203)] =   1   (204)    Efficiency of secondary/supplementary heating system, %   0   (208)    Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year   Space heating requirement (calculated above)    847.24   682.76   586.52   343.06   150.82   0   0   0   0   348.65   615.91   860.3    (211)m = {[(98)m x (204)] } × 100 ÷ (206)   (211)    Space heating fuel (secondary), kWh/month   = {[(98)m x (201)] } × 100 ÷ (208)    (215)m = 0   0   0   0   0   0   0   0   0   0					i –			16.6	16.4	14.1	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	Heat los	ss rate f	or mea	an intern	al tempe	erature,	Lm , W :	=[(39)m:	x [(93)m	– (96)m	]			I	
Space   B47.24   682.76   586.52   343.06   150.82   0   0   0   0   348.65   615.91   860.3	(97)m= 16	686.07 1	630.06	1474.98	1229.12	949.24	637.22	418.89	439.8	686.13	1035.36	1382.02	1676.64		(97)
Space heating requirement in kWh/m²/year   Sum(98)sa.12   4435.25   (98)	Space h	heating	require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4 <sup>-</sup>	1)m		•	
Space heating requirement in kWh/m²/year   37.07   (99)	(98)m= 8	347.24	682.76	586.52	343.06	150.82	0	0	0	0	348.65	615.91	860.3		
Space heating:   Space heat from secondary/supplementary system   O (201)									Tota	l per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	4435.25	(98)
Space heating:           Fraction of space heat from secondary/supplementary system         0 (201)           Fraction of space heat from main system(s)         (202) = 1 - (201) = (202) × [1 - (203)] = (204)         1 (202)           Fraction of total heating from main system 1         (204) = (202) × [1 - (203)] = (203) = (204)         1 (204)           Efficiency of main space heating system 1         93.4 (206)           Efficiency of secondary/supplementary heating system, %         0 (208)           Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         kWh/year           Space heating requirement (calculated above)         847.24 (682.76 (586.52 (343.06 (150.82 0 0 0 0 0 348.65 (615.91 (60.3))))) (206)         (211)           (211)m = {[(98)m x (204)] } x 100 ÷ (206)         70 (206)         70 (206)         70 (206)           Fotal (kWh/year) = Sum(211) (1.5.9012)         4748.67 (211)         4748.67 (211)           Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)         4748.67 (211)         4748.67 (211)	Space h	heating	require	ement in	kWh/m²	/year								37.07	(99)
Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  847.24 682.76 586.52 343.06 150.82 0 0 0 0 348.65 615.91 860.3  (211)m = {[[98]m x (204)]} x 100 ÷ (206)  Total (kWh/year) = Sum(211) <sub>151012</sub> 4748.67 (211)  Space heating fuel (secondary), kWh/month = {[[98]m x (201)]} x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9a. Ener	gy requ	iremen	ıts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  847.24 682.76 586.52 343.06 150.82 0 0 0 0 348.65 615.91 860.3  (211)m = {[[(98)m x (204)]] x 100 ÷ (206)}  Total (kWh/year) = Sum(211)_1_5.1012 = 4748.67 (211)  Space heating fuel (secondary), kWh/month  = {[[(98)m x (201)]] x 100 ÷ (208)}  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Space I	heating	<b>j</b> :				,	9		,					
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) (206) (208) (	Fraction	n of spa	ce hea	t from se	econdar	y/supple	mentary	system						0	(201)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  847.24 682.76 586.52 343.06 150.82 0 0 0 0 348.65 615.91 860.3  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  907.11 731 627.96 367.31 161.47 0 0 0 0 373.29 659.43 921.09  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 4748.67  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction	n of spa	ce hea	t from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  847.24 682.76 586.52 343.06 150.82 0 0 0 0 348.65 615.91 860.3  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  907.11 731 627.96 367.31 161.47 0 0 0 0 373.29 659.43 921.09  Total (kWh/year) = Sum(211),5,1012 = 4748.67 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction	n of tota	l heatir	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   kWh/year	Efficien	cy of ma	ain spa	ce heat	ing syste	em 1								93.4	(206)
Space heating requirement (calculated above)  847.24	Efficien	cy of se	conda	ry/supple	ementar	y heatin	g systen	ո, %						0	(208)
Space heating requirement (calculated above)  847.24	Г	Jan	Feh	Mar	Anr	May	Jun	Jul	Aug	Sen	Oct	Nov	Dec	k\/\h/v#	—l ⊇ar
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	L Space h						I.	l oui	7 tug	ОСР	001	1101	DCC		Jui
$907.11  731  627.96  367.31  161.47  0  0  0  0  373.29  659.43  921.09$ $Total (kWh/year) = Sum(211)_{15,1012} = \qquad 4748.67  (211)$ $Space heating fuel (secondary), kWh/month$ $= \{[(98)m \times (201)] \} \times 100 \div (208)$ $(215)m = 0  0  0  0  0  0  0  0  0$	· —	Ť	<del></del>				<u> </u>	0	0	0	348.65	615.91	860.3		
$907.11  731  627.96  367.31  161.47  0  0  0  0  373.29  659.43  921.09$ $Total (kWh/year) = Sum(211)_{15,1012} = \qquad 4748.67  (211)$ $Space heating fuel (secondary), kWh/month$ $= \{[(98)m \times (201)] \} \times 100 \div (208)$ $(215)m = 0  0  0  0  0  0  0  0  0$	 = (211)m =	 = {[(98)n	n x (20	4)1 } x 1	00 ÷ (20	)6)	<u> </u>	<u> </u>	ļ	ļ		ļ		I	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) (215)m=					· ·		0	0	0	0	373.29	659.43	921.09		( )
$= \{ [(98)m \times (201)] \} \times 100 \div (208)$ $(215)m =                                   $	_		!				<u> </u>	<u> </u>	Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<b>=</b>	4748.67	(211)
$= \{ [(98)m \times (201)] \} \times 100 \div (208)$ $(215)m =                                   $	Space h	heatina	fuel (se	econdar	y), kWh/	month								<u>L</u>	
	•	_	•		• •										
Total (kWh/year) =Sum(215) <sub>15,10,12</sub> = 0 (215)	(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
									Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>		0	(215)

217.62 191.79 201.38 180.45 174.77 1	53.93 147.48	164.4	166.15	187.12	197.95	212.37		
Efficiency of water heater	33.93   147.40	104.4	100.15	107.12	197.93	212.37	80.3	(21
	80.3 80.3	80.3	80.3	86.6	87.72	88.2	80.3	ا کا 21)
Fuel for water heating, kWh/month	00.5	00.3	00.5	00.0	07.72	00.2		(2
$219)m = (64)m \times 100 \div (217)m$								
219)m= 246.92   218.01   229.92   208.27   206.38   1	91.69 183.66	204.73	206.92	216.09	225.67	240.77		_
		Total	= Sum(2 <sup>-</sup>	19a) <sub>112</sub> =			2579.04	(2
Annual totals				k\	Wh/year		kWh/year	1
Space heating fuel used, main system 1						ļ	4748.67	]
Vater heating fuel used							2579.04	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(2
boiler with a fan-assisted flue						45		(2
Total electricity for the above, kWh/year		sum c	of (230a).	(230g) =			75	(2:
Electricity for lighting						ĺ	515.24	(2:
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						
	Energy			Emiss	ion fac	tor	Emissions	
	kWh/year			kg CO	2/kWh		kg CO2/yea	r
	Kvvii/y <del>c</del> ai							(26
Space heating (main system 1)	(211) x			0.2	16	=	1025.71	1,
Space heating (main system 1) Space heating (secondary)	•			0.2		= [	1025.71 0	] (26
Space heating (secondary)	(211) x				19	l I		,
Space heating (secondary) Vater heating	(211) x (215) x	+ (263) + (2	64) =	0.5	19	=	0	] [2
Space heating (secondary)  Vater heating  Space and water heating	(211) x (215) x (219) x	+ (263) + (2	64) =	0.5	19	=	0 557.07	](2 ](2 ](2
	(211) x (215) x (219) x (261) + (262)	+ (263) + (2	64) =	0.5	19 16 19	= [	0 557.07 1582.78	](2 ](2

TER =

(273)

15.79

	llser	Details:						
Assessor Name: Joseph Treanor	— - <del></del>		a Num	ber:		STRO	032062	
Software Name: Stroma FSAP 2012		Softwa	are Ve	rsion:		Versio	on: 1.0.4.14	
	•	Address	: P2					
Address: , Gondar Gardens, Lond 1. Overall dwelling dimensions:	on, NW6 1	HG						
1. Overall uwelling ulfriensions.	Are	ea(m²)		Av. He	ight(m)		Volume(m	3)
Basement			(1a) x		2.55	(2a) =	274.97	(3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+$	(1n)	107.83	(4)			_		
Dwelling volume			(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	274.97	(5)
2. Ventilation rate:								
main secon heating heati	dary	other		total			m³ per hoι	ır
Number of chimneys 0 + 0		0	<b>]</b> = [	0	x 4	40 =	0	(6a)
Number of open flues 0 + 0	<del></del>	0	<b>-</b>	0	x	20 =	0	(6b)
Number of intermittent fans				4	x ·	10 =	40	(7a)
Number of passive vents				0	x ·	10 =	0	(7b)
Number of flueless gas fires				0	x 4	40 =	0	(7c)
			<u>L</u>					
			_			Air ch	nanges per he	our —
Infiltration due to chimneys, flues and fans = (6a)+(6l)  If a pressurisation test has been carried out or is intended, pro			continuo fi	40		÷ (5) =	0.15	(8)
Number of storeys in the dwelling (ns)	) (17),	Oli ICI WISC (	continue n	0111 (3) 10	(10)		0	(9)
Additional infiltration					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame			•	ruction			0	(11)
if both types of wall are present, use the value corresponding deducting areas of openings); if equal user 0.35	ng to the grea	iter wall are	ea (atter					
If suspended wooden floor, enter 0.2 (unsealed) of	or 0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, enter 0.05, else enter 0							0	(13)
Percentage of windows and doors draught strippe	ed	0.25 [0.0	) v (4.4) v 4	1001			0	(14)
Window infiltration			2 x (14) ÷ 1 + (11) + (1	-	± (15) =		0	(15)
Infiltration rate  Air permeability value, q50, expressed in cubic m	otroe nor h					aroa	0	(16)
If based on air permeability value, then (18) = $[(17) \div 2]$	-		•	ietie oi e	rivelope	aica	0.4	(17)
Air permeability value applies if a pressurisation test has beer				is being u	sed		0.4	(,,,
Number of sides sheltered							2	(19)
Shelter factor			[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18	s) x (20) =				0.34	(21)
Infiltration rate modified for monthly wind speed		1	•	•	1	1	1	
Jan   Feb   Mar   Apr   May   Ju	ın Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind speed from Table 7							1	
(22)m= 5.1 5 4.9 4.4 4.3 3.4	8 3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (22)m ÷ 4								
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.9	0.95	0.92	1	1.08	1.12	1.18	]	

0.43	0.42	0.41	0.37	0.36	d wind s	0.32	0.31	0.34	0.36	0.38	0.39	1	
Calculate effe		-	rate for t	he appli	cable ca	se						J 	
If mechanic							.=					0	(23
If exhaust air h		0		, ,	,	. `	,, .	•	) = (23a)			0	(23
If balanced with		•	•	•		,						0	(23
a) If balance				i		<del>-                                    </del>	<del>- ´ ` -</del>	ŕ	<del> </del>	<del> </del>	<del></del>	i) ÷ 100] ¬	(0.
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance		_				<del>-                                    </del>		<del>``</del>	<del> </del>	<del></del>	1	7	10
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	•				E (22h	.\			
	n < 0.5 x	(236), t	nen (240	(230) = (230)	o); otherv	wise (24)	C) = (220)	) m + 0.	5 × (230	0	0	1	(24
- /			<u> </u>			<u> </u>			U	0		J	(2-
d) If natural if (22b)r				•	ve input erwise (2				0.51				
24d)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	1	(2
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	· (25)		<u>I</u>	•	J	
25)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	1	(2
												_	
3. Heat losse		•											
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<b>〈</b> )	k-valu kJ/m².		A X k kJ/K
Vindows Type		( )		•	4.92	<del>_</del>			6.52	, 	110/111		(2
Vindows Type					4.92	= ,	/[1/( 1.4 )+	L	6.52	=			(2 <sup>-</sup>
Vindows Type					2.39	= ,		· .	3.17	=			(27
loor					107.8	=	0.13		14.0179				(2)
Valls Type1	747	,7	12.2			=						╡	(29
Valls Type1	74.7			<u>^</u>	62.54	=	0.18	=	11.26			╡	
	12.3		0		12.35	=	0.18	= [	2.22				(29
otal area of e	Herrierius	, 111-			194.9	=							(3
arty wall					36.38		0	= [	0				(32
for windows and include the are						ated using	tormula 1	/[(1/U-valu	ie)+0.04j a	is given in	paragrapi	n 3.2	
abric heat lo							(26)(30)	+ (32) =				43.71	(3:
leat capacity			,					((28)	.(30) + (32	2) + (32a).	(32e) =	17991.8	ऱ.
hermal mass			c = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value:	: Medium		250	(3
or design asses	•	`		,			ecisely the	indicative	values of	TMP in T	able 1f		`
an be used inste	ad of a de	tailed calcı	ulation.										
	es : S (L	x Y) cal	culated (	using Ap	pendix ł	<						11.05	(3
		are not kn	own (36) =	= 0.15 x (3	11)			(22)	(20)				
hermal bridg								(33) +	(36) =			54.76	(3
hermal bridg details of therm otal fabric he	at loss	slavilati i	الله من ال					(00)	0.00	05\ /=	<b>\</b>		
hermal bridg details of therm otal fabric he entilation hea	at loss		·	<u> </u>			_		= 0.33 × (	· ·	1	7	
hermal bridg details of therm otal fabric he entilation hea	at loss at loss ca Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	(0
hermal bridg details of thermo otal fabric he entilation her Jan 8)m= 53.7	at loss cat	Mar 53.06	·	<u> </u>	Jun 50	Jul 50	Aug 49.76			· ·	1	]	(3
hermal bridg details of thermand otal fabric head entilation head Jan	at loss cat	Mar 53.06	Apr	May			Ť	Sep 50.5	Oct	Nov 51.86	Dec		(3

Heat loss para	meter (l	-II P) W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.01	1	1 1	0.99	0.98	0.97	0.97	0.97	0.98	0.98	0.99	0.99		
( )										Sum(40) <sub>1</sub> .	L .	0.99	(40)
Number of day	s in mo	nth (Tabl	e 1a)						3	( /	L		` ′
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)
				Į.									
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	pancy.	N								2	.8		(42)
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.				( /
Annual averag											0.73		(43)
Reduce the annua							o achieve	a water us	se target o	of			
									I 0.				
Jan Hot water usage in	Feb	Mar Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
		· ·		1			, ,		l	T	I 1		
(44)m= 110.8	106.77	102.74	98.71	94.68	90.65	90.65	94.68	98.71	102.74	106.77	110.8		7
Energy content of	hot water	used - cal	culated mo	onthlv = 4.	190 x Vd.r	n x nm x D	)Tm / 3600			m(44) <sub>112</sub> = ables 1b. 1	L	1208.73	(44)
(45)m= 164.31	143.71	148.3	129.29	124.05	107.05	99.2	113.83	115.19	134.24	146.54	159.13		
(43)111= 104.31	143.71	146.3	129.29	124.03	107.03	99.2	113.03	l		m(45) <sub>112</sub> =	l	1584.83	(45)
If instantaneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46)		10lal = Su	111(43)112 =	- [	1304.03	(40)
(46)m= 24.65	21.56	22.24	19.39	18.61	16.06	14.88	17.07	17.28	20.14	21.98	23.87		(46)
Water storage				1	10.00					1			, ,
Storage volum	e (litres)	) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	eating a	and no ta	nk in dw	velling, 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	urer's de	eclared lo	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		-	-				(48) x (49)	) =			0		(50)
b) If manufact			-										(= 4)
Hot water stora If community h	_			ie∠(Kvvi	n/iitre/aa	ıy)					0		(51)
Volume factor	_		JII <del>4</del> .5								0		(52)
Temperature fa			2b								0		(53)
Energy lost fro				ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (		•	,,	<i>-</i>			( ) (- )	(= ) (	,		0		(55)
Water storage	, ,	,	or each	month			((56)m = (	55) × (41):	m				, ,
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	_		-	-							-	хH	(30)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	e H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calcula	ted for eac	h month	(61)m =	(60) ÷ 3	· `	)m		,	•		•	
(61)m= 50.96 46	03 50.96	48.68	48.25	44.71	46.2	48.25	48.68	50.96	49.32	50.96		(61)
Total heat required	for water h	neating c	alculated	for eac	h month	(62)m	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 215.27 189	.74 199.25	177.97	172.3	151.76	145.39	162.0	163.87	185.2	195.85	210.09		(62)
Solar DHW input calcu	ated using Ap	pendix G o	r Appendix	: H (negati	ve quantity	y) (enter	'0' if no sola	r contribut	tion to wate	er heating)		
(add additional line	s if FGHRS	S and/or \	WWHRS	applies	, see Ap	pendix	(G)				•	
(63)m= 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water	heater											
(64)m= 215.27 189	.74 199.25	177.97	172.3	151.76	145.39	162.0	163.87	185.2	195.85	210.09		,
						0	utput from w	ater heate	r (annual)	112	2168.78	(64)
Heat gains from w	ater heating	g, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61	m] + 0.8	k [(46)m	+ (57)m	+ (59)m	]	
(65)m= 67.37 59	29 62.05	55.16	53.31	46.77	44.53	49.91	50.47	57.38	61.05	65.65		(65)
include (57)m in	calculation	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Internal gains	see Table	5 and 5a	):									
Metabolic gains (T	able 5). Wa	atts										
	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 140.06 14	.06 140.06	140.06	140.06	140.06	140.06	140.0	140.06	140.06	140.06	140.06		(66)
Lighting gains (cal	culated in A	ppendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				1	
(67)m= 26.89 23	88 19.42	14.71	10.99	9.28	10.03	13.03	17.49	22.21	25.93	27.64		(67)
Appliances gains	calculated i	in Appen	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5	<b>I</b>		ı	
	.19 264.17	<del>-                                    </del>	230.36	212.64	200.8	198.0		219.97	238.83	256.56		(68)
Cooking gains (ca	culated in A	Appendix	L. eguat	ion L15	or L15a	). also	see Table	5	ļ		ı	
(69)m= 37.01 37		37.01	37.01	37.01	37.01	37.01		37.01	37.01	37.01		(69)
Pumps and fans g	ins (Table		<u> </u>							<u> </u>		
· -	3	З 3	3	3	3	3	3	3	3	3	]	(70)
Losses e.g. evapo	ation (neg:	ative valu	L les) (Tah	l <u> </u>	<u> </u>				<u>I</u>	<u> </u>	I	
(71)m= -112.05 -11	<del>-                                    </del>		-112.05	· · · · · ·	-112.05	-112.0	5 -112.05	-112.05	-112.05	-112.05		(71)
Water heating gair			1		1	1	- 1 =	1	1.12.00	1	l	` '
(72)m= 90.56 88	<del>`</del>	76.61	71.65	64.96	59.86	67.08	70.1	77.12	84.79	88.24	1	(72)
		70.01	71.00	l		L	n + (69)m +	l	<u> </u>	<u> </u>		()
<b>Total internal gai</b> (73)m= 453.87 45	.32 435.01	408.56	381.03	354.89	338.7	346.1	<u> </u>	387.32	417.57	440.45	1	(73)
6. Solar gains:	.52 455.01	400.50	301.03	334.03	330.7	340.1	300.04	307.32	417.57	440.43		(10)
Solar gains are calcu	ated using sol	ar flux from	Table 6a	and assoc	iated equa	ations to	convert to th	ne applical	ole orienta	tion.		
Orientation: Acce	_	Area		Flu			g_		FF		Gains	
Tabl		m²	•		ble 6a		Table 6b	Т	able 6c		(W)	
East 0.9x	1 )	4.9	92	x -	19.64	] <sub>x</sub> [	0.63	x [	0.7		29.53	(76)
East 0.9x		K 4.9	===	-	38.42	]	0.63		0.7	= =	57.77	](76)
East 0.9x		4.9			63.27	」^∟ 1 x	0.63	^	0.7		95.14	](76)
East 0.9x		4.9			92.28	」^∟ 1 x	0.63	^	0.7		138.75	](76) ](76)
East 0.9x				-		; ⊨		<b>≓</b>		=		-
_ast 0.9x	1	4.9	92	X 1	13.09	X	0.63	X	0.7	=	170.05	(76)

	_								,			_					_
East	0.9x	1		×	4.92	X	1	15.77	X		0.63	X	0.7		=	174.07	(76)
East	0.9x	1	:	ĸ	4.92	X	1	10.22	X		0.63	X	0.7		=	165.73	(76)
East	0.9x	1		κ [	4.92	X	9	4.68	X		0.63	×	0.7		= [	142.36	(76)
East	0.9x	1		× [	4.92	X	7	3.59	X		0.63	x	0.7	-	= [	110.65	(76)
East	0.9x	1		κ [	4.92	X	4	5.59	X		0.63	X	0.7	:	= [	68.55	(76)
East	0.9x	1		ĸ	4.92	X	2	4.49	X		0.63	X	0.7	:	= [	36.82	(76)
East	0.9x	1		κ [	4.92	X	1	6.15	X		0.63	x	0.7	:	=	24.29	(76)
West	0.9x	0.77		ĸ	4.92	X	1	9.64	X		0.63	x	0.7	-	=	29.53	(80)
West	0.9x	0.77		ĸ	2.39	X	1	9.64	X		0.63	X	0.7	-	= [	14.35	(80)
West	0.9x	0.77		ĸ [	4.92	X	3	8.42	X		0.63	×	0.7	-	= [	57.77	(80)
West	0.9x	0.77		ĸ	2.39	X	3	8.42	X		0.63	X	0.7	-	= [	28.06	(80)
West	0.9x	0.77		ĸ	4.92	X	6	3.27	X		0.63	×	0.7	=	= [	95.14	(80)
West	0.9x	0.77		κ [	2.39	x	6	3.27	X		0.63	x	0.7	:	= [	46.22	(80)
West	0.9x	0.77		κ [	4.92	x	9	2.28	X		0.63	x	0.7	:	= [	138.75	(80)
West	0.9x	0.77		ĸ	2.39	x	9	2.28	X		0.63	X	0.7	=	= [	67.4	(80)
West	0.9x	0.77		κ [	4.92	x	1	13.09	X		0.63	x	0.7	:	= [	170.05	(80)
West	0.9x	0.77		ĸ	2.39	X	1	13.09	X		0.63	X	0.7	:	= [	82.6	(80)
West	0.9x	0.77		ĸ	4.92	X	1	15.77	X		0.63	×	0.7	-	= [	174.07	(80)
West	0.9x	0.77		ĸ	2.39	x	1	15.77	X		0.63	X	0.7	:	= [	84.56	(80)
West	0.9x	0.77		κ [	4.92	x	1	10.22	X		0.63	x	0.7	:	= [	165.73	(80)
West	0.9x	0.77		κ [	2.39	x	1	10.22	X		0.63	x	0.7	:	= [	80.51	(80)
West	0.9x	0.77		ĸ [	4.92	x	9	4.68	X		0.63	x	0.7		= [	142.36	(80)
West	0.9x	0.77		ĸ	2.39	X	9	4.68	X		0.63	X	0.7	:	= [	69.15	(80)
West	0.9x	0.77		<b>·</b> [	4.92	x	7	3.59	X		0.63	x	0.7	:	= [	110.65	(80)
West	0.9x	0.77		ĸ [	2.39	x	7	3.59	X		0.63	x	0.7		= [	53.75	(80)
West	0.9x	0.77		κ [	4.92	x		5.59	X		0.63	x	0.7	:	= [	68.55	(80)
West	0.9x	0.77		ĸ [	2.39	x		5.59	X		0.63	X	0.7	=	= [	33.3	(80)
West	0.9x	0.77		ĸ	4.92	x	2	4.49	X		0.63	X	0.7	-	=	36.82	(80)
West	0.9x	0.77		ĸ	2.39	X	2	4.49	X		0.63	x	0.7	=	= [	17.89	(80)
West	0.9x	0.77		ĸ	4.92	X	1	6.15	X		0.63	×	0.7	-	= [	24.29	(80)
West	0.9x	0.77		ĸ	2.39	x	1	6.15	X		0.63	X	0.7	:	= [	11.8	(80)
				_	for each mon	$\overline{}$		i	<del></del>	_	ım(74)m				_		/e = 1
(83)m=	73.41	143.6	236.49	ㅗ	344.91 422.7		32.71	411.96	353	.86	275.05	170.4	91.53	60.37	7		(83)
_				_	$\frac{(84)m = (73)r}{750.47 \cdot 1.000.7}$			1	700	. 04	005.00		0 5004		$\overline{}$		(04)
(84)m=	527.27	594.92	671.5		753.47 803.7	3	787.6	750.65	700	0.01	635.69	557.7	2 509.1	500.8	2		(84)
				_ `	heating seaso												7
•		_	_	•	eriods in the li	_			ble 9	, Th1	ı (°C)					21	(85)
Utilisa				$\overline{}$	ving area, h1,	Ť											
(00)	Jan	Feb	Mar	+	Apr Ma	<del>`</del>	Jun	Jul	<del>                                     </del>	ug	Sep	Oct		De	С		(96)
(86)m=	1	1	1		0.98 0.92		0.78	0.6	0.6		0.9	0.99	1	1			(86)
		, i		ı li	ving area T1	<del>`</del>		i	1						_		(c=)
(87)m=	19.85	19.97	20.2		20.51 20.78	3   2	20.95	20.99	20.	98	20.86	20.51	20.13	19.83	3		(87)

<b>T</b>				and a star to		.1 .112	( T	ulu o Ti	LO (0 <b>0</b> )					
				eriods ir			1		<del></del>	00.4	00.00	00.00		(00)
(88)m=	20.08	20.08	20.08	20.09	20.1	20.11	20.11	20.11	20.1	20.1	20.09	20.09		(88)
Utilisa	tion fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	1	0.99	0.97	0.89	0.7	0.49	0.55	0.85	0.98	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.53	18.71	19.04	19.49	19.87	20.07	20.1	20.1	19.98	19.49	18.94	18.51		(90)
•		=		-					1	LA = Livin	g area ÷ (4	4) =	0.29	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = f	LA x T1	+ (1 – fL	A) x T2			•		
(92)m=	18.91	19.08	19.38	19.79	20.13	20.32	20.36	20.36	20.24	19.79	19.29	18.89		(92)
	adjustr	nent to t	he mear	internal	temper	ature fro	ı——— ım Table	4e, whe	ere appro	priate		<u> </u>		
(93)m=	18.91	19.08	19.38	19.79	20.13	20.32	20.36	20.36	20.24	19.79	19.29	18.89		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	to the	mean int	ternal te	mperatui	e obtair	ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation	r		using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm	i										(5.4)
(94)m=	1	1	0.99	0.97	0.89	0.72	0.52	0.58	0.86	0.98	1	1		(94)
i			· ·	4)m x (84		T 504.05		405.00	F 45 75	F 47.04	507.50	500.0		(05)
(95)m=	526.53	593.13	665.64	729.31	717.21	564.35	389.4	405.33	545.75	547.61	507.59	500.3		(95)
(96)m=	11y aver	age exte	ernai terr 6.5	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
				l o.s al tempe						<u> </u>	7.1	4.2		(50)
(97)m=		1532.97		1157.73		599.65	394.01	413.68	646.09	974.48	1299.16	1575.39		(97)
` ′		l		r each n					l					, ,
(98)m=	787.41	631.58	537.62	308.46	131.81	0	0	0	0	317.6	569.93	799.86		
` ′			ļ	I		ļ	ļ	Tota	l per year	l (kWh/year	) = Sum(9	8) <sub>15,912</sub> =	4084.27	(98)
Snace	heatin	a requir	ament in	kWh/m²	!/vear					` •	,	′ ' L	37.88	(99)
•		•										l	37.00	
			nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
-	e heatir	•	at from s	econdar	v/sunnle	mentary	, system					ſ	0	(201)
	•					riiciitaiy	•	(202) = 1 -	_ (201) _			<u>[</u>		= '
				nain syst	, ,			` '	` '	(000)1			1	(202)
			Ū	main sys				(204) = (204)	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1							ļ	93.4	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heatin	g systen	ո, %						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	)								
	787.41	631.58	537.62	308.46	131.81	0	0	0	0	317.6	569.93	799.86		
(211)m	ı = {[(98	)m x (20	04)] } x 1	00 ÷ (20	06)									(211)
	843.05	676.21	575.61	330.26	141.12	0	0	0	0	340.04	610.21	856.39		
		-	-					Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	4372.88	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							•		
= {[(98]	)m x (20	)1)]} x 1	00 ÷ (20	(8)		,	,	1	ı	ı				
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	I (kWh/yea	ar) = Sum(2)	215) <sub>15,1012</sub>	=	0	(215)
												L		

Output from water heater (calculated above)	54.70 445.00	1 400 00 1	400.07	405.0	405.05	040.00		
	51.76 145.39	162.08	163.87	185.2	195.85	210.09		1,,,,
Efficiency of water heater							80.3	(21
	80.3 80.3	80.3	80.3	86.4	87.58	88.1		(21
Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m								
·	88.99 181.06	201.84	204.07	214.36	223.62	238.48		
<u> </u>		Total	= Sum(2	19a) <sub>112</sub> =	-		2550.99	(21
Annual totals				k'	Wh/year		kWh/year	1
Space heating fuel used, main system 1							4372.88	]
Vater heating fuel used							2550.99	]
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(2
boiler with a fan-assisted flue						45		(2
otal electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(2
Electricity for lighting							474.91	(2:
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						
	Energy			Emiss	ion fac	tor	Emissions	
	kWh/year			kg CO	2/kWh		kg CO2/yea	r
	,			0.0	16	= [	944.54	(26
Space heating (main system 1)	(211) x			0.2	10	_ [		-
Space heating (main system 1) Space heating (secondary)	•			0.2		= [	0	] [26
Space heating (secondary)	(211) x				19	l r		(2)
Space heating (secondary) Vater heating	(211) x (215) x	+ (263) + (2	264) =	0.5	19	= [	0	J
Space heating (secondary)  Vater heating  Space and water heating	(211) x (215) x (219) x	+ (263) + (2	264) =	0.5	19	= [	0 551.01	](2 ](2
	(211) x (215) x (219) x (261) + (262)	+ (263) + (2	264) =	0.5	19 16 19	= [	0 551.01 1495.56	(2

TER =

(273)

16.52

			Heor P	otaile: -						
			User D			_		a		
Assessor Name:	Joseph Treanor	140		Strom					0032062	
Software Name:	Stroma FSAP 20			Softwa		rsion:		version	on: 1.0.4.14	
A dalagoo .	, Gondar Gardens		i i	Address:	P3					
Address: 1. Overall dwelling dime	•	, London,	INVVO IF	10						
1. Overall awelling aime	511310113.		Area	a(m²)		Av. He	ight(m)		Volume(m³	)
Ground floor				<u> </u>	(1a) x		.55	(2a) =	188.73	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	le)+(1r	n)	4.01	(4)			J		
Dwelling volume	, , , , , , , , ,	, ,	´ <u> </u>			)+(3c)+(3c	d)+(3e)+	.(3n) =	188.73	(5)
2. Ventilation rate:									3000	` ′
2. Ventuation rate.		secondar	у	other		total			m³ per hou	r
Number of chimneys	heating	heating 0	+ [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0		0	i - F	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				,	3	x ·	10 =	30	(7a)
Number of passive vents	6				F	0	x ·	10 =	0	(7b)
Number of flueless gas f	ires				F	0	X 4	40 =	0	
Ç					L					` ′
								Air cl	hanges per ho	ur
Infiltration due to chimne	ys, flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(	7c) =	Γ	30		÷ (5) =	0.16	(8)
If a pressurisation test has t		ded, procee	d to (17), d	otherwise o	continue fr	om (9) to (	(16)			_
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration		,	0.05.6				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
deducting areas of openi	present, use the value corre ings); if equal user 0.35	esponaing ic	ine great	er wan are	a (aitei					
If suspended wooden	floor, enter 0.2 (unse	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	nter 0.05, else enter 0								0	(13)
Percentage of window	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)
Air permeability value,	• •		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•								0.41	(18)
Air permeability value applie		as been don	ne or a deg	gree air pe	rmeability	is being u	sed			<b>–</b>
Number of sides shelters Shelter factor	ea			(20) = 1 -	0.075 x (1	9)1 <b>=</b>			2	(19)
Infiltration rate incorpora	ting shelter factor			(21) = (18)		-/1			0.85	(21)
Infiltration rate modified	•	ed							0.00	(=.)
Jan Feb	Mar Apr May	i	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp				1 3			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	7	
		1	L	I		I	<u> </u>	<u> </u>	_	
Wind Factor $(22a)m = (2a)m =$	<del>'</del>	1	T .			1		1	7	
(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	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.44	0.43	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41	]	
Calculate effe		_	rate for t	he appli	cable ca	se	•					- -	
If mechanic  If exhaust air h			endix N. (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) . othe	rwise (23b	) = (23a)			0	(23
If balanced wit									, (===,			0	(23
a) If balance		•	•	J		`		,	2h\m + (	23h) ~ [·	1 _ (23c)		(2.
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
b) If balance	ed mech:	l anical ve	l entilation	without	heat red	overv (N	MV) (24h	$\lim_{n \to \infty} \frac{1}{(2n)^n}$	2b)m + (	23h)			•
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
c) If whole h	nouse ex n < 0.5 >				•				.5 × (23b	) )		J	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural	ventilation n = 1, the			•	•				0.51	l	l	J	
24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	]	(24
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)				1	
25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	]	(2
												1	
3. Heat losse	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
Vindows Type	e 1				10.11	x1	/[1/( 1.4 )+	0.04] =	13.4				(2
Vindows Type	e 2				4.19	x1	/[1/( 1.4 )+	0.04] =	5.55				(2
Valls Type1	34.7	<b>'</b> 4	18.49	9	16.25	, x	0.18	i i	2.93	<b>=</b> [			(2
Valls Type2	43.3	3	0	=	43.33	x	0.18	<u> </u>	7.8	₹ i			(2
otal area of e	elements	, m²			78.07	一							(3
arty wall					33.58	x	0		0				(3
for windows and include the are					alue calcul		g formula 1	 /[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	 h 3.2	`
abric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	) + (32) =				35.24	(3
leat capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	5085.	9 (3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design asses an be used inste				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
hermal bridg	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						51.3	(3
details of therm otal fabric he		are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			86.54	1 (3
entilation he	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	]	
38)m= 37.26	37.02	36.79	35.69	35.49	34.54	34.54	34.36	34.9	35.49	35.9	36.33	]	(3
leat transfer	coefficie	nt, W/K						(39)m	= (37) + (37)	38)m	_	_	
ical transici													
39)m= 123.8	123.56	123.33	122.23	122.03	121.08	121.08	120.9	121.44	122.03	122.44	122.88	]	

Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.67	1.67	1.67	1.65	1.65	1.64	1.64	1.63	1.64	1.65	1.65	1.66		
						Į.		,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.65	(40)
Number of day		<u> </u>	e 1a)			i		<del></del>		i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu	nancy	N											(40)
if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		34		(42)
Annual averag											.76		(43)
Reduce the annua not more that 125	_				-	-	o achieve	a water us	se target o	of	_		
									I	·			
Jan Hot water usage in	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
	,						, ,	07.07	04.50	T 05.45	00.74		
(44)m= 98.74	95.15	91.56	87.97	84.38	80.79	80.79	84.38	87.97	91.56	95.15	98.74	1077.10	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) <sub>112</sub> = ables 1b, 1	L	1077.13	(44)
(45)m= 146.42	128.06	132.15	115.21	110.55	95.39	88.4	101.44	102.65	119.63	130.58	141.8		
(40)111= 140.42	120.00	102.10	110.21	110.00	00.00	00.4	101.44	l		m(45) <sub>112</sub> =		1412.29	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotar – ou	111(40)112	L	1412.20	(```
(46)m= 21.96	19.21	19.82	17.28	16.58	14.31	13.26	15.22	15.4	17.94	19.59	21.27		(46)
Water storage	loss:					ļ		<u> </u>	<u> </u>	<u> </u>			
Storage volum	e (litres)	) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage		المعامية	ft-		/1.\^/L	·/do./\							(40)
a) If manufact				or is kno	wn (kvvr	n/day):					0		(48)
Temperature fa											0		(49)
Energy lost fro b) If manufact		_	-		or io not		(48) x (49)	) =			0		(50)
Hot water stora			-								0		(51)
If community h	_			(	,,,,,,	-57					<u> </u>		()
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (	54) in (5	55)									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder 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	хН	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit				•	•	. ,	, ,						
(modified by	factor f	rom Tabl	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

				<b>(- 1)</b>	<b></b>								
Combi loss				<u> </u>		<del>1 ``</del>	<u> </u>	1	1	T		1	(04)
(61)m= 50.3		46.66	43.38	43	39.84	41.17	43	43.38	46.66	46.92	50.32		(61)
	<del></del>		<del></del>				<del>`</del>		<del>`                                    </del>	(46)m +	<del>` ´                                     </del>	(59)m + (61)m	
(62)m= 196.7	74 171.86	178.81	158.59	153.55	135.23	129.56	144.4	3 146.03	166.28	177.5	192.12		(62)
Solar DHW inp									r contribut	tion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \		applies	s, see Ap	pendi	<del></del>				1	
(63)m = 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
(64)m= 196.7	74 171.86	178.81	158.59	153.55	135.23	129.56	144.4	3 146.03	166.28	177.5	192.12		,
							C	utput from w	ater heate	r (annual)	12	1950.71	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61	)m] + 0.8 z	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 61.2	7 53.53	55.6	49.15	47.51	41.68	39.68	44.48	3 44.98	51.44	55.15	59.73		(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinder	is in the o	dwellir	ng 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										
Jai		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 116.9	7 116.97	116.97	116.97	116.97	116.97	116.97	116.9	7 116.97	116.97	116.97	116.97		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5	1		•	•	
(67)m= 18.4	<u> </u>	13.3	10.07	7.52	6.35	6.86	8.92		15.21	17.75	18.92		(67)
Appliances	gains (calc	ulated ir	. Append	dix L. ea	uation L	.13 or L1	 3а). а	lso see Ta	ıble 5	1	!	ı	
(68)m= 206.4	<del>`                                    </del>	203.21	191.72	177.21	163.57	154.46	152.3		169.21	183.72	197.36		(68)
Cooking gai	ns (calcula	ted in A	ppendix	L. eguat	ion L15	or L15a	), also	see Table	+ e 5	!	l .	l	
(69)m= 34.7	<del>_`</del>	34.7	34.7	34.7	34.7	34.7	34.7		34.7	34.7	34.7	]	(69)
Pumps and		(Tahle <sup>l</sup>	 5a)	<u> </u>		<u> </u>	<u> </u>		<u> </u>	<u> </u>			
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	]	(70)
Losses e.g.			<u> </u>	<u> </u>			L						( - /
(71)m= -93.5		-93.58	-93.58	-93.58	-93.58	-93.58	-93.5	8 -93.58	-93.58	-93.58	-93.58	1	(71)
			-93.30	-93.30	-93.30	-95.50	-95.5	0 -95.50	-95.50	-93.30	-93.30		(, ,)
Water heating (72)m= 82.3	<del></del>	74.74	68.27	63.85	57.89	53.34	59.78	62.47	69.14	76.6	80.28	1	(72)
` '		<u> </u>	00.27	03.00		<u> </u>				76.6	<u> </u>		(12)
Total intern	_ <del>_</del>		004.44	000 00		1		m + (69)m +	•	•	i	1	(72)
(73)m= 368.3		352.34	331.14	309.68	288.9	275.76	282.1	2 293.25	314.65	339.16	357.65		(73)
6. Solar ga		ucina colo	r flux from	Table 6a	and accor	siated equa	tions to	convert to the	no applicat	olo orientat	tion		
Orientation:		•	Area		Flu	•	ilions ic		іс арріісаі	FF	iioii.	Gains	
Onemation.	Table 6d		m <sup>2</sup>			ble 6a		g_ Table 6b	Т	able 6c		(W)	
East 0.9	x 1	×	10	11	x -	10.64	] <sub>x</sub> [	0.62	¬ , г	0.7		60.68	(76)
East 0.9		_		==	-	19.64	1 +	0.63	X	0.7	╡ -	60.68	](76) ](76)
East 0.9		×				19.64	]	0.63		0.7	=	50.3	╡
		X				38.42	] × <u>[</u> ] ., Г	0.63	×	0.7	_ =	118.71	(76)
		X	4.1		=	38.42	X _	0.63	X	0.7	=	98.4	<b>_</b> (76) <b>_</b> (70)
East 0.9	X 1	X	10.	11	X	63.27	X	0.63	x	0.7	=	195.5	(76)

	_								_						
East	0.9x	2	X	4.	19	X	6	3.27	X	0.63	X	0.7	=	162.04	(76)
East	0.9x	1	Х	10	.11	X	9	2.28	X	0.63	X	0.7	=	285.12	(76)
East	0.9x	2	X	4.	19	X	9	2.28	X	0.63	X	0.7	=	236.33	(76)
East	0.9x	1	X	10	.11	X	1	13.09	X	0.63	X	0.7	=	349.43	(76)
East	0.9x	2	Х	4.	19	X	1	13.09	x	0.63	X	0.7	=	289.63	(76)
East	0.9x	1	X	10	.11	X	1	15.77	X	0.63	X	0.7	=	357.7	(76)
East	0.9x	2	X	4.	19	X	1	15.77	x	0.63	х	0.7	=	296.49	(76)
East	0.9x	1	X	10	.11	X	1	10.22	x	0.63	x	0.7	=	340.55	(76)
East	0.9x	2	X	4.	19	X	1	10.22	x	0.63	x	0.7	=	282.27	(76)
East	0.9x	1	×	10	.11	X	9	94.68	x	0.63	x	0.7	=	292.52	(76)
East	0.9x	2	×	4.	19	X	9	94.68	x	0.63	x	0.7		242.47	(76)
East	0.9x	1	X	10	.11	X	7	73.59	x	0.63	х	0.7	=	227.37	(76)
East	0.9x	2	X	4.	19	X	7	73.59	x	0.63	x	0.7	=	188.46	(76)
East	0.9x	1	x	10	.11	X	4	15.59	x	0.63	x	0.7	=	140.86	(76)
East	0.9x	2	X	4.	19	X	4	15.59	x	0.63	х	0.7	=	116.76	(76)
East	0.9x	1	×	10	.11	X	2	24.49	x	0.63	x	0.7	=	75.67	(76)
East	0.9x	2	x	4.	19	X	2	24.49	x	0.63	x	0.7	=	62.72	(76)
East	0.9x	1	X	10	.11	X	1	6.15	x	0.63	х	0.7	=	49.9	(76)
East	0.9x	2	x	4.	19	X	1	6.15	x	0.63	x	0.7	=	41.36	(76)
	_								-						
Solar	gains in	watts, ca	alculate	d for eac	h montl	h		_	(83)m	n = Sum(74)m	(82)m			_	
(83)m=	110.98	217.11	357.54	521.45	639.06	6	54.19	622.82	534	.99 415.84	257.6	1 138.38	91.27		(83)
Total g	jains – i	nternal a	nd sola	r (84)m :	= (73)m	+ (	83)m	, watts						-	
(84)m=	479.3	582.82	709.88	852.6	948.74		943.1	898.58	817	.11 709.09	572.2	7 477.54	448.92		(84)
7. Me	an inter	nal temp	erature	(heating	seaso	n)									
Temp	erature	during h	eating <sub>l</sub>	periods i	n the liv	ing	area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living ar	ea, h1,r	n (s	ee Ta	ble 9a)						_	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug Sep	Oc	Nov	Dec		
(86)m=	1	0.99	0.98	0.94	0.86		0.71	0.56	0.6	0.85	0.97	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (	follo	w ste	ps 3 to 7	7 in T	able 9c)					
(87)m=	19.16	19.36	19.73	20.22	20.62	2	20.88	20.96	20.	94 20.73	20.17	19.57	19.12		(87)
Temp	erature	durina h	eating	periods i	n rest o	f dw	/elling	from Ta	able 9	9, Th2 (°C)				_	
(88)m=	19.56	19.56	19.57	19.58	19.58	_	19.59	19.59	19.	<del>`                                    </del>	19.58	3 19.57	19.57		(88)
l Itilie:	ation fac	tor for g	ains for	rest of d	welling	h2	m (se	a Tahla	. Oa)		•			_	
(89)m=	1	0.99	0.97	0.92	0.8		0.59	0.4	0.4	16 0.77	0.96	0.99	1	1	(89)
				!				<u> </u>		!	<u>.                                      </u>	1		_	, ,
	17.16	17.47		1	1	Ť		i	r <del>i —</del>	to 7 in Tab	<u> </u>	17.70	17.12	1	(90)
(90)m=	17.10	17.47	18	18.69	19.23		19.51	19.58	19.		18.65	17.78 ving area ÷ (	ļ	0.4	
												ring area + (	., –	0.4	(91)
				1	1	_			<del></del>	– fLA) × T2			ı	٦	
(92)m=	17.96	18.22	18.69	19.3	19.78		20.05	20.13	20.		19.25		17.91		(92)
Apply	adjustn	nent to th	ne mea	n interna	ı tempe	ratu	ıre fro	m Table	e 4e,	where appr	ropriate	)			

(00) 47.00	10.00	40.00	40.0	40.70	00.05	00.40	00.44	40.04	40.05	10.40	47.04		(93)
(93)m= 17.96	18.22	18.69	19.3	19.78	20.05	20.13	20.11	19.91	19.25	18.49	17.91		(93)
8. Space hea				o obtoin	ad at at	on 11 of	Table O	o oo tha	+ Ti m /	76\m on	d ro oolo	uloto	
the utilisation			•		eu al Sil	<del></del>	Table 9	o, so ma	t 11,111=(	rojili ali	u re-caic	uiale	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	<del></del>	1				<u> </u>		ı			ı		( <b>5</b> 1)
(94)m= 0.99	0.99	0.97	0.92	0.81	0.63	0.46	0.52	0.79	0.95	0.99	1		(94)
Useful gains,		<del>` ` `</del>	<del></del>		500.00	440.04	407.5	500 70	E 4 E 00	170.45	440.70		(OE)
(95)m= 476.32	575.27	687.25	780.49	765.73	598.68	413.61	427.5	560.73	545.39	472.15	446.72		(95)
Monthly average (96)m= 4.3	age exte	ernal tem	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
										7.1	4.2		(90)
Heat loss rate (97)m= 1690.54	1645.83		1270.76	986.33	660.2	426.94	449.08	705.87	1055.65	1394.86	1685.15		(97)
Space heatin	l .					l				<u> </u>	1003.13		(01)
(98)m= 903.38	719.42	607.16	352.99	164.12	0	0.02	0	0	379.63	664.35	921.39		
(66)=	7 10.12	007.10	002.00	1011.12	Ü			l per year				4712.44	(98)
				.,			Tota	ii pei yeai	(KVVII/yeai	) = Sum(9	O)15,912 —		╡``
Space heatin	g require	ement in	kVVh/m²	/year								63.67	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space heating	_										ı		_
Fraction of sp	pace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of sp	pace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of to	tal heati	ng from i	main sys	stem 1			(204) = (204)	02) × [1 –	(203)] =			1	(204)
Efficiency of	main spa	ace heat	ing syste	em 1								93.4	(206)
Efficiency of	seconda	ry/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 heatin	g require	ement (c	alculate	d above)		1					•		
903.38	719.42	607.16	352.99	164.12	0	0	0	0	379.63	664.35	921.39		
$(211)m = \{[(98)$	)m x (20	)4)] } x 1	00 ÷ (20	16)									(211)
967.22	770.25	650.06	377.93	175.72	0	0	0	0	406.46	711.29	986.5		
							Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	5045.44	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month							·		_
$= \{[(98)m \times (20)]\}$	01)] } x 1	00 ÷ (20	8)			г							
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)
Water heating	3												
Output from w						1	1	1			1		
196.74	171.86	178.81	158.59	153.55	135.23	129.56	144.43	146.03	166.28	177.5	192.12		٦
Efficiency of w											1	80.3	(216)
(217)m= 88.41	88.26	87.89	87.01	85.22	80.3	80.3	80.3	80.3	87.06	88.06	88.48		(217)
Fuel for water	•												
(219)m = (64) (219)m = 222.53	T	203.45	m 182.27	180.18	168.41	161.35	179.87	181.85	190.99	201.56	217.13		
,=::/	L	L		. 50.10	. 50.11	L		I = Sum(2		L	L	2284.32	(219)
Annual totals							- /	,-		Wh/year	,	kWh/year	<b>_</b>
Space heating		ed, main	system	1					ĸ	y cai		5045.44	7
			•									<u> </u>	_

Water heating fuel used				2284.32	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 (230	0a)(230g) =		75	(231)
Electricity for lighting				325.07	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	<b>Energy</b> kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x	0.216	=	1089.82	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	493.41	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1583.23	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	168.71	(268)
Total CO2, kg/year	sur	m of (265)(271) =		1790.87	(272)

TER =

(273)

			Heor P	otaile: -						
	–		User D			_		a== -		
Assessor Name:	Joseph Treanor	240		Strom					0032062	
Software Name:	Stroma FSAP 20			Softwa		rsion:		version	on: 1.0.4.14	
A dalagoo .	, Gondar Gardens		i i	Address:	P4					
Address: 1. Overall dwelling dime	·	, London,	INVVO IF	16						
1. Overall awelling all the	71010113.		Area	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor				<u> </u>	(1a) x		.55	(2a) =	241.48	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(	1e)+ (1r	n)		(4)			]` '		`
	۵,۰(۱۵,۰(۱۵,۰(۱۵,۰(۱	. •) (	·/ L`	74.1		) . (20) . (20	d)+(3e)+	(2n) -		<b>7</b>
Dwelling volume					(Sa)+(Sb)	)+(30)+(30	1)+(3e)+	.(311) =	241.48	(5)
2. Ventilation rate:	main	secondar	37	other		total			m³ per hou	r
	heating	heating	-	Other	, –	lotai			, per nou	_
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				Ī	3	x -	10 =	30	(7a)
Number of passive vents	<b>S</b>				Ē	0	x ·	10 =	0	(7b)
Number of flueless gas f	ires				F	0	x	40 =	0	(7c)
	90				L					(, 0)
								Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(	7c) =	Г	30		÷ (5) =	0.12	(8)
If a pressurisation test has b	•				ontinue fr			` ,		``
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corr	esponding to	the great	er wall are	a (after					
If suspended wooden	• / .	aled) 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 window	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	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in co	ubic metre	s per ho	our per so	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	•								0.37	(18)
Air permeability value applie		as been don	ne or a deg	gree air pei	meability	is being u	sed			<b>7</b>
Number of sides shelters Shelter factor	ea			(20) = 1 -	0.075 x (1	19)] =			0.85	(19) (20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)		,,			0.32	(21)
Infiltration rate modified f	-	ed		( ) ( -)	( - /				0.32	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp		,   ••		7.0.9					J	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
, , , , , , , , , , , , , , , , , , , ,	1 1	1				<u> </u>	<u> </u>	I	1	
Wind Factor $(22a)m = (2a)m =$	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	]	

ljusted infiltration rate (allowing for shelte		<del>i ´</del>	<u>`                                    </u>	<u> </u>		ı		1	
0.41   0.4   0.39   0.35   0.3 alculate effective air change rate for the a	1 -	0.3	0.29	0.32	0.34	0.36	0.37		
If mechanical ventilation:	орпсаы <del>с</del> са	36						0	(2
If exhaust air heat pump using Appendix N, (23b) =	(23a) × Fmv (6	equation (N	N5)) , othe	rwise (23b	) = (23a)			0	(2
If balanced with heat recovery: efficiency in % allow	ing for in-use f	actor (fron	n Table 4h	) =				0	(
a) If balanced mechanical ventilation with	heat recove	erv (MVI	HR) (24a	a)m = (2:	2b)m + (	23b) <b>x</b> [	1 – (23c)		`
la)m= 0 0 0 0 0	<u> </u>	0	0	0	0	0	0	]	(
b) If balanced mechanical ventilation with	out heat red	coverv (N	иV) (24b	m = (22)	2b)m + (	23b)	l	ı	
(b)m= 0 0 0 0 0		0	0	0	0	0	0	]	(
c) If whole house extract ventilation or po	sitive input v	ventilatio	on from o	utside	!	!	!	J	
if $(22b)m < 0.5 \times (23b)$ , then $(24c) = 0$	•				.5 × (23b	o)			
c)m= 0 0 0 0 0	0	0	0	0	0	0	0		(
d) If natural ventilation or whole house point (22b)m = 1, then (24d)m = (22b)m	•				0.51	-			
d)m= 0.58 0.58 0.58 0.56 0.5	<del></del>	0.55	0.54	0.55	0.56	0.56	0.57	1	(
Effective air change rate - enter (24a) or	(24b) or (24	c) or (24	d) in box	· (25)	1			1	
i)m= 0.58 0.58 0.58 0.56 0.5	<del>`                                    </del>	0.55	0.54	0.55	0.56	0.56	0.57	1	(
		I			L		1	1	
. Heat losses and heat loss parameter:  _EMENT	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-l		A X k kJ/K
ndows Type 1	4.5	x1.	/[1/( 1.4 )+	0.04] =	5.97	,			(
ndows Type 2	2.26		/[1/( 1.4 )+	0.04] =	3	一			(
indows Type 3	4.72	ऱ .	/[1/( 1.4 )+	0.04] =	6.26	=			(
indows Type 4	2.29	╡.	- /[1/( 1.4 )+		3.04	=			(
por	33.02	=	0.13		4.2926	<u> </u>			(
alls Type1 34.82 13.77	21.05		0.13	╡ :	3.79	'극 ¦		<b>-</b>    -	(
		=				<del>- </del>		╡ ⊨	
·	4.02		0.18	=	0.72				(
tal area of elements, m <sup>2</sup>	71.86	_							(
irty wall	78.29		0	=	0				(
or windows and roof windows, use effective window nclude the areas on both sides of internal walls and		ated using	j formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapi	1 3.2	
bric heat loss, W/K = S (A x U)	•		(26)(30)	) + (32) =				27.00	6 (
eat capacity Cm = S(A x k)				((28).	(30) + (32	2) + (32a).	(32e) =	7503.	
ermal mass parameter (TMP = Cm ÷ TF)	A) in kJ/m²K	,		Indica	itive Value	: Medium		250	(
r design assessments where the details of the cons	truction are no	t known pr	recisely the	e indicative	e values of	TMP in T	able 1f		,
ermal bridges : S (L x Y) calculated using	Appendix I	K						5.03	; (
letails of thermal bridging are not known (36) = 0.15								0.00	\
tal fabric heat loss				(33) +	(36) =			32.09	9 (
ntilation heat loss calculated monthly				(38)m	= 0.33 × (	25)m x (5	)		
Jan Feb Mar Apr M	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
)m= 46.4 46.14 45.9 44.72 44	.5 43.48	43.48	43.29	43.88	44.5	44.95	45.41	]	(
eat transfer coefficient, W/K				(39)m	= (37) + (	38)m		-	
)m= 78.49 78.23 77.98 76.81 76.	59 75.57	75.57	75.38	75.97	76.59	77.04	77.5	]	
		1	1	L	1	1	1	i .	

Heat loss para	meter (I	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.83	0.83	0.82	0.81	0.81	0.8	0.8	0.8	0.8	0.81	0.81	0.82		
Number of day	vo in mo	nth (Tob	0.10)						Average =	Sum(40) <sub>1</sub>	12 /12=	0.81	(40)
Number of day 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	ing ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occur if TFA > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		68		(42)
if TFA £ 13.9	9, N = 1				,		, , -	,					
Annual averag Reduce the annua									se target o		'.96		(43)
not more that 125								a mater at	oo targot o				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	r day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)		•	•			
(44)m= 107.76	103.84	99.92	96	92.09	88.17	88.17	92.09	96	99.92	103.84	107.76		
Energy content of	hot water	used - cal	culated m	onthly – 4	190 v Vd r	n v nm v F	Tm / 3600			m(44) <sub>112</sub> =	L	1175.55	(44)
(45)m= 159.8	139.77	144.23	125.74	120.65	104.11	96.47	110.71	112.03	130.56	142.51	154.76		
(45)111= 159.6	139.77	144.23	123.74	120.03	104.11	90.47	110.71	l		m(45) <sub>112</sub> =	<del>  </del>	1541.34	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotar – ou	(10)112	L	1011.01	( -/
(46)m= 23.97	20.96	21.63	18.86	18.1	15.62	14.47	16.61	16.8	19.58	21.38	23.21		(46)
Water storage							.,,						
Storage volum	` '		•			_		ame ves	sei		0		(47)
If community h Otherwise if no	-			-			, ,	ers) ente	er 'O' in <i>(</i>	(47)			
Water storage			. (					o. o, o		, ,			
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =			0		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-								0		(51)
If community h	•			0 2 (	. I, III O, GO	•97					0		(0.)
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		•	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (	, ,	•						,			0		(55)
Water storage	loss cal	culated f	or each	month	T	T	((56)m = (	55) × (41)ı	m •	1	1		
(56)m= 0  If cylinder contains	0 s dedicate	0 d solar sto	0 rage, (57)ı	0 m = (56)m	0 x [(50) – (	0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (	0 (H11) is fro	0 m Appendi	x H	(56)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	 e 3					<del>-</del>		0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	e H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

				<b></b>	<b>()</b>	(							
Combi loss ca				<u> </u>	<u> </u>	<del>- ` ` `</del>	<u> </u>	T .=	<u> </u>	T	<u> </u>	1	(04)
(61)m= 50.96	46.03	50.92	47.34	46.93	43.48	44.93	46.93		50.92	49.32	50.96	]	(61)
							<del>`</del>		<del>`                                    </del>	<del>`</del>	<del>`</del>	(59)m + (61)m	
(62)m= 210.76	185.79	195.14	173.08	167.58	147.59	141.4	157.6		181.48	191.83	205.72		(62)
Solar DHW input of									r contribu	tion to wate	er heating)		
(add additiona				1		<del></del>	<del>.                                      </del>	<del></del>		1		1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from w		ter										1	
(64)m= 210.76	185.79	195.14	173.08	167.58	147.59	141.4	157.6	3 159.37	181.48	191.83	205.72		7
							0	utput from w	ater heate	er (annual)	112	2117.38	(64)
Heat gains from	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61	)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	[]	
(65)m= 65.87	57.98	60.68	53.64	51.85	45.49	43.31	48.54	49.09	56.14	59.71	64.2		(65)
include (57)	m in calc	culation of	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 ga	ains (see	Table 5	and 5a	):									
Metabolic gain	s (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec	]	
(66)m= 134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.2	4 134.24	134.24	134.24	134.24	1	(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5	•	•	•	•	
(67)m= 23.48	20.85	16.96	12.84	9.6	8.1	8.75	11.38		19.39	22.63	24.13	1	(67)
Appliances ga	ins (calc	ulated in	Append	dix L. ea	uation L	13 or L1	 3a), al	so see Ta	ble 5	1		J	
(68)m= 247.46		243.56	229.78	212.4	196.05	185.13	182.5		202.81	220.2	236.55	]	(68)
Cooking gains		ted in A	nnendix	l equat	ion I 15	or I 15a	) also	see Table	· 5	!		J	
(69)m= 36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42		36.42	36.42	36.42	1	(69)
Pumps and fai		(Tahla F	<u>[</u>			1			<u> </u>	1	<u> </u>	J	, ,
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g. ev				ļ								J	( - /
(71)m= -107.39	·	-107.39	-107.39	-107.39	-107.39	-107.39	-107.3	9 -107.39	-107.39	-107.39	-107.39	1	(71)
` ′	LI		-107.59	-107.59	-107.33	107.39	-107.5	9   -107.59	-107.53	-107.39	-107.33	J	(, ,)
Water heating (72)m= 88.54	gains (1		74.51	60.60	62.40	F0 04	65.0	60.17	75.46	1 82 04	86.29	1	(72)
` '		81.57	74.31	69.69	63.18	58.21	65.24		75.46	82.94	I	J	(12)
Total internal			000.4	057.05				m + (69)m +	· · · · · ·	1		1	(72)
(73)m= 425.75		408.35	383.4	357.95	333.6	318.37	325.4	6 338.75	363.93	392.04	413.23		(73)
6. Solar gains Solar gains are of		ucina colo	r flux from	Table 6a	and accor	siated equa	tions to	convert to th	o applica	ble orienta	tion		
Orientation: A		_	Area		Flu		ttions to		іс аррііса	FF	uori.	Gains	
	Table 6d	actor	m <sup>2</sup>			ble 6a		g_ Table 6b	Т	able 6c		(W)	
East 0.9x	4			F	<b>,</b>	10.64	1 , _	0.63	<b>—</b> "г	0.7	<u> </u>	. ,	(76)
East 0.9x	1	×	4.	==	-	19.64	」 ×	0.63	×	0.7	_ =	27.01	1
	1	x	2.2		-	19.64	]	0.63	×	0.7	=	13.57	(76)
Ļ	1	x	4.			38.42	]	0.63	×	0.7	=	52.84	(76)
East 0.9x	1	X	2.2	==	-	38.42	]	0.63		0.7	_ =	26.54	(76)
East 0.9x	1	X	4.	5	X (	63.27	X	0.63	Х	0.7	=	87.02	(76)

East	Foot			1		1		1		l	<u> </u>	1	Γ	٦
East	East	0.9x	1	X	2.26	X	63.27	X	0.63	X	0.7	=	43.7	(76)
East		<u> </u>	1	X	4.5	X	92.28	X	0.63	X	0.7	=	126.91	╡``
East		<u> </u>	1	X		X	92.28	X	0.63	X	0.7	=	63.74	╡``
East		늗	1	X	4.5	X	113.09	X	0.63	X	0.7	=	155.53	<b>1</b> (76)
East		0.9x	1	X	2.26	X	113.09	X	0.63	X	0.7	=	78.11	(76)
East		0.9x	1	X	4.5	X	115.77	X	0.63	X	0.7	=	159.21	(76)
East	East	0.9x	1	X	2.26	X	115.77	X	0.63	X	0.7	=	79.96	(76)
East	East	0.9x	1	X	4.5	X	110.22	X	0.63	X	0.7	=	151.58	(76)
East	East	0.9x	1	X	2.26	X	110.22	X	0.63	X	0.7	=	76.13	(76)
East	East	0.9x	1	X	4.5	X	94.68	X	0.63	X	0.7	=	130.2	(76)
East	East	0.9x	1	X	2.26	x	94.68	X	0.63	X	0.7	=	65.39	(76)
East	East	0.9x	1	X	4.5	X	73.59	x	0.63	X	0.7	=	101.2	(76)
East	East	0.9x	1	X	2.26	X	73.59	x	0.63	X	0.7	=	50.83	(76)
East 0.9x 1 x 4.5 x 24.49 x 0.63 x 0.7 = 33.68 (76)  East 0.9x 1 x 4.5 x 24.49 x 0.63 x 0.7 = 16.91 (76)  East 0.9x 1 x 4.5 x 16.15 x 0.63 x 0.7 = 16.91 (76)  East 0.9x 1 x 2.26 x 16.15 x 0.63 x 0.7 = 22.21 (76)  East 0.9x 1 x 2.26 x 16.15 x 0.63 x 0.7 = 22.21 (76)  East 0.9x 0.77 x 4.72 x 19.64 x 0.63 x 0.7 = 11.16 (76)  West 0.9x 0.77 x 2.29 x 19.64 x 0.63 x 0.7 = 28.33 (80)  West 0.9x 0.77 x 4.72 x 38.42 x 0.63 x 0.7 = 55.42 (80)  West 0.9x 0.77 x 4.72 x 63.27 x 0.63 x 0.7 = 26.89 (80)  West 0.9x 0.77 x 4.72 x 63.27 x 0.63 x 0.7 = 91.27 (80)  West 0.9x 0.77 x 4.72 x 63.27 x 0.63 x 0.7 = 91.27 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 166.626 (80)  West 0.9x 0.77 x 4.72 x 110.22 x 0.63 x 0.7 = 166.626 (80)  West 0.9x 0.77 x 4.72 x 7.359 x 0.63 x 0.7 = 51.5 (80)  West 0.9x 0.77 x 4.72 x 4.72 x 7.359 x 0.63 x 0.7 = 51.5 (80)  West 0.9x 0.77 x 4.72 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80)  West 0.9x 0.77 x 4.72 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80)	East	0.9x	1	X	4.5	x	45.59	x	0.63	x	0.7	=	62.7	(76)
East	East	0.9x	1	X	2.26	x	45.59	X	0.63	x	0.7	=	31.49	(76)
East 0.9x 1	East	0.9x	1	X	4.5	x	24.49	x	0.63	x	0.7	=	33.68	(76)
East 0.9x 1	East	0.9x	1	x	2.26	x	24.49	x	0.63	x	0.7	=	16.91	(76)
West         0.9x         0.77         x         4.72         x         19.64         x         0.63         x         0.7         =         28.33         (80)           West         0.9x         0.77         x         2.29         x         19.64         x         0.63         x         0.7         =         13.75         (80)           West         0.9x         0.77         x         4.72         x         38.42         x         0.63         x         0.7         =         26.89         (80)           West         0.9x         0.77         x         4.72         x         63.27         x         0.63         x         0.7         =         26.89         (80)           West         0.9x         0.77         x         4.72         x         63.27         x         0.63         x         0.7         =         91.27         (80)           West         0.9x         0.77         x         4.72         x         92.28         x         0.63         x         0.7         =         44.28         (80)           West         0.9x         0.77         x         4.72         x         113.09	East	0.9x	1	x	4.5	x	16.15	x	0.63	x	0.7	=	22.21	(76)
West 0.9x 0.77 x 2.29 x 38.42 x 0.63 x 0.7 = 13.75 (80) West 0.9x 0.77 x 4.72 x 38.42 x 0.63 x 0.7 = 26.89 (80) West 0.9x 0.77 x 4.72 x 63.27 x 0.63 x 0.7 = 91.27 (80) West 0.9x 0.77 x 2.29 x 63.27 x 0.63 x 0.7 = 91.27 (80) West 0.9x 0.77 x 4.72 x 92.28 x 0.63 x 0.7 = 44.28 (80) West 0.9x 0.77 x 4.72 x 92.28 x 0.63 x 0.7 = 64.58 (80) West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 64.58 (80) West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80) West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 167.16 (80) West 0.9x 0.77 x 4.72 x 115.77 x 0.63 x 0.7 = 167. (80) West 0.9x 0.77 x 4.72 x 115.77 x 0.63 x 0.7 = 167. (80) West 0.9x 0.77 x 4.72 x 115.77 x 0.63 x 0.7 = 168.00 West 0.9x 0.77 x 4.72 x 115.77 x 0.63 x 0.7 = 168.00 West 0.9x 0.77 x 4.72 x 115.77 x 0.63 x 0.7 = 168.00 West 0.9x 0.77 x 4.72 x 110.22 x 0.63 x 0.7 = 158.99 (80) West 0.9x 0.77 x 4.72 x 110.22 x 0.63 x 0.7 = 158.99 (80) West 0.9x 0.77 x 4.72 x 110.22 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 94.68 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 94.68 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 94.68 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 73.59 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 73.59 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 73.59 x 0.63 x 0.7 = 151.5 (80) West 0.9x 0.77 x 4.72 x 4.72 x 73.59 x 0.63 x 0.7 = 151.5 (80) West 0.9x 0.77 x 4.72 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 66.26 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 65.76 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 65.76 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 65.76 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 31.91 (80)	East	0.9x	1	x	2.26	x	16.15	x	0.63	x	0.7	=	11.16	(76)
West 0.9x 0.77	West	0.9x	0.77	x	4.72	x	19.64	x	0.63	x	0.7	=	28.33	(80)
West 0.9x 0.77	West	0.9x	0.77	X	2.29	x	19.64	x	0.63	x	0.7	=	13.75	(80)
West 0.9x 0.77	West	0.9x	0.77	x	4.72	x	38.42	x	0.63	x	0.7	j =	55.42	(80)
West 0.9x 0.77	West	0.9x	0.77	x	2.29	x	38.42	x	0.63	x	0.7	j =	26.89	(80)
West         0.9x         0.77         x         4.72         x         92.28         x         0.63         x         0.7         =         133.11         (80)           West         0.9x         0.77         x         2.29         x         92.28         x         0.63         x         0.7         =         64.58         (80)           West         0.9x         0.77         x         4.72         x         113.09         x         0.63         x         0.7         =         64.58         (80)           West         0.9x         0.77         x         4.72         x         113.09         x         0.63         x         0.7         =         163.14         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         110.22	West	0.9x	0.77	x	4.72	x	63.27	x	0.63	x	0.7	=	91.27	(80)
West         0.9x         0.77         x         2.29         x         92.28         x         0.63         x         0.7         =         64.58         (80)           West         0.9x         0.77         x         4.72         x         113.09         x         0.63         x         0.7         =         163.14         (80)           West         0.9x         0.77         x         2.29         x         113.09         x         0.63         x         0.7         =         163.14         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         94.68	West	0.9x	0.77	x	2.29	x	63.27	х	0.63	х	0.7	j =	44.28	(80)
West         0.9x         0.77         x         4.72         x         113.09         x         0.63         x         0.7         =         163.14         (80)           West         0.9x         0.77         x         2.29         x         113.09         x         0.63         x         0.7         =         79.15         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         94.68         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         4.72         x         73.59	West	0.9x	0.77	x	4.72	x	92.28	x	0.63	x	0.7	j =	133.11	(80)
West         0.9x         0.77         x         2.29         x         113.09         x         0.63         x         0.7         =         79.15         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         2.29         x         115.77         x         0.63         x         0.7         =         81.02         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         81.02         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         94.68         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         4.72         x         73.59	West	0.9x	0.77	x	2.29	x	92.28	x	0.63	x	0.7	=	64.58	(80)
West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         2.29         x         115.77         x         0.63         x         0.7         =         81.02         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         94.68         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         4.72         x         73.59         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         4.72         x         73.59	West	0.9x	0.77	x	4.72	x	113.09	x	0.63	x	0.7	j =	163.14	(80)
West         0.9x         0.77         x         2.29         x         115.77         x         0.63         x         0.7         =         81.02         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         2.29         x         110.22         x         0.63         x         0.7         =         77.14         (80)           West         0.9x         0.77         x         4.72         x         94.68         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         4.72         x         73.59         x         0.63         x         0.7         =         66.26         (80)           West         0.9x         0.77         x         4.72         x         73.59         x         0.63         x         0.7         =         51.5         (80)           West         0.9x         0.77         x         4.72         x         45.59	West	0.9x	0.77	x	2.29	x	113.09	x	0.63	x	0.7	j =	79.15	(80)
West       0.9x       0.77       x       4.72       x       110.22       x       0.63       x       0.7       =       158.99       (80)         West       0.9x       0.77       x       2.29       x       110.22       x       0.63       x       0.7       =       77.14       (80)         West       0.9x       0.77       x       4.72       x       94.68       x       0.63       x       0.7       =       136.57       (80)         West       0.9x       0.77       x       2.29       x       94.68       x       0.63       x       0.7       =       66.26       (80)         West       0.9x       0.77       x       4.72       x       73.59       x       0.63       x       0.7       =       51.5       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       51.5       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West <t< td=""><td>West</td><td>0.9x</td><td>0.77</td><td>x</td><td>4.72</td><td>x</td><td>115.77</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td>  =</td><td>167</td><td>(80)</td></t<>	West	0.9x	0.77	x	4.72	x	115.77	x	0.63	x	0.7	=	167	(80)
West         0.9x         0.77         x         2.29         x         110.22         x         0.63         x         0.7         =         77.14         (80)           West         0.9x         0.77         x         4.72         x         94.68         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         2.29         x         94.68         x         0.63         x         0.7         =         66.26         (80)           West         0.9x         0.77         x         4.72         x         73.59         x         0.63         x         0.7         =         106.15         (80)           West         0.9x         0.77         x         4.72         x         45.59         x         0.63         x         0.7         =         51.5         (80)           West         0.9x         0.77         x         4.72         x         45.59         x         0.63         x         0.7         =         65.76         (80)           West         0.9x         0.77         x         4.72         x         24.49	West	0.9x	0.77	x	2.29	x	115.77	x	0.63	x	0.7	j =	81.02	(80)
West       0.9x       0.77       x       4.72       x       94.68       x       0.63       x       0.7       =       136.57       (80)         West       0.9x       0.77       x       2.29       x       94.68       x       0.63       x       0.7       =       66.26       (80)         West       0.9x       0.77       x       4.72       x       73.59       x       0.63       x       0.7       =       106.15       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       2.29       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       2.29       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West       0.9x       0.77       x       4.72       x       24.49       x       0.63       x       0.7       =       35.33       (80)	West	0.9x	0.77	x	4.72	x	110.22	x	0.63	x	0.7	j =	158.99	(80)
West       0.9x       0.77       x       2.29       x       94.68       x       0.63       x       0.7       =       66.26       (80)         West       0.9x       0.77       x       4.72       x       73.59       x       0.63       x       0.7       =       106.15       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West       0.9x       0.77       x       4.72       x       24.49       x       0.63       x       0.7       =       35.33       (80)	West	0.9x	0.77	x	2.29	x	110.22	x	0.63	x	0.7	=	77.14	(80)
West       0.9x       0.77       x       4.72       x       73.59       x       0.63       x       0.7       =       106.15       (80)         West       0.9x       0.77       x       2.29       x       73.59       x       0.63       x       0.7       =       51.5       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       2.29       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West       0.9x       0.77       x       4.72       x       24.49       x       0.63       x       0.7       =       35.33       (80)	West	0.9x	0.77	x	4.72	x	94.68	x	0.63	x	0.7	j =	136.57	(80)
West       0.9x       0.77       x       2.29       x       73.59       x       0.63       x       0.7       =       51.5       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       2.29       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West       0.9x       0.77       x       4.72       x       24.49       x       0.63       x       0.7       =       35.33       (80)	West	0.9x	0.77	x	2.29	x	94.68	x	0.63	x	0.7	j =	66.26	(80)
West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       2.29       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West       0.9x       0.77       x       4.72       x       24.49       x       0.63       x       0.7       =       35.33       (80)	West	0.9x	0.77	x	4.72	x	73.59	x	0.63	х	0.7	j =	106.15	(80)
West 0.9x 0.77 x 2.29 x 45.59 x 0.63 x 0.7 = 31.91 (80) West 0.9x 0.77 x 4.72 x 24.49 x 0.63 x 0.7 = 35.33 (80)	West	0.9x	0.77	×	2.29	x	73.59	x	0.63	x	0.7	j   =	51.5	(80)
West 0.9x 0.77 x 4.72 x 24.49 x 0.63 x 0.7 = 35.33 (80)	West	0.9x	0.77	x	4.72	x	45.59	x	0.63	x	0.7	=	65.76	(80)
West 500	West	0.9x	0.77	×	2.29	x	45.59	x	0.63	x	0.7	] =	31.91	(80)
West 0.9x 0.77 x 2.29 x 24.49 x 0.63 x 0.7 = 17.14 (80)	West	0.9x	0.77	x	4.72	x	24.49	x	0.63	x	0.7	=	35.33	(80)
0	West	0.9x	0.77	x	2.29	x	24.49	X	0.63	x	0.7	=	17.14	(80)

West West														
West	0.9x	0.77	X	4.7	<b>'</b> 2	x 1	6.15	X	0.63	x	0.7	=	23.3	(80)
	0.9x	0.77	x	2.2	29	x 1	16.15	X	0.63	x	0.7	=	11.3	(80)
Solar	gains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m			ı	
(83)m=	82.65	161.68	266.27	388.34	475.93	487.2	463.83	398.42	309.69	191.85	103.06	67.97		(83)
Total g	gains – ir	nternal a	nd solar	(84)m =	= (73)m -	+ (83)m	, watts						ı	
(84)m=	508.4	585.12	674.63	771.74	833.88	820.8	782.2	723.88	648.44	555.78	495.1	481.2		(84)
7. Me	ean inter	nal temp	erature	(heating	season	)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(see Ta	ıble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.94	0.79	0.58	0.42	0.48	0.76	0.97	1	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fc	llow ste	ps 3 to 7	' in Tabl	e 9c)					
(87)m=	20.15	20.29	20.51	20.78	20.95	20.99	21	21	20.97	20.73	20.39	20.13		(87)
						.1 .112		l l o T						
-						20.26	from Ta		· `	20.25	20.24	20.24		(88)
(88)m=	20.23	20.23	20.23	20.24	20.25	20.26	20.26	20.26	20.25	20.25	20.24	20.24		(00)
	ation fac	tor for g		est of d	welling, l	n2,m (se	e Table	9a)	1				l	
(89)m=	1	1	0.98	0.92	0.75	0.52	0.35	0.4	0.7	0.96	1	1		(89)
Mean	n interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	19.08	19.28	19.6	19.99	20.2	20.25	20.25	20.26	20.23	19.93	19.44	19.06		(90)
			-		-		-		f	LA = Livin	g area ÷ (4	l) =	0.36	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lina) = fl	LA × T1	+ (1 – fl	A) × T2			'		_
(92)m=	19.47	19.65	19.93	20.28	20.47	20.52	20.53	20.53	20.5	20.22	19.78	19.45		(92)
vlaqA		nent to t	he mean	interna	tempera	ature fro	m Table		ere appro	priate				
(93)m=	19.47	19.65	19.93	20.28	20.47	20.52	20.53	20.53	20.5	20.22	19.78	19.45		(93)
8. Sp	ace hea	ting requ	uirement											
Set T	i to the r	mean int	ernal ter	nperatu	re obtain									
the ut	tilisation	factor fo	or gains i	icina Ta		ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(	76)m and	d re-calc	ulate	
	Jan	. – .		using ra	ble 9a	ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(7	76)m and	d re-calc	ulate	
		Feb	Mar	Apr	ble 9a May	ed at ste	ep 11 of Jul	Table 9l Aug	o, so tha Sep	t Ti,m=(7	76)m and	d re-cald Dec	culate	
	ation fac	tor for g	ains, hm	Apr :	May	Jun	Jul	Aug	Sep	Oct	Nov		eulate	
(94)m=	1	tor for g	ains, hm	Apr : 0.92	May 0.76					-			ulate	(94)
(94)m= Usefu	1 ul gains,	tor for g 0.99 hmGm	ains, hm 0.98 , W = (94	Apr : 0.92 1)m x (8	0.76 4)m	Jun 0.54	Jul 0.38	Aug 0.43	Sep 0.72	Oct 0.96	Nov 0.99	Dec 1	ulate	
(94)m= Usefu (95)m=	1 ul gains, 507.33	0.99 hmGm 581.84	ains, hm 0.98 , W = (94 661.12	Apr : 0.92 1)m x (8- 708.2	0.76 4)m 634.06	Jun 0.54 444.22	Jul	Aug	Sep	Oct	Nov	Dec	ulate	(94) (95)
(94)m= Usefu (95)m= Montl	1 gains, 507.33	o.99 hmGm 581.84 age exte	ains, hm 0.98 , W = (94 661.12 rnal tem	Apr : 0.92 4)m x (8- 708.2 perature	0.76 4)m 634.06	Jun 0.54 444.22 able 8	Jul 0.38 296.46	Aug 0.43 310.53	Sep 0.72 466.67	Oct 0.96 532.65	Nov 0.99 492.5	Dec 1 480.48	ulate	(95)
(94)m= Usefu (95)m= Month (96)m=	1 gains, 507.33 hly avera 4.3	o.99 hmGm 581.84 age exter	0.98 , W = (94 661.12 ernal tem	Apr : 0.92 1)m x (8 708.2 perature 8.9	0.76 4)m 634.06 e from Ta	Jun 0.54 444.22 able 8 14.6	Jul 0.38 296.46	Aug 0.43 310.53	Sep 0.72 466.67	Oct 0.96 532.65	Nov 0.99	Dec 1	ulate	
(94)m= Usefu (95)m= Montl (96)m= Heat	1 gains, 507.33 hly avera 4.3 loss rate	o.99 hmGm 581.84 age exter 4.9	ains, hm 0.98 , W = (94 661.12 ernal tem 6.5 an intern	Apr : 0.92 4)m x (8- 708.2 perature 8.9 al tempe	0.76 4)m 634.06 e from Ta 11.7	Jun  0.54  444.22  able 8  14.6  Lm , W =	Jul 0.38 296.46 16.6 =[(39)m x	Aug 0.43 310.53 16.4 x [(93)m	Sep 0.72 466.67 14.1 - (96)m	Oct 0.96 532.65	Nov 0.99 492.5	Dec 1 480.48 4.2	ulate	(95) (96)
(94)m= Usefu (95)m= Montil (96)m= Heat (97)m=	1 gains, 507.33 hly avera 4.3 loss rate 1190.92	0.99 hmGm 581.84 age exte 4.9 e for mea	ains, hm 0.98 , W = (94 661.12  rnal tem 6.5  an intern 1047.56	Apr : 0.92 1)m x (8-708.2 perature 8.9 al tempe 874	0.76 4)m 634.06 e from Ta 11.7 erature, I 671.63	Jun  0.54  444.22  able 8  14.6  Lm , W =	Jul  0.38  296.46  16.6  =[(39)m)  296.71	Aug  0.43  310.53  16.4  x [(93)m  311.1	Sep 0.72 466.67 14.1 - (96)m 486.01	Oct  0.96  532.65  10.6  ]	Nov 0.99 492.5 7.1	Dec 1 480.48	ulate	(95)
(94)m= Usefu (95)m= Montl (96)m= Heat (97)m= Space	1 gains, 507.33 hly avera 4.3 loss rate 1190.92 e heating	tor for g 0.99 hmGm 581.84 age exte 4.9 e for mea 1153.64 g require	ains, hm 0.98 , W = (94 661.12 ernal tem 6.5 an intern 1047.56 ement fo	Apr : 0.92 1)m x (8.708.2 perature 8.9 al tempe 874 r each n	May  0.76  4)m  634.06 e from Ta  11.7 erature, 1  671.63 nonth, k\	Jun  0.54  444.22  able 8  14.6  Lm , W =  447.54  Wh/mon	Jul  0.38  296.46  16.6  =[(39)m x 296.71  th = 0.02	Aug  0.43  310.53  16.4  x [(93)m  311.1  24 x [(97)	Sep  0.72  466.67  14.1  - (96)m  486.01  )m - (95	Oct  0.96  532.65  10.6  ]  736.76  )m] x (4'	Nov 0.99 492.5 7.1 977.21 1)m	Dec  1  480.48  4.2  1181.93	ulate	(95) (96)
(94)m= Usefu (95)m= Montil (96)m= Heat (97)m=	1 gains, 507.33 hly avera 4.3 loss rate 1190.92	0.99 hmGm 581.84 age exte 4.9 e for mea	ains, hm 0.98 , W = (94 661.12  rnal tem 6.5  an intern 1047.56	Apr : 0.92 1)m x (8-708.2 perature 8.9 al tempe 874	0.76 4)m 634.06 e from Ta 11.7 erature, I 671.63	Jun  0.54  444.22  able 8  14.6  Lm , W =	Jul  0.38  296.46  16.6  =[(39)m)  296.71	Aug  0.43  310.53  16.4  x [(93)m  311.1  24 x [(97)  0	Sep  0.72  466.67  14.1  - (96)m  486.01  )m - (95  0	Oct  0.96  532.65  10.6  ]  736.76  )m] x (4'  151.86	Nov 0.99 492.5 7.1 977.21 1)m 348.99	Dec  1  480.48  4.2  1181.93		(95) (96) (97)
(94)m= Usefu (95)m= Montl (96)m= Heat (97)m= Space	1 gains, 507.33 hly avera 4.3 loss rate 1190.92 e heating	tor for g 0.99 hmGm 581.84 age exte 4.9 e for mea 1153.64 g require	ains, hm 0.98 , W = (94 661.12 ernal tem 6.5 an intern 1047.56 ement fo	Apr : 0.92 1)m x (8.708.2 perature 8.9 al tempe 874 r each n	May  0.76  4)m  634.06 e from Ta  11.7 erature, 1  671.63 nonth, k\	Jun  0.54  444.22  able 8  14.6  Lm , W =  447.54  Wh/mon	Jul  0.38  296.46  16.6  =[(39)m x 296.71  th = 0.02	Aug  0.43  310.53  16.4  x [(93)m  311.1  24 x [(97)  0	Sep  0.72  466.67  14.1  - (96)m  486.01  )m - (95	Oct  0.96  532.65  10.6  ]  736.76  )m] x (4'  151.86	Nov 0.99 492.5 7.1 977.21 1)m 348.99	Dec  1  480.48  4.2  1181.93	2350.39	(95) (96)
(94)m= Usefu (95)m= Montl (96)m= Heat (97)m= Space (98)m=	1 gains, 507.33 hly avera 4.3 loss rate 1190.92 e heating 508.59	0.99 hmGm 581.84 age exte 4.9 e for mea 1153.64 g require 384.25	ains, hm 0.98 , W = (94 661.12 ernal tem 6.5 an intern 1047.56 ement fo	Apr : 0.92 4)m x (8-708.2 perature 8.9 al tempe 874 r each n	0.76 4)m 634.06 e from Ta 11.7 erature, I 671.63 nonth, kV	Jun  0.54  444.22  able 8  14.6  Lm , W =  447.54  Wh/mon	Jul  0.38  296.46  16.6  =[(39)m x 296.71  th = 0.02	Aug  0.43  310.53  16.4  x [(93)m  311.1  24 x [(97)  0	Sep  0.72  466.67  14.1  - (96)m  486.01  )m - (95  0	Oct  0.96  532.65  10.6  ]  736.76  )m] x (4'  151.86	Nov 0.99 492.5 7.1 977.21 1)m 348.99	Dec  1  480.48  4.2  1181.93		(95) (96) (97)
(94)m= Usefu (95)m= Montl (96)m= Heat (97)m= Space (98)m=	1 gains, 507.33 hly avera 4.3 loss rate 1190.92 e heating 508.59	o.99 hmGm 581.84 age exte 4.9 e for mea 1153.64 g require 384.25	ains, hm 0.98 , W = (94 661.12 ernal tem 6.5 an intern 1047.56 ement fo 287.51	Apr : 0.92 4)m x (8-708.2 perature 8.9 al tempe 874 r each n 119.38	0.76 4)m 634.06 e from Ta 11.7 erature,   671.63 nonth, k\ 27.95	Jun  0.54  444.22  able 8  14.6  Lm , W = 447.54  Wh/mont	Jul  0.38  296.46  16.6  =[(39)m x 296.71  th = 0.02	Aug  0.43  310.53  16.4  x [(93)m  311.1  24 x [(97)  0  Tota	0.72 466.67 14.1 - (96)m 486.01 )m - (95 0	Oct  0.96  532.65  10.6  ]  736.76  )m] x (4'  151.86	Nov 0.99 492.5 7.1 977.21 1)m 348.99	Dec  1  480.48  4.2  1181.93	2350.39	(95) (96) (97)
(94)m= Usefu (95)m= Montl (96)m= Heat (97)m= Space (98)m=  Space	1 gains, 507.33 hly avera 4.3 loss rate 1190.92 e heating 508.59	tor for g 0.99 hmGm 581.84 age exte 4.9 e for mea 1153.64 g require 384.25	ains, hm 0.98 , W = (94 661.12 ernal tem 6.5 an intern 1047.56 ement fo 287.51	Apr : 0.92 4)m x (8-708.2 perature 8.9 al tempe 874 r each n 119.38	0.76 4)m 634.06 e from Ta 11.7 erature,   671.63 nonth, k\ 27.95	Jun  0.54  444.22  able 8  14.6  Lm , W = 447.54  Wh/mont	Jul  0.38  296.46  16.6  =[(39)m)  296.71  th = 0.02	Aug  0.43  310.53  16.4  x [(93)m  311.1  24 x [(97)  0  Tota	0.72 466.67 14.1 - (96)m 486.01 )m - (95 0	Oct  0.96  532.65  10.6  ]  736.76  )m] x (4'  151.86	Nov 0.99 492.5 7.1 977.21 1)m 348.99	Dec  1  480.48  4.2  1181.93	2350.39	(95) (96) (97)

Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.4	(206)
Efficiency of secondary/supplementary heating s	system	, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)  508.59   384.25   287.51   119.38   27.95	0	0	0	0	151.86	348.99	521.88		
	0	U	U	U	131.00	346.99	321.00		(211)
$ (211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $ 544.53  411.4  307.82  127.81  29.92 $	0	0	0	0	162.59	373.65	558.75		(211)
			Total	l (kWh/yea	ar) =Sum(2		_	2516.48	(211)
Space heating fuel (secondary), kWh/month									_
= {[(98)m x (201)] } x 100 ÷ (208)								•	
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		7(045)
Materia			Total	i (kvvn/yea	ar) =Sum(2	(15) <sub>15,1012</sub>		0	(215)
Water heating Output from water heater (calculated above)									
·	147.59	141.4	157.63	159.37	181.48	191.83	205.72		
Efficiency of water heater								80.3	(216)
(217)m= 87.19 86.84 86.03 84.14 81.6	80.3	80.3	80.3	80.3	84.61	86.54	87.3		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	400.0	470.00			0445	004.07	005.00		
(219)111= 241.74   213.95   220.05   203.72   203.55	183.8	176.09	196.3	198.47	214.5	221.67	235.66		
(219)1112 241.74 213.95 220.05 203.72 203.35	183.8	176.09		198.47 I = Sum(2		221.67	235.66	2520.09	(219)
Annual totals	183.8	176.09			19a) <sub>112</sub> =	Wh/year		kWh/yeai	
Annual totals Space heating fuel used, main system 1	183.8	176.09			19a) <sub>112</sub> =			kWh/year 2516.48	
Annual totals Space heating fuel used, main system 1 Water heating fuel used	183.8	176.09			19a) <sub>112</sub> =			kWh/yeai	
Annual totals Space heating fuel used, main system 1	183.8	176.09			19a) <sub>112</sub> =			kWh/year 2516.48	
Annual totals Space heating fuel used, main system 1 Water heating fuel used	183.8	176.09			19a) <sub>112</sub> =			kWh/year 2516.48	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot	183.8	176.09			19a) <sub>112</sub> =			kWh/year 2516.48	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:	183.8	176.09	Total	I = Sum(2	19a) <sub>112</sub> =	Wh/year	30	kWh/year 2516.48	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue	183.8	176.09	Total	I = Sum(2	19a) <sub>112</sub> = <b>k\</b>	Wh/year	30	kWh/year 2516.48 2520.09	(230c) (230e)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			Total	l = Sum(2: of (230a).	19a) <sub>112</sub> = <b>k\</b>	Wh/year	30	kWh/year 2516.48 2520.09	(230c) (230e) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu	ding mi	Total	l = Sum(2: of (230a).	19a) <sub>112</sub> = <b>k1</b> (230g) =	Wh/year	30 45	kWh/year 2516.48 2520.09 75 414.58	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu		Total	l = Sum(2: of (230a).	19a) <sub>112</sub> = <b>k1</b> (230g) =	Wh/year	30 45	kWh/year 2516.48 2520.09	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu	ding mi e <b>rgy</b> h/year	Total	l = Sum(2: of (230a).	19a) <sub>112</sub> = kk\footnote{k\footn	Wh/year	30 45	kWh/year 2516.48 2520.09 75 414.58	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	ns inclu Ene kW	ding midergy h/year	Total	l = Sum(2: of (230a).	(230g) =  Emiss kg CO2	ion fac	30 45 <b>tor</b>	2516.48 2520.09  75 414.58  Emissions kg CO2/ye	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions — Individual heating system Space heating (main system 1)	ns inclu Ene kW	ding midergy h/year ) × ) ×	Total	l = Sum(2: of (230a).	(230g) =  Emiss kg CO2	ion fac 2/kWh	30 45 <b>tor</b>	2516.48 2520.09  75 414.58  Emissions kg CO2/ye 543.56 0	(230c) (230e) (231) (232) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions — Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Ene kW (211) (215 (219)	ding midergy h/year ) × ) × ) ×	Total	of (230a).	(230g) =  Emiss kg CO2  0.5	ion fac 2/kWh	30 45 <b>tor</b> = =	2516.48 2516.48 2520.09  75 414.58  Emissions kg CO2/ye 543.56 0 544.34	(230c) (230e) (231) (232)  (261) (263) (264)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions — Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Ene kW (211) (215) (219) (261)	ding minergy h/year ) x ) x ) x ) + (262)	sum	of (230a).	19a) <sub>112</sub> = k1	ion fac 2/kWh	30 45 <b>tor</b> = = =	kWh/year 2516.48 2520.09 75 414.58 Emissions kg CO2/ye 543.56 0 544.34 1087.9	(230c) (230e) (231) (232)  (261) (263) (264) (265)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions — Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Ene kW (211) (215 (219)	ding midergy h/year ) x ) x ) + (262)	sum	of (230a).	(230g) =  Emiss kg CO2  0.5	ion fac 2/kWh	30 45 <b>tor</b> = =	2516.48 2516.48 2520.09  75 414.58  Emissions kg CO2/ye 543.56 0 544.34	(230c) (230e) (231) (232)  (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1341.99 (272)

 $TER = 14.17 \tag{273}$ 

		Lloo	r Details:				
		USE	Details.				
Assessor Name:	Joseph Treanor		Stroma Nu			0032062	
Software Name:	Stroma FSAP 20	)12	Software V	ersion:	Versio	on: 1.0.4.14	
		Proper	ty Address: P5				
Address :	, Gondar Gardens	, London, NW6	1HG				
1. Overall dwelling dime	ensions:						
		Α	rea(m²)	Av. Hei	ght(m)	Volume(m	3)
Ground floor			97.6 (1a) x	2.	55 (2a) =	248.88	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	1e)+(1n)	97.6 (4)				
Dwelling volume			(3a)+(	3b)+(3c)+(3d)	)+(3e)+(3n) =	248.88	(5)
2. Ventilation rate:							
		secondary	other	total		m³ per hou	ur
Number of chimneys	heating +	heating +	0 =	0	x 40 =	0	(6a)
Number of open flues	0 +	0 +	0 =	0	x 20 =	0	(6b)
Number of intermittent fa					x 10 =		╡`´
				3		30	(7a)
Number of passive vents	5			0	x 10 =	0	(7b)
Number of flueless gas f	ires			0	x 40 =	0	(7c)
					Δir ck	nanges per h	our
lefituation due to alciene	fl and fam.	(Ca) - (Ch) - (Za) - (Zh	) . ( <b>7</b> 0)				
Infiltration due to chimne	•			30 from (0) to (	÷ (5) =	0.12	(8)
If a pressurisation test has I Number of storeys in t		idea, proceed to ( r	7), otnerwise continue	; Irom (9) to (	16)	0	(9)
Additional infiltration	rie dweiling (ris)				[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	) 25 for steel or timbe	ur frame or 0.35	for masonry cons	etruction	[(9)-1]x0.1 =	0	(11)
	oresent, use the value corr		•			U	(11)
deducting areas of openi		- <b></b>					
If suspended wooden	floor, enter 0.2 (unse	aled) or 0.1 (se	aled), else enter	0		0	(12)
If no draught lobby, er	nter 0.05, else enter 0	)				0	(13)
Percentage of window	s 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 co	ubic metres per	hour per square	metre of e	nvelope area	5	(17)
If based on air permeabi	lity value, then (18) = I	$[(17) \div 20] + (8)$ , other	erwise (18) = (16)			0.37	(18)
Air permeability value applie	es if a pressurisation test h	as been done or a	degree air permeabil	ity is being us	ed	-	
Number of sides sheltered	ed					2	(19)
Shelter factor			(20) = 1 - [0.075)	(19)] =		0.85	(20)
Infiltration rate incorpora	•		$(21) = (18) \times (20)$	=		0.31	(21)
Infiltration rate modified	<del></del>	1				1	
Jan Feb	Mar Apr May	y Jun Ju	I Aug Se <sub>l</sub>	o Oct	Nov Dec	]	
Monthly average wind sp	peed from Table 7					-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7 4	4.3	4.5 4.7	]	
Wind Factor (22a)m = (2	2)m ÷ 4						
vviiiu i acitii (22a)iii = (2	†	T T	-			1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

djusted infiltration rate (allowing f		nd wind s	peed) =	<u> </u>	<del>` ´</del>	,	1		1	
0.4 0.39 0.39 0.39 0.39 0.39 0.39 0.39 0.39	35 0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37		
If mechanical ventilation:	тог ите арри	icable ca	SE						0	
If exhaust air heat pump using Appendix	N, (23b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0	(
If balanced with heat recovery: efficiency	/ in % allowing t	for in-use f	actor (from	n Table 4h	) =				0	(
a) If balanced mechanical ventila	ation with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	,
·	0 0	0	0	0	0	0	0	0	]	(
b) If balanced mechanical ventila	ation without	heat rec	covery (N	ЛV) (24b	)m = (22	2b)m + (2	23b)	1	J	
Hb)m= 0 0 0	0 0	0	0	0	0	0	0	0	]	(
c) If whole house extract ventilate	ion or positiv	ve input v	ventilatio	n from o	outside	l	l			
if $(22b)m < 0.5 \times (23b)$ , then	(24c) = (23b)	o); otherv	wise (24	c) = (22k	o) m + 0.	5 × (23b	)		_	
c)m= 0 0 0	0 0	0	0	0	0	0	0	0	]	(
d) If natural ventilation or whole if (22b)m = 1, then (24d)m =	•	•				0.51				
	56 0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	]	(
Effective air change rate - enter	(24a) or (24l	b) or (24	c) or (24	d) in box	x (25)				J	
	56 0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	]	(
								1		
. Heat losses and heat loss para <b>EMENT</b> Gross Oparea (m²)	enings m²	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value		A X k kJ/K
ndows Type 1		4.5		/[1/( 1.4 )+		5.97		NO/III		(
ndows Type 2		2.26	〓 .	/[1/( 1.4 )+	l l	3	=			(
ndows Type 3			= .	/[1/( 1.4 )+	l.		=			,
• •		4.72	= .	/[1/( 1.4 )+		6.26	<b>=</b>			(
ndows Type 4		2.29	=		— ;	3.04	륵 ,			) 
oor		33.02	=	0.13	=	4.2926	닠 !		╡	(
alls Type1 34.82	13.77	21.05	x	0.18	=	3.79	닠 !		<b>Ⅎ</b> ┡	(
alls Type2 4.02	0	4.02	Х	0.18	=	0.72				(
tal area of elements, m <sup>2</sup>		71.86	<u> </u>							(
irty wall		78.29		0	=	0				(
or windows and roof windows, use effect include the areas on both sides of interna			ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	h 3.2	
bric heat loss, W/K = S (A x U)	ar wans and par	uuons		(26)(30)	) + (32) =				27.0	<u> </u>
eat capacity Cm = S(A x k)				. , . ,		(30) + (32	2) + (32a).	(32e) =	7503.	
ermal mass parameter (TMP = 0	Cm ∸ TFA) ir	n k.l/m²K			., ,	tive Value	, , ,	()	250	(
r design assessments where the details	,			ecisely the				able 1f	230	(
n be used instead of a detailed calculation			·	•						
ermal bridges : S (L x Y) calcula	ited using Ap	pendix ł	<						5.03	(
etails of thermal bridging are not known	$(36) = 0.15 \times (3$	31)			(00)	(26)				<del></del> 1.
tal fabric heat loss	and the late					(36) =	OE\ (=	<b>\</b>	32.0	9 (
adjudan hard been selected to the	ntniv		1		<del>- ` ´</del>	= 0.33 × (	<u> </u>	1	1	
	<del>- i</del>								Ī	
Jan Feb Mar A	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	,
Jan Feb Mar A  )m= 47.69 47.43 47.18 45	<del>- i</del>	Jun 44.74	Jul 44.74	Aug 44.55	45.14	45.77	46.22	46.69		(
eat transfer coefficient, W/K	Apr May	-		Ť	45.14	-	46.22	<del> </del>	1	(

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.82	0.81	0.81	0.8	0.8	0.79	0.79	0.79	0.79	0.8	0.8	0.81		
L								,	Average =	Sum(40) <sub>1</sub> .	12 /12=	0.8	(40)
Number of day	s in mo	nth (Tabl	e 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 heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
Assumed 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 ( <sup>-</sup>	ΓFA -13.		72		(42)
Annual averag											.71		(43)
Reduce the annua							o achieve	a water us	se target o	r <sup>t</sup>			
not more that 125	ilites per j	ı ı	uay (all w		ioi and co								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	ı litres pei	day for ea	cn montn	Va,m = ta	ctor from	able 1c x	(43)						
(44)m= 108.58	104.63	100.68	96.73	92.79	88.84	88.84	92.79	96.73	100.68	104.63	108.58		_
Charmy contant of	hat water	used sole	ouloted m	anthly 1	100 v Vd r	n v nm v [	Tm / 2600			m(44) <sub>112</sub> =	L	1184.51	(44)
Energy content of		usea - car		ontniy = 4.	190 x va,r		71m / 3600	KVVN/mor	itri (see Ta		c, 1a)		
(45)m= 161.02	140.83	145.32	126.7	121.57	104.9	97.21	111.55	112.88	131.55	143.6	155.94		_
If instantaneous w	ator hoati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (16		Total = Su	m(45) <sub>112</sub> =	= [	1553.08	(45)
									1		1		(15)
(46)m= 24.15 Water storage	21.12	21.8	19	18.24	15.74	14.58	16.73	16.93	19.73	21.54	23.39		(46)
Storage volum		includin	n anv so	olar or ₩	/WHRS	storage	within sa	ame ves	امء		0		(47)
If community h	, ,		•			_			001		0		(47)
Otherwise if no	•			•			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water storage			(					J. J, J		, ,			
a) If manufact		eclared lo	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro				ear			(48) x (49)	) =			0		(50)
b) If manufact		-	-		or is not		`				<u> </u>		(00)
Hot water stora	age loss	factor fr	om Tabl	e 2 (kWl	h/litre/da	ıy)					0		(51)
If community h	•		on 4.3										
Volume factor			0.1								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		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder 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	хН	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit	loss cal	culated f	or each	month (	59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	e H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calculated			,	<u> </u>	· ` `						1	
(61)m= 50.96 46.03	50.96	47.7	47.28	43.81	45.27	47.2	!	50.96	49.32	50.96	]	(61)
Total heat required for						<del>`</del>		<del>` ´                                     </del>	<del>ì ´</del>	<del>`</del>	(59)m + (61)m	
(62)m= 211.98 186.86	196.28	174.4	168.85	148.72	142.48	158.8	160.59	182.51	192.91	206.9	]	(62)
Solar DHW input calculate								r contribu	tion to wate	er heating)		
(add additional lines i	f FGHRS			applies	, see Ap	pendi	<del></del>		1		1	
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from water he								1			1	
(64)m= 211.98 186.86	196.28	174.4	168.85	148.72	142.48	158.8		182.51	192.91	206.9		<b>1</b>
						C	Output from w	ater heate	er (annual)	112	2131.31	(64)
Heat gains from water	r 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= 66.28 58.33	61.06	54.05	52.24	45.83	43.64	48.9	1 49.46	56.48	60.08	64.59		(65)
include (57)m in ca	lculation of	of (65)m	only if c	ylinder i	s in the	dwellii	ng or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (se	e Table 5	and 5a	):									
Metabolic gains (Tab	le 5), Wat	ts										
Jan Feb		Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 135.81 135.81	135.81	135.81	135.81	135.81	135.81	135.8	135.81	135.81	135.81	135.81		(66)
Lighting gains (calcul	ated in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				•	
(67)m= 24.1 21.4	17.41	13.18	9.85	8.32	8.99	11.6	8 15.68	19.91	23.23	24.77	]	(67)
Appliances gains (cal	culated in	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble 5			•	
(68)m= 252.39 255.01	248.41	234.36	216.62	199.95	188.82	186.	2 192.8	206.85	224.58	241.25	1	(68)
Cooking gains (calcu	ated in Ar	pendix	L, equat	ion L15	or L15a	), also	see Table	5			•	
(69)m= 36.58 36.58	36.58	36.58	36.58	36.58	36.58	36.5	<u> </u>	36.58	36.58	36.58	]	(69)
Pumps and fans gain	s (Table 5	ia)				•				•	1	
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g. evaporat	ion (negat	ive valu	es) (Tab	le 5)	<u>!</u>	!		<u> </u>	ı		ı	
(71)m= -108.65 -108.65	<del> </del>	-108.65	-108.65	-108.65	-108.65	-108.6	65 -108.65	-108.65	-108.65	-108.65	]	(71)
Water heating gains	Table 5)						!		Į.		ı	
(72)m= 89.08 86.8	82.07	75.07	70.22	63.66	58.66	65.7	4 68.69	75.92	83.44	86.81	]	(72)
Total internal gains	 =				l )m + (67)m	1 + (68)	m + (69)m +	(70)m + (7		)m	1	
(73)m= 432.31 429.96		389.35	363.43	338.67	323.2	330.3	<del>`</del> `	369.41	398	419.58	1	(73)
6. Solar gains:												• •
Solar gains are calculate	d using solar	r flux from	Table 6a	and assoc	iated equa	ations to	convert to th	ne applical	ble orienta	tion.		
Orientation: Access	Factor	Area		Flu	IX		g_		FF		Gains	
Table 6	d	m²		Ta	ble 6a		Table 6b	Т	able 6c		(W)	
East 0.9x 1	x	4.5	5	χ .	19.64	] <sub>x</sub> [	0.63	x	0.7	=	27.01	(76)
East 0.9x 1	x	2.2		-	19.64	) x	0.63	x	0.7	=	13.57	(76)
East 0.9x 1	×	4.:			38.42	] x	0.63	x	0.7	=	52.84	(76)
East 0.9x 1		2.2			38.42	]	0.63	x	0.7	= =	26.54	] (76)
East 0.9x 1	x	4.5		-	63.27	]	0.63	x [	0.7	= =	87.02	(76)
		L	-	<u>`</u>		J L	0.00		0.7			」` ⁻′

East	Foot			1		1		1		l	<u> </u>	1	Γ	٦
East	East	0.9x	1	X	2.26	X	63.27	X	0.63	X	0.7	=	43.7	(76)
East		<u> </u>	1	X	4.5	X	92.28	X	0.63	X	0.7	=	126.91	╡``
East		<u> </u>	1	X		X	92.28	X	0.63	X	0.7	=	63.74	╡``
East		늗	1	X	4.5	X	113.09	X	0.63	X	0.7	=	155.53	<b>1</b> (76)
East		0.9x	1	X	2.26	X	113.09	X	0.63	X	0.7	=	78.11	(76)
East		0.9x	1	X	4.5	X	115.77	X	0.63	X	0.7	=	159.21	(76)
East	East	0.9x	1	X	2.26	X	115.77	X	0.63	X	0.7	=	79.96	(76)
East	East	0.9x	1	X	4.5	X	110.22	X	0.63	X	0.7	=	151.58	(76)
East	East	0.9x	1	X	2.26	X	110.22	X	0.63	X	0.7	=	76.13	(76)
East	East	0.9x	1	X	4.5	X	94.68	X	0.63	X	0.7	=	130.2	(76)
East	East	0.9x	1	X	2.26	x	94.68	X	0.63	X	0.7	=	65.39	(76)
East	East	0.9x	1	X	4.5	X	73.59	x	0.63	X	0.7	=	101.2	(76)
East	East	0.9x	1	X	2.26	X	73.59	x	0.63	X	0.7	=	50.83	(76)
East 0.9x 1 x 4.5 x 24.49 x 0.63 x 0.7 = 33.68 (76)  East 0.9x 1 x 4.5 x 24.49 x 0.63 x 0.7 = 16.91 (76)  East 0.9x 1 x 4.5 x 16.15 x 0.63 x 0.7 = 16.91 (76)  East 0.9x 1 x 2.26 x 16.15 x 0.63 x 0.7 = 22.21 (76)  East 0.9x 1 x 2.26 x 16.15 x 0.63 x 0.7 = 22.21 (76)  East 0.9x 0.77 x 4.72 x 19.64 x 0.63 x 0.7 = 11.16 (76)  West 0.9x 0.77 x 2.29 x 19.64 x 0.63 x 0.7 = 28.33 (80)  West 0.9x 0.77 x 4.72 x 38.42 x 0.63 x 0.7 = 55.42 (80)  West 0.9x 0.77 x 4.72 x 63.27 x 0.63 x 0.7 = 26.89 (80)  West 0.9x 0.77 x 4.72 x 63.27 x 0.63 x 0.7 = 91.27 (80)  West 0.9x 0.77 x 4.72 x 63.27 x 0.63 x 0.7 = 91.27 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80)  West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 166.626 (80)  West 0.9x 0.77 x 4.72 x 110.22 x 0.63 x 0.7 = 166.626 (80)  West 0.9x 0.77 x 4.72 x 7.359 x 0.63 x 0.7 = 51.5 (80)  West 0.9x 0.77 x 4.72 x 4.72 x 7.359 x 0.63 x 0.7 = 51.5 (80)  West 0.9x 0.77 x 4.72 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80)  West 0.9x 0.77 x 4.72 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80)	East	0.9x	1	X	4.5	x	45.59	x	0.63	x	0.7	=	62.7	(76)
East	East	0.9x	1	X	2.26	x	45.59	X	0.63	x	0.7	=	31.49	(76)
East 0.9x 1	East	0.9x	1	X	4.5	x	24.49	x	0.63	x	0.7	=	33.68	(76)
East 0.9x 1	East	0.9x	1	x	2.26	x	24.49	x	0.63	x	0.7	=	16.91	(76)
West         0.9x         0.77         x         4.72         x         19.64         x         0.63         x         0.7         =         28.33         (80)           West         0.9x         0.77         x         2.29         x         19.64         x         0.63         x         0.7         =         13.75         (80)           West         0.9x         0.77         x         4.72         x         38.42         x         0.63         x         0.7         =         26.89         (80)           West         0.9x         0.77         x         4.72         x         63.27         x         0.63         x         0.7         =         26.89         (80)           West         0.9x         0.77         x         4.72         x         63.27         x         0.63         x         0.7         =         91.27         (80)           West         0.9x         0.77         x         4.72         x         92.28         x         0.63         x         0.7         =         44.28         (80)           West         0.9x         0.77         x         4.72         x         113.09	East	0.9x	1	x	4.5	x	16.15	x	0.63	x	0.7	=	22.21	(76)
West 0.9x 0.77 x 2.29 x 38.42 x 0.63 x 0.7 = 13.75 (80) West 0.9x 0.77 x 4.72 x 38.42 x 0.63 x 0.7 = 26.89 (80) West 0.9x 0.77 x 4.72 x 63.27 x 0.63 x 0.7 = 91.27 (80) West 0.9x 0.77 x 2.29 x 63.27 x 0.63 x 0.7 = 91.27 (80) West 0.9x 0.77 x 4.72 x 92.28 x 0.63 x 0.7 = 44.28 (80) West 0.9x 0.77 x 4.72 x 92.28 x 0.63 x 0.7 = 64.58 (80) West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 64.58 (80) West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 163.14 (80) West 0.9x 0.77 x 4.72 x 113.09 x 0.63 x 0.7 = 167.16 (80) West 0.9x 0.77 x 4.72 x 115.77 x 0.63 x 0.7 = 167. (80) West 0.9x 0.77 x 4.72 x 115.77 x 0.63 x 0.7 = 167. (80) West 0.9x 0.77 x 4.72 x 115.77 x 0.63 x 0.7 = 168.00 West 0.9x 0.77 x 4.72 x 115.77 x 0.63 x 0.7 = 168.00 West 0.9x 0.77 x 4.72 x 115.77 x 0.63 x 0.7 = 168.00 West 0.9x 0.77 x 4.72 x 110.22 x 0.63 x 0.7 = 158.99 (80) West 0.9x 0.77 x 4.72 x 110.22 x 0.63 x 0.7 = 158.99 (80) West 0.9x 0.77 x 4.72 x 110.22 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 94.68 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 94.68 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 94.68 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 73.59 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 73.59 x 0.63 x 0.7 = 166.26 (80) West 0.9x 0.77 x 4.72 x 73.59 x 0.63 x 0.7 = 151.5 (80) West 0.9x 0.77 x 4.72 x 4.72 x 73.59 x 0.63 x 0.7 = 151.5 (80) West 0.9x 0.77 x 4.72 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 51.5 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 66.26 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 65.76 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 65.76 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 65.76 (80) West 0.9x 0.77 x 4.72 x 4.559 x 0.63 x 0.7 = 31.91 (80)	East	0.9x	1	x	2.26	x	16.15	x	0.63	x	0.7	=	11.16	(76)
West 0.9x 0.77	West	0.9x	0.77	x	4.72	x	19.64	x	0.63	x	0.7	=	28.33	(80)
West 0.9x 0.77	West	0.9x	0.77	X	2.29	x	19.64	x	0.63	x	0.7	=	13.75	(80)
West 0.9x 0.77	West	0.9x	0.77	x	4.72	x	38.42	x	0.63	x	0.7	j =	55.42	(80)
West 0.9x 0.77	West	0.9x	0.77	x	2.29	x	38.42	x	0.63	x	0.7	j =	26.89	(80)
West         0.9x         0.77         x         4.72         x         92.28         x         0.63         x         0.7         =         133.11         (80)           West         0.9x         0.77         x         2.29         x         92.28         x         0.63         x         0.7         =         64.58         (80)           West         0.9x         0.77         x         4.72         x         113.09         x         0.63         x         0.7         =         64.58         (80)           West         0.9x         0.77         x         4.72         x         113.09         x         0.63         x         0.7         =         163.14         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         110.22	West	0.9x	0.77	x	4.72	x	63.27	x	0.63	x	0.7	=	91.27	(80)
West         0.9x         0.77         x         2.29         x         92.28         x         0.63         x         0.7         =         64.58         (80)           West         0.9x         0.77         x         4.72         x         113.09         x         0.63         x         0.7         =         163.14         (80)           West         0.9x         0.77         x         2.29         x         113.09         x         0.63         x         0.7         =         163.14         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         94.68	West	0.9x	0.77	x	2.29	x	63.27	х	0.63	х	0.7	j =	44.28	(80)
West         0.9x         0.77         x         4.72         x         113.09         x         0.63         x         0.7         =         163.14         (80)           West         0.9x         0.77         x         2.29         x         113.09         x         0.63         x         0.7         =         79.15         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         94.68         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         4.72         x         73.59	West	0.9x	0.77	x	4.72	x	92.28	x	0.63	x	0.7	j =	133.11	(80)
West         0.9x         0.77         x         2.29         x         113.09         x         0.63         x         0.7         =         79.15         (80)           West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         2.29         x         115.77         x         0.63         x         0.7         =         81.02         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         81.02         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         94.68         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         4.72         x         73.59	West	0.9x	0.77	x	2.29	x	92.28	x	0.63	x	0.7	=	64.58	(80)
West         0.9x         0.77         x         4.72         x         115.77         x         0.63         x         0.7         =         167         (80)           West         0.9x         0.77         x         2.29         x         115.77         x         0.63         x         0.7         =         81.02         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         4.72         x         94.68         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         4.72         x         73.59         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         4.72         x         73.59	West	0.9x	0.77	x	4.72	x	113.09	x	0.63	x	0.7	j =	163.14	(80)
West         0.9x         0.77         x         2.29         x         115.77         x         0.63         x         0.7         =         81.02         (80)           West         0.9x         0.77         x         4.72         x         110.22         x         0.63         x         0.7         =         158.99         (80)           West         0.9x         0.77         x         2.29         x         110.22         x         0.63         x         0.7         =         77.14         (80)           West         0.9x         0.77         x         4.72         x         94.68         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         4.72         x         73.59         x         0.63         x         0.7         =         66.26         (80)           West         0.9x         0.77         x         4.72         x         73.59         x         0.63         x         0.7         =         51.5         (80)           West         0.9x         0.77         x         4.72         x         45.59	West	0.9x	0.77	x	2.29	x	113.09	x	0.63	x	0.7	j =	79.15	(80)
West       0.9x       0.77       x       4.72       x       110.22       x       0.63       x       0.7       =       158.99       (80)         West       0.9x       0.77       x       2.29       x       110.22       x       0.63       x       0.7       =       77.14       (80)         West       0.9x       0.77       x       4.72       x       94.68       x       0.63       x       0.7       =       136.57       (80)         West       0.9x       0.77       x       2.29       x       94.68       x       0.63       x       0.7       =       66.26       (80)         West       0.9x       0.77       x       4.72       x       73.59       x       0.63       x       0.7       =       51.5       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       51.5       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West <t< td=""><td>West</td><td>0.9x</td><td>0.77</td><td>x</td><td>4.72</td><td>x</td><td>115.77</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td>  =</td><td>167</td><td>(80)</td></t<>	West	0.9x	0.77	x	4.72	x	115.77	x	0.63	x	0.7	=	167	(80)
West         0.9x         0.77         x         2.29         x         110.22         x         0.63         x         0.7         =         77.14         (80)           West         0.9x         0.77         x         4.72         x         94.68         x         0.63         x         0.7         =         136.57         (80)           West         0.9x         0.77         x         2.29         x         94.68         x         0.63         x         0.7         =         66.26         (80)           West         0.9x         0.77         x         4.72         x         73.59         x         0.63         x         0.7         =         106.15         (80)           West         0.9x         0.77         x         4.72         x         45.59         x         0.63         x         0.7         =         51.5         (80)           West         0.9x         0.77         x         4.72         x         45.59         x         0.63         x         0.7         =         65.76         (80)           West         0.9x         0.77         x         4.72         x         24.49	West	0.9x	0.77	x	2.29	x	115.77	x	0.63	x	0.7	j =	81.02	(80)
West       0.9x       0.77       x       4.72       x       94.68       x       0.63       x       0.7       =       136.57       (80)         West       0.9x       0.77       x       2.29       x       94.68       x       0.63       x       0.7       =       66.26       (80)         West       0.9x       0.77       x       4.72       x       73.59       x       0.63       x       0.7       =       106.15       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       2.29       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       2.29       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West       0.9x       0.77       x       4.72       x       24.49       x       0.63       x       0.7       =       35.33       (80)	West	0.9x	0.77	x	4.72	x	110.22	x	0.63	x	0.7	j =	158.99	(80)
West       0.9x       0.77       x       2.29       x       94.68       x       0.63       x       0.7       =       66.26       (80)         West       0.9x       0.77       x       4.72       x       73.59       x       0.63       x       0.7       =       106.15       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West       0.9x       0.77       x       4.72       x       24.49       x       0.63       x       0.7       =       35.33       (80)	West	0.9x	0.77	x	2.29	x	110.22	x	0.63	x	0.7	=	77.14	(80)
West       0.9x       0.77       x       4.72       x       73.59       x       0.63       x       0.7       =       106.15       (80)         West       0.9x       0.77       x       2.29       x       73.59       x       0.63       x       0.7       =       51.5       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       2.29       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West       0.9x       0.77       x       4.72       x       24.49       x       0.63       x       0.7       =       35.33       (80)	West	0.9x	0.77	x	4.72	x	94.68	x	0.63	x	0.7	j =	136.57	(80)
West       0.9x       0.77       x       2.29       x       73.59       x       0.63       x       0.7       =       51.5       (80)         West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       2.29       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West       0.9x       0.77       x       4.72       x       24.49       x       0.63       x       0.7       =       35.33       (80)	West	0.9x	0.77	x	2.29	x	94.68	x	0.63	x	0.7	j =	66.26	(80)
West       0.9x       0.77       x       4.72       x       45.59       x       0.63       x       0.7       =       65.76       (80)         West       0.9x       0.77       x       2.29       x       45.59       x       0.63       x       0.7       =       31.91       (80)         West       0.9x       0.77       x       4.72       x       24.49       x       0.63       x       0.7       =       35.33       (80)	West	0.9x	0.77	x	4.72	x	73.59	x	0.63	х	0.7	j =	106.15	(80)
West 0.9x 0.77 x 2.29 x 45.59 x 0.63 x 0.7 = 31.91 (80) West 0.9x 0.77 x 4.72 x 24.49 x 0.63 x 0.7 = 35.33 (80)	West	0.9x	0.77	×	2.29	x	73.59	x	0.63	x	0.7	j   =	51.5	(80)
West 0.9x 0.77 x 4.72 x 24.49 x 0.63 x 0.7 = 35.33 (80)	West	0.9x	0.77	x	4.72	x	45.59	x	0.63	x	0.7	=	65.76	(80)
West 500	West	0.9x	0.77	×	2.29	x	45.59	x	0.63	x	0.7	] =	31.91	(80)
West 0.9x 0.77 x 2.29 x 24.49 x 0.63 x 0.7 = 17.14 (80)	West	0.9x	0.77	x	4.72	x	24.49	x	0.63	x	0.7	=	35.33	(80)
0	West	0.9x	0.77	x	2.29	x	24.49	X	0.63	x	0.7	=	17.14	(80)

	0.9x	0.77	x	4.7	′2	x	16.15	x	0.63	_ x _	0.7		23.3	(80)
West	0.9x	0.77	x	2.2	9	x 🗀	16.15	x	0.63	╡ <sub>╺</sub> ╞	0.7	<b>=</b>	11.3	(80)
							10.10	] " [	0.00	_	0.7		11.0	()
Solar o	nains in v	watts ca	alculated	l for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m=	82.65	161.68	266.27	388.34	475.93	487.2		398.42	309.69	191.85	103.06	67.97	]	(83)
Total g	gains – ir	nternal a	ınd solar	(84)m =	= (73)m ·	+ (83)n	n , watts	l			ļ		ı	
(84)m=	514.97	591.64	680.9	777.69	839.36	825.86	787.03	728.78	653.6	561.26	501.06	487.55	]	(84)
7 Mo	an inter	nal tomr	erature	(heating	cascan	\ \		l .					J	
				,		<b>,</b>	a from Tal	ala 0 Th	1 (°C)				21	(85)
_		_				_	able 9a)	JIC 5, 111	11 ( 0)				21	(00)
Utilisa	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(86)m=	1	1	0.99	0.94	0.8	0.59	0.43	0.48	0.77	0.97	1	1		(86)
(00)111=		'	0.99	0.94	0.0	0.59	0.43	0.40	0.77	0.97	'	'		(00)
Mean			1		· `	1	eps 3 to 7	7 in Tabl	e 9c)				1	
(87)m=	20.16	20.29	20.51	20.78	20.95	20.99	21	21	20.97	20.73	20.4	20.14		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwellin	g from Ta	able 9, T	h2 (°C)					
=m(88)	20.24	20.24	20.24	20.25	20.26	20.26	20.26	20.27	20.26	20.26	20.25	20.25		(88)
Utilisa	ation fac	tor for a	ains for i	rest of d	welling	h2 m (s	see Table	9a)					-	
(89)m=	1	1	0.98	0.92	0.75	0.52	0.36	0.41	0.7	0.96	1	1	1	(89)
							/f = 11 = = = 1 =	0	7 ' - <b>T</b> - 1 - 1	- 0-1			J	
1						<del>–</del>	(follow ste	<del>i                                     </del>			40.45	40.00	1	(90)
(90)m=	19.1	19.29	19.61	20	20.2	20.26	20.26	20.27	20.24	19.94	19.45 g area ÷ (4	19.08		<b>—</b> `
									'	LA = LIVIII	g area - (²	+) =	0.35	(91)
Mean	internal	temper	ature (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1 – fL	A) × T2				_	
(92)m=	19.48	19.65	19.93	20.27	20.47	20.52	20.52	20.52	20.5	20.22	19.79	19.45		(92)
Apply	adjustn	nent to t	he mean	interna	temper	ature fi	om Table	4e, whe	ere appro	priate			-	
(93)m=	19.48	19.65	19.93	20.27	20.47	20.52	20.52	20.52	20.5	20.22	19.79	19.45		(93)
8. Spa	ace hea	ting requ	uirement											
				•		ed at s	step 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-cald	culate	
the ut			or gains										1	
1.100	Jan	Feb	Mar	Apr	May			l .						
Utilisa	ation fac	tor for a			way	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
(0.4)	1 4 1		ains, hm				<u> </u>						] ]	(04)
(94)m=	1	0.99	0.98	0.92	0.77	Jun 0.55	0.38	0.43	0.73	Oct 0.96	Nov 1	Dec 1	]	(94)
Usefu	ıl gains,	0.99 hmGm	0.98 , W = (94	0.92 4)m x (8	0.77 4)m	0.55	0.38	0.43	0.73	0.96	1	1	] ]	, ,
Usefu (95)m=	ul gains, 513.97	0.99 hmGm , 588.6	0.98 , W = (94 668.21	0.92 4)m x (8- 716.75	0.77 4)m 643.55	0.55 451.44	0.38						]	(94) (95)
Usefu (95)m= Month	ul gains, 513.97 hly avera	0.99 hmGm 588.6 age exte	0.98 , W = (94 668.21 ernal tem	0.92 4)m x (84 716.75 perature	0.77 4)m 643.55	0.55 451.44 able 8	0.38	0.43	0.73	0.96 539.15	1 498.63	1 486.88	]	(95)
Usefu (95)m= Month (96)m=	stantantantantantantantantantantantantant	0.99 hmGm , 588.6 age exte	0.98 , W = (9 <sup>2</sup> 668.21 ernal tem	0.92 4)m x (8- 716.75 perature 8.9	0.77 4)m 643.55 e from Ta	0.55 451.44 able 8 14.6	0.38	0.43	0.73	0.96 539.15	1	1	] ]	, ,
Usefu (95)m= Month (96)m= Heat	ul gains, 513.97 hly avera 4.3 loss rate	0.99 hmGm . 588.6 age exter 4.9 e for mea	0.98 , W = (94 668.21 ernal tem 6.5 an intern	0.92 4)m x (8- 716.75 perature 8.9 al tempe	0.77 4)m 643.55 e from Ta 11.7 erature,	0.55 451.44 able 8 14.6 Lm , W	0.38 301.24 16.6 7 =[(39)m	0.43 315.56 16.4 x [(93)m	0.73 474 14.1 – (96)m	0.96 539.15 10.6	1 498.63 7.1	1 486.88 4.2	]	(95) (96)
Usefu (95)m= Month (96)m= Heat I (97)m=	1 gains, 513.97 hly avera 4.3 loss rate	0.99 hmGm , 588.6 age exte 4.9 e for mea	0.98 W = (94 668.21 ernal tem 6.5 an intern 1064.58	0.92 4)m x (84 716.75 perature 8.9 al tempe 888.11	0.77 4)m 643.55 e from Ta 11.7 erature, 682.54	0.55 451.44 able 8 14.6 Lm , W	0.38 301.24 16.6 7 =[(39)m 301.5	0.43 315.56 16.4 x [(93)m 316.13	0.73 474 14.1 - (96)m 493.92	0.96 539.15 10.6 ]	1 498.63 7.1 993.43	1 486.88	] ] ] ]	(95)
Useful (95)m= Month (96)m= Heat I (97)m= Space	solution of the state of the st	0.99 hmGm , 588.6 age exter 4.9 e for mea	0.98 W = (94 668.21 ernal tem 6.5 an intern 1064.58 ement fo	0.92 1)m x (8-716.75 perature 8.9 al tempe 888.11 r each n	0.77 4)m 643.55 e from Ta 11.7 erature, 682.54 nonth, k	0.55 451.44 able 8 14.6 Lm , W 454.84 Wh/mo	0.38 1 301.24 16.6 7 =[(39)m 1 301.5 1 301.5	0.43 315.56 16.4 x [(93)m 316.13 24 x [(97	0.73 474 14.1 — (96)m 493.92 )m — (95	0.96 539.15 10.6 ] 748.74 )m] x (4	1 498.63 7.1 993.43 1)m	1 486.88 4.2 1201.75	] ] ]	(95) (96)
Useful (95)m= Month (96)m= Heat I (97)m= Space	1 gains, 513.97 hly avera 4.3 loss rate	0.99 hmGm , 588.6 age exte 4.9 e for mea	0.98 W = (94 668.21 ernal tem 6.5 an intern 1064.58	0.92 4)m x (84 716.75 perature 8.9 al tempe 888.11	0.77 4)m 643.55 e from Ta 11.7 erature, 682.54	0.55 451.44 able 8 14.6 Lm , W	0.38 301.24 16.6 7 =[(39)m 301.5	0.43 315.56 16.4 x [(93)m 316.13 24 x [(97	0.73 474 14.1 - (96)m 493.92 )m - (95	0.96 539.15 10.6 ] 748.74 )m] x (4 155.93	1 498.63 7.1 993.43 1)m 356.26	1 486.88 4.2 1201.75 531.86	] ] ] ]	(95) (96) (97)
Useful (95)m= Month (96)m= Heat I (97)m= Space	solution of the state of the st	0.99 hmGm , 588.6 age exter 4.9 e for mea	0.98 W = (94 668.21 ernal tem 6.5 an intern 1064.58 ement fo	0.92 1)m x (8-716.75 perature 8.9 al tempe 888.11 r each n	0.77 4)m 643.55 e from Ta 11.7 erature, 682.54 nonth, k	0.55 451.44 able 8 14.6 Lm , W 454.84 Wh/mo	0.38 1 301.24 16.6 7 =[(39)m 1 301.5 1 301.5	0.43 315.56 16.4 x [(93)m 316.13 24 x [(97	0.73 474 14.1 — (96)m 493.92 )m — (95	0.96 539.15 10.6 ] 748.74 )m] x (4 155.93	1 498.63 7.1 993.43 1)m 356.26	1 486.88 4.2 1201.75 531.86	2402.26	(95) (96)
Usefu (95)m= Montr (96)m= Heat I (97)m= Space (98)m=	1 gains, 513.97 hly avera 4.3 loss rate 1210.77 e heating 518.42	0.99 hmGm , 588.6 age exte 4.9 e for mea 1172.67 g require 392.5	0.98 W = (94 668.21 ernal tem 6.5 an intern 1064.58 ement fo	0.92 4)m x (84 716.75 perature 8.9 al tempe 888.11 r each n	0.77 4)m 643.55 e from Ta 11.7 erature, 682.54 nonth, k\ 29.01	0.55 451.44 able 8 14.6 Lm , W 454.84 Wh/mo	0.38 1 301.24 16.6 7 =[(39)m 1 301.5 1 301.5	0.43 315.56 16.4 x [(93)m 316.13 24 x [(97	0.73 474 14.1 - (96)m 493.92 )m - (95	0.96 539.15 10.6 ] 748.74 )m] x (4 155.93	1 498.63 7.1 993.43 1)m 356.26	1 486.88 4.2 1201.75 531.86	2402.26	(95) (96) (97)
Useful (95)m=   Month (96)m=   Heat   (97)m=   Space (98)m=	l gains, 513.97 hly avera 4.3 loss rate 1210.77 e heating	0.99 hmGm , 588.6 age exte 4.9 e for mea 1172.67 g require 392.5	0.98  W = (94) 668.21  Frinal tem 6.5  an intern 1064.58  Ement fo 294.9  Ement in	0.92 4)m x (84 716.75 perature 8.9 al tempe 888.11 r each n 123.38	0.77 4)m 643.55 e from Ta 11.7 erature, 682.54 nonth, kv 29.01	0.55 451.44 able 8 14.6 Lm , W 454.84 Wh/mo	0.38 1 301.24 16.6 7 =[(39)m 1 301.5 1 301.5	0.43 315.56 16.4 x [(93)m 316.13 24 x [(97 0	0.73 474 14.1 — (96)m 493.92 )m — (95 0	0.96 539.15 10.6 ] 748.74 )m] x (4 155.93	1 498.63 7.1 993.43 1)m 356.26	1 486.88 4.2 1201.75 531.86		(95) (96) (97)
Usefu (95)m=  Month (96)m=  Heat I (97)m=  Space (98)m=  Space	l gains, 513.97 hly avera 4.3 loss rate 1210.77 e heating	0.99 hmGm , 588.6 age exter 4.9 e for mea 1172.67 g require 392.5 g require	0.98  W = (94) 668.21  Frinal tem 6.5  an intern 1064.58  Ement fo 294.9  Ement in	0.92 4)m x (84 716.75 perature 8.9 al tempe 888.11 r each n 123.38	0.77 4)m 643.55 e from Ta 11.7 erature, 682.54 nonth, kv 29.01	0.55 451.44 able 8 14.6 Lm , W 454.84 Wh/mo	0.38 301.24 16.6 7 =[(39)m 301.5 nth = 0.02	0.43 315.56 16.4 x [(93)m 316.13 24 x [(97 0	0.73 474 14.1 — (96)m 493.92 )m — (95 0	0.96 539.15 10.6 ] 748.74 )m] x (4 155.93	1 498.63 7.1 993.43 1)m 356.26	1 486.88 4.2 1201.75 531.86		(95) (96) (97)

Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.4	(206)
Efficiency of secondary/supplementary heating s	system	, %						0	(208)
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (calculated above)  518.42 392.5 294.9 123.38 29.01	0	0	0	0	155.93	356.26	531.86	1	
	<u> </u>	0	0	U	100.90	330.20	331.00	J	(211)
$ (211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $ 555.05  420.24  315.74  132.1  31.06 $	0	0	0	0	166.95	381.43	569.44	]	(211)
			Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>		2572.01	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)								1	
(215)m= 0 0 0 0 0	0	0	0 Tota	0	0 ar) =Sum(2	0	0		7(045)
Water besting			Tota	i (KVVII/yea	ai) =Suiii(2	15) <sub>15,1012</sub>		0	(215)
Water heating Output from water heater (calculated above)									
·	48.72	142.48	158.83	160.59	182.51	192.91	206.9		
Efficiency of water heater								80.3	(216)
` '	80.3	80.3	80.3	80.3	84.66	86.57	87.32		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	185.2	177.44	197.8	199.98	215.59	222.83	236.93	]	
			Tota	I = Sum(2	19a) <sub>112</sub> =			2535.91	(219)
									_
Annual totals Space heating fuel used, main system 1					k۱	Nh/year	•	kWh/yea	
Space heating fuel used, main system 1					k\	Wh/year		2572.01	r' 
Space heating fuel used, main system 1 Water heating fuel used					k\	Nh/year			r   
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot					k\	Wh/year		2572.01	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:					k\	Wh/year	30	2572.01	(230c)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot					k1	Wh/year		2572.01	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:			sum	of (230a).	(230g) =		30	2572.01	(230c)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue			sum	of (230a).			30	2572.01 2535.91	(230c) (230e)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year	s inclu	iding mic					30	2572.01 2535.91 75	(230c) (230e) (231)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting					(230g) =		30 45	2572.01 2535.91 75 425.59	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	End	iding mid ergy h/year			(230g) =	ion fac	30 45	2572.01 2535.91 75	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	End	<b>ergy</b> h/year			(230g) =	ion fac 2/kWh	30 45	2572.01 2535.91 75 425.59 Emissions	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems	<b>En</b> ekW	ergy h/year			(230g) = <b>Emiss</b> kg CO2	ion fac 2/kWh	30 45 <b>tor</b>	2572.01 2535.91  75 425.59  Emissions kg CO2/ye	(230c) (230e) (231) (232)
Space heating fuel used, main system 1  Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating systems  Space heating (main system 1)	Enc kW	ergy h/year ) ×			(230g) = <b>Emiss</b> kg CO2	ion fac 2/kWh	30 45 <b>tor</b>	2572.01 2535.91  75 425.59  Emissions kg CO2/ye 555.56	(230c) (230e) (231) (232) Sar (261)
Space heating fuel used, main system 1  Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating systems  Space heating (main system 1)  Space heating (secondary)	End kW (211 (215 (219	ergy h/year ) x ) x			(230g) =  Emiss kg CO2  0.5	ion fac 2/kWh	30 45 <b>tor</b> = =	2572.01 2535.91  75 425.59  Emissions kg CO2/ye 555.56 0 547.76	(230c) (230e) (231) (232) Sar (261) (263) (264)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating Space and water heating	End kW (211 (215 (219	ergy h/year ) x ) x ) x ) + (262) -	cro-CHP		(230g) =  Emiss kg CO2  0.5	ion fac: 2/kWh	30 45 <b>tor</b> = =	2572.01 2535.91  75 425.59  Emissions kg CO2/ye 555.56 0 547.76 1103.31	(230c) (230e) (231) (232)  Sar (261) (263) (264) (265)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary) Water heating	End kW (211 (215 (219 (261 (231	ergy h/year ) x ) x ) x ) + (262) -	cro-CHP		(230g) =  Emiss kg CO2  0.5	ion fac 2/kWh 16	30 45 <b>tor</b> = =	2572.01 2535.91  75 425.59  Emissions kg CO2/ye 555.56 0 547.76	(230c) (230e) (231) (232) Sar (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1363.12 (272)

 $TER = 13.97 \tag{273}$ 

			l loo <del>r P</del>	)otoile: -						
	–		User D					0===	2000000	
Assessor Name:	Joseph Treanor			Strom					0032062	
Software Name:	Stroma FSAP 20		roporti	Softwa		rsion:		versio	on: 1.0.4.14	
Address :	, Gondar Gardens		·	Address:	. P0					
1. Overall dwelling dime	·	s, London,	INVVO II	10						
The Coronal arrelling all in			Area	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor					(1a) x		.55	(2a) =	211.88	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(	1e)+(1r	n)	33.09	(4)			_		
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	211.88	(5)
2. Ventilation rate:										
<u> </u>	main	secondar	у	other		total			m³ per hoι	ır
Number of chimneys	heating +	heating 0	<b>]</b> + [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	ī + F	0	i - F	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans	<u> </u>			,	3	x -	10 =	30	(7a)
Number of passive vents	5				F	0	x ·	10 =	0	(7b)
Number of flueless gas t					L F	0	x 4	40 =	0	(7c)
Trainison on muonoco guo	•				L					(10)
								Air cl	hanges per he	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(	7c) =	Γ	30		÷ (5) =	0.14	(8)
If a pressurisation test has	been carried out or is inter	nded, procee	d to (17), d	otherwise o	continue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (					•	uction			0	(11)
if both types of wall are p deducting areas of open	oresent, use the value corr ings): if equal user 0.35	responding to	the great	er wall are	a (after					
If suspended wooden	• / .	ealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter (	)	`	,					0	(13)
Percentage of window	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	12) + (13)	+ (15) =		0	(16)
Air permeability value	, q50, expressed in c	ubic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	ility value, then (18) =	[(17) ÷ 20]+(8	B), otherwi	ise (18) = (	16)				0.39	(18)
Air permeability value appli	es if a pressurisation test l	has been dor	ne or a deg	gree air pe	rmeability	is being u	sed			
Number of sides shelter	ed			(00)		10)1			2	(19)
Shelter factor				(20) = 1 -		19)] =			0.85	(20)
Infiltration rate incorpora	-			(21) = (18)	) x (20) =				0.33	(21)
Infiltration rate modified	<del></del>	<u> </u>							٦	
Jan Feb	Mar Apr Ma	y Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								7	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (2	22)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
									_	

djusted infiltration rate (allowing for shelter an	d wind s	peed) =	(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		
alculate effective air change rate for the application of the applicat	саріе са	se						0	
If exhaust air heat pump using Appendix N, (23b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	wise (23b	) = (23a)			0	
If balanced with heat recovery: efficiency in % allowing for	or in-use f	actor (fron	n Table 4h	) =	, , ,			0	
a) If balanced mechanical ventilation with hea					2h)m + (	23h) <b>x</b> [	1 – (23c)		
4a)m= 0 0 0 0 0	0	0	0	0	0	0	0		
b) If balanced mechanical ventilation without	heat rec	overv (N	<u>I</u> Л\/) (24b	$\lim_{n \to \infty} (2)$	2h)m + (	23b)	ļ	l	
4b)m= 0 0 0 0 0	0	0	0	0	0	0	0		
c) If whole house extract ventilation or positive	re input v	/entilatio	n from c	L outside			ļ.	J	
if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$	•				.5 × (23b	o)			
4c)m= 0 0 0 0 0	0	0	0	0	0	0	0		
d) If natural ventilation or whole house positive	e input	ventilatio	on from I	oft	!			_	
if $(22b)m = 1$ , then $(24d)m = (22b)m$ other	rwise (2	4d)m =	0.5 + [(2	2b)m² x	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 - enter (24a) or (24b)	o) or (24	c) or (24	d) in box	(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		
B. Heat losses and heat loss parameter:									
LEMENT Gross Openings	Net Ar	ea	U-valı		ΑXU		k-value	9	ΑXk
area (m²) m²	A ,n		W/m2		(W/	K)	kJ/m²·l	K	kJ/K
indows Type 1	4.5	х1.	/[1/( 1.4 )+	0.04] =	5.97				
indows Type 2	2.26	х1.	/[1/( 1.4 )+	0.04] =	3				
indows Type 3	4.72	x1.	/[1/( 1.4 )+	0.04] =	6.26				
indows Type 4	2.29	x1.	/[1/( 1.4 )+	0.04] =	3.04				
oor	33.02	<u>x</u>	0.13	=	4.2926	;			
/alls Type1 34.82 13.77	21.05	, x	0.18	_ =	3.79			$\neg$	
/alls Type2 4.02 0	4.02	x	0.18	<b>=</b>	0.72			<b>=</b>	
otal area of elements, m <sup>2</sup>	71.86	;							
arty wall	78.29	) x	0		0			7 6	
or windows and roof windows, use effective window U-va				 /[(1/U-valu		as given in	paragraph		
include the areas on both sides of internal walls and part	titions								
abric heat loss, $W/K = S (A \times U)$			(26)(30)	+ (32) =				27.0	06
eat capacity Cm = S(A x k )				((28).	(30) + (3	2) + (32a)	(32e) =	7503	.51
nermal mass parameter (TMP = Cm ÷ TFA) in	ı kJ/m²K			Indica	tive Value	: Medium		25	)
or design assessments where the details of the constructi	ion are not	known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
n be used instead of a detailed calculation. nermal bridges : S (L x Y) calculated using Ap	nendiy k	<i>(</i>						5.0	3
details of thermal bridging are not known (36) = $0.15 \times (3)$	•	`						5.0	ა
otal fabric heat loss	• /			(33) +	(36) =			32.0	09
entilation heat loss calculated monthly				(38)m	= 0.33 × (	(25)m x (5	)		
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
B)m= 41.26 41.01 40.77 39.65 39.44	38.46	38.46	38.27	38.83	39.44	39.86	40.31		
eat transfer coefficient, W/K				(39)m	= (37) + (	38)m	•	•	
9)m= 73.35 73.1 72.86 71.74 71.53	70.55	70.55	70.36	70.92	71.53	71.95	72.4		
			l		1	1		I	

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.88	0.88	0.88	0.86	0.86	0.85	0.85	0.85	0.85	0.86	0.87	0.87		
									Average =	Sum(40) <sub>1</sub> .	12 /12=	0.86	(40)
Number of day	s in mo	nth (Tabl	e 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	ing ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu	nancy	NI									50		(40)
if TFA > 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		52		(42)
Annual averag											.02		(43)
Reduce the annua not more that 125	-		• .		-	•	o achieve	a water us	se target o	of Total			
										Γ			
Jan Jan	Feb	Mar	Apr	May	Jun	Jul Table 10 Y	Aug	Sep	Oct	Nov	Dec		
Hot water usage in							, ,		1				
(44)m= 103.43	99.66	95.9	92.14	88.38	84.62	84.62	88.38	92.14	95.9	99.66	103.43		<b>-</b>
Energy content of	hot water	used - cal	culated mo	onthly = 4	190 x Vd r	n x nm x F.	)Tm / 3600			m(44) <sub>112</sub> = ables 1b 1	L	1128.28	(44)
(45)m= 153.38	134.14	138.43	120.68	115.8	99.92	92.6	106.25	107.52	125.31	136.78	148.54	4.470.05	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		10tal = Su	m(45) <sub>112</sub> =	= L	1479.35	(43)
(46)m= 23.01	20.12	20.76	18.1	17.37	14.99	13.89	15.94	16.13	18.8	20.52	22.28		(46)
Water storage		20.70	10.1	17.07	14.00	10.00	10.04	10.10	10.0	20.02	22.20		(10)
Storage volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =			0		(50)
b) If manufaction Hot water stora			-										(51)
If community h	_			C Z (KVVI	ii/iiti e/ue	(y)					0		(31)
Volume factor	_										0		(52)
Temperature 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		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	О	0		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	<u>l</u> H11)] ÷ (5	0), else (5	<u>l</u> 7)m = (56)	m where (	H11) is fro	m Appendi	хН	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	e H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calculated			,		· ` `	<del></del>					1	
(61)m= 50.96 45.87	48.87	45.44	45.04	41.73	43.12	45.0	<u> </u>	48.87	49.15	50.96	]	(61)
Total heat required for						<del>` ´</del>		<del>``</del>	<del>`                                    </del>	<del>`</del>	(59)m + (61)m	
(62)m= 204.34 180.02	187.3	166.12	160.84	141.66	135.72	151.	!		185.93	199.5	]	(62)
Solar DHW input calculated								ar contribu	tion to wat	er heating)		
(add additional lines if	FGHRS				, see Ap	pend	<del></del>				1	
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from water hea	iter								•	,	1	
(64)m= 204.34 180.02	187.3	166.12	160.84	141.66	135.72	151.			185.93	199.5		<b>1</b>
						(	Output from	water heate	er (annual)	112	2039.85	(64)
Heat gains from water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	<u>.</u> ]	
(65)m= 63.74 56.07	58.24	51.49	49.76	43.66	41.57	46.5	9 47.11	53.88	57.77	62.13		(65)
include (57)m in cal	culation c	of (65)m	only if c	ylinder i	s in the	dwelli	ng or hot	water is t	rom com	munity h	neating	
5. Internal gains (see	e Table 5	and 5a)	):									
Metabolic gains (Table	e 5), Watt	S										
Jan Feb	Mar	Apr	May	Jun	Jul	Αι	ıg Sep	Oct	Nov	Dec		
(66)m= 125.94 125.94	125.94	125.94	125.94	125.94	125.94	125.	94 125.94	125.94	125.94	125.94		(66)
Lighting gains (calcula	ited in Ap	pendix I	_, equat	ion L9 o	r L9a), a	lso se	ee Table 5	;			•	
(67)m= 20.86 18.53	15.07	11.41	8.53	7.2	7.78	10.1	1 13.57	17.23	20.11	21.44	]	(67)
Appliances gains (calc	culated in	Append	lix L, eq	uation L	13 or L1	3a), a	llso see T	able 5	•		•	
(68)m= 225.78 228.12	222.22	209.65	193.78	178.87	168.91	166.	57 172.47	185.04	200.9	215.82	1	(68)
Cooking gains (calcula	ated in Ap	pendix	L, equat	ion L15	or L15a	), also	see Tabl	e 5			•	
(69)m= 35.59 35.59	35.59	35.59	35.59	35.59	35.59	35.5		35.59	35.59	35.59	]	(69)
Pumps and fans gains	Table 5	a)				•					1	
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g. evaporation	on (negat	ive valu	es) (Tab	le 5)	1					1	ı	
(71)m= -100.76 -100.76	<del>, `                                   </del>	-100.76	-100.76	-100.76	-100.76	-100.	76 -100.76	-100.76	-100.76	-100.76	]	(71)
Water heating gains (	rable 5)				!		-!	Į.	Į.	!	ı	
(72)m= 85.67 83.44	78.29	71.51	66.89	60.64	55.87	62.6	2 65.43	72.42	80.23	83.51	]	(72)
Total internal gains :				(66	)m + (67)m	l	m + (69)m +	- (70)m + (		)m	1	
(73)m= 396.09 393.87	379.35	356.35	332.98	310.49	296.34	303.	08 315.25	338.47	365.03	384.54	1	(73)
6. Solar gains:												• •
Solar gains are calculated	using solar	flux from	Table 6a	and assoc	iated equa	tions to	convert to	the applica	ble orienta	tion.		
Orientation: Access I	actor	Area		Flu	ıx		g_		FF		Gains	
Table 60	I	m²		Ta	ble 6a		Table 6	о Т	able 6c		(W)	
East 0.9x 1	х	4.5	5	х -	19.64	] <sub>x</sub> [	0.63	×	0.7	=	27.01	(76)
East 0.9x 1	x	2.2		-	19.64	x	0.63	x [	0.7	=	13.57	(76)
East 0.9x 1	x	4.5			38.42	] <sub>x</sub> [	0.63	x [	0.7	=	52.84	(76)
East 0.9x 1	x	2.2		-	38.42	] <sub>x</sub> [	0.63	x [	0.7	= =	26.54	] (76)
East 0.9x 1	X	4.5		-	63.27	]	0.63	x [	0.7	= =	87.02	(76)
				<u>`</u>		J L	0.00		J.,		07.02	」` ⁻′

Foot	г		1		1		1		ı		1	Γ	٦
East	0.9x	1	X	2.26	X	63.27	X	0.63	X	0.7	=	43.7	(76)
East	0.9x	1	X	4.5	X	92.28	X	0.63	X	0.7	=	126.91	(76)
East	0.9x	1	X	2.26	X	92.28	X	0.63	X	0.7	=	63.74	(76)
East	0.9x	1	X	4.5	X	113.09	X	0.63	X	0.7	=	155.53	(76)
East	0.9x	1	X	2.26	X	113.09	X	0.63	X	0.7	=	78.11	(76)
East	0.9x	1	X	4.5	X	115.77	X	0.63	X	0.7	=	159.21	(76)
East	0.9x	1	X	2.26	X	115.77	X	0.63	X	0.7	=	79.96	(76)
East	0.9x	1	X	4.5	X	110.22	X	0.63	X	0.7	=	151.58	(76)
East	0.9x	1	X	2.26	X	110.22	X	0.63	X	0.7	=	76.13	(76)
East	0.9x	1	X	4.5	X	94.68	X	0.63	X	0.7	=	130.2	(76)
East	0.9x	1	X	2.26	x	94.68	X	0.63	X	0.7	=	65.39	(76)
East	0.9x	1	X	4.5	X	73.59	x	0.63	X	0.7	=	101.2	(76)
East	0.9x	1	X	2.26	X	73.59	x	0.63	X	0.7	=	50.83	(76)
East	0.9x	1	X	4.5	x	45.59	x	0.63	x	0.7	=	62.7	(76)
East	0.9x	1	X	2.26	x	45.59	X	0.63	x	0.7	=	31.49	(76)
East	0.9x	1	X	4.5	x	24.49	x	0.63	x	0.7	=	33.68	(76)
East	0.9x	1	X	2.26	x	24.49	x	0.63	x	0.7	=	16.91	(76)
East	0.9x	1	X	4.5	X	16.15	x	0.63	x	0.7	=	22.21	(76)
East	0.9x	1	X	2.26	x	16.15	x	0.63	x	0.7	=	11.16	(76)
West	0.9x	0.77	x	4.72	x	19.64	x	0.63	х	0.7	=	28.33	(80)
West	0.9x	0.77	X	2.29	x	19.64	x	0.63	x	0.7	=	13.75	(80)
West	0.9x	0.77	x	4.72	x	38.42	x	0.63	x	0.7	j =	55.42	(80)
West	0.9x	0.77	x	2.29	x	38.42	x	0.63	x	0.7	j =	26.89	(80)
West	0.9x	0.77	x	4.72	x	63.27	x	0.63	x	0.7	=	91.27	(80)
West	0.9x	0.77	x	2.29	x	63.27	x	0.63	x	0.7	j =	44.28	(80)
West	0.9x	0.77	x	4.72	x	92.28	x	0.63	x	0.7	j =	133.11	(80)
West	0.9x	0.77	x	2.29	x	92.28	x	0.63	x	0.7	=	64.58	(80)
West	0.9x	0.77	x	4.72	x	113.09	x	0.63	x	0.7	j =	163.14	(80)
West	0.9x	0.77	x	2.29	x	113.09	x	0.63	x	0.7	j =	79.15	(80)
West	0.9x	0.77	x	4.72	x	115.77	x	0.63	x	0.7	j =	167	(80)
West	0.9x	0.77	x	2.29	x	115.77	x	0.63	x	0.7	j =	81.02	(80)
West	0.9x	0.77	x	4.72	x	110.22	x	0.63	x	0.7	=	158.99	(80)
West	0.9x	0.77	x	2.29	x	110.22	x	0.63	x	0.7	j =	77.14	(80)
West	0.9x	0.77	x	4.72	x	94.68	х	0.63	x	0.7	j =	136.57	(80)
West	0.9x	0.77	x	2.29	x	94.68	x	0.63	x	0.7	j =	66.26	(80)
West	0.9x	0.77	x	4.72	x	73.59	x	0.63	x	0.7	j =	106.15	(80)
West	0.9x	0.77	×	2.29	x	73.59	x	0.63	x	0.7	=	51.5	(80)
West	0.9x	0.77	×	4.72	x	45.59	x	0.63	x	0.7	i =	65.76	(80)
West	0.9x	0.77	x	2.29	x	45.59	×	0.63	x	0.7	i =	31.91	(80)
West	0.9x	0.77	×	4.72	x	24.49	x	0.63	x	0.7	=	35.33	(80)
West	0.9x	0.77	x	2.29	x	24.49	×	0.63	х	0.7	j =	17.14	(80)
	_		•		•		•		•		•		_

Solar gains in watts, calculated for each month   (8)m = Sum(74)m(82)m   (82)m	Solar gains in watts, calculated for each month   (85)m = Sum(74)m((82)m   (82)m   (825)   161.68   266.27   388.34   475.83   487.2   463.83   388.42   308.68   191.85   103.06   67.97   (8.7)m															
Solar gains in watts, calculated for each month	Solar gains in watts, calculated for each month (83)me Sum(74)m(82)m (83)me Sum(74)m(82)m (83)me Sum(74)m(82)m (84)me [78:74] 858.56 168.62 286.27 383.34 475.93] 487.2 483.83 389.42 308.69 191.85 103.06 67.97  Total gains – internal and solar (84)me (73)m + (83)m , watts (84)me [78:74] 858.55 645.62 744.69 808.9 797.68 760.17 701.5 624.94 530.33 488.09 452.51  7. Mean internal temperature (heating season) 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)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (97)m= 20.11 20.26 20.5 20.76 20.95 20.99 21 21 20.29 20.72 20.36 20.09  (87)me 20.11 20.26 20.5 20.78 20.95 20.99 21 21 20.97 20.72 20.36 20.00  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)me 1 0.99 0.98 0.9 0.72 0.49 0.33 0.38 0.67 0.95 0.99 1  Whisation factor for gains for rest of dwelling, h2, m (see Table 9a)  (99)me 1 0.99 0.98 0.9 0.72 0.49 0.33 0.38 0.67 0.95 0.99 1  What internal temperature in the rest of dwelling, h2, m (see Table 9a)  (90)me 18.98 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.21 20.23 10.78 19.84  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (82)me 9.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 10.78 19.43  Apply adjustment 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  Useful gains, hmGm. W = (94)m x (84)m  (85)me 17 10 0.99 0.97 0.9 0.72 0.73 0.75 0.95 0.99 1  Useful gains, hmGm. W = (94)m x (84)m  (85)me 17 10 0.99 0.97 0.9 0.74 0.95 0.97 0.97 0.97 0.97 0.97 0.97 0.97 0.97	West	0.9x	0.77	X	4.7	72	x	16.15	x	0.63	x	0.7	=	23.3	(80)
(83)me	(93)me 82.65   616.68   286.27   389.34   475.93   487.2   463.83   389.42   309.89   191.05   103.06   67.97   Total gains - internal and solar (84)me   (73)m + (83)m , watts   (84)me   478.74   585.55   646.62   744.68   808.9   797.68   760.17   701.5   624.94   530.33   486.09   452.51    7. Mean internal temperature (reating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)   21   (88)me   1   1   0.98   0.92   0.77   0.56   0.41   0.46   0.74   0.96   1   1   (88)me   1   1   0.98   0.92   0.77   0.56   0.41   0.46   0.74   0.96   1   1   (89)me   20.11   20.26   20.5   20.78   20.95   20.99   21   21   20.97   20.72   20.36   20.09   (87)me   20.18   20.18   20.19   20.2   20.2   20.2   20.21   20.21   20.21   20.21   20.22   20.21   20.19   20.19   20.19   20.19   20.2   20.2   20.21   20.21   20.21   20.21   20.22   20.21   20.19   20.19   20.19   20.19   20.19   20.2   20.2   20.21	West	0.9x	0.77	x	2.2	29	x	16.15	x	0.63	_ x _	0.7	=	11.3	(80)
(83)me	(93)me 82.65   616.68   286.27   389.34   475.93   487.2   463.83   389.42   309.89   191.05   103.06   67.97   Total gains - internal and solar (84)me   (73)m + (83)m , watts   (84)me   478.74   585.55   646.62   744.68   808.9   797.68   760.17   701.5   624.94   530.33   486.09   452.51    7. Mean internal temperature (reating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)   21   (88)me   1   1   0.98   0.92   0.77   0.56   0.41   0.46   0.74   0.96   1   1   (88)me   1   1   0.98   0.92   0.77   0.56   0.41   0.46   0.74   0.96   1   1   (89)me   20.11   20.26   20.5   20.78   20.95   20.99   21   21   20.97   20.72   20.36   20.09   (87)me   20.18   20.18   20.19   20.2   20.2   20.2   20.21   20.21   20.21   20.21   20.22   20.21   20.19   20.19   20.19   20.19   20.2   20.2   20.21   20.21   20.21   20.21   20.22   20.21   20.19   20.19   20.19   20.19   20.19   20.2   20.2   20.21		_					_								_
Total gains — internal and solar (84)m = (73)m + (83)m, wats   [84]me	Total gains - internal and solar (84)m = (73)m + (83)m , watts  (84)m= 478.74   \$55.55   \$45.62   744.69   \$808.8   797.68   760.17   701.5   \$24.94   \$50.33   \$48.08   \$452.51   \$(8.77.468   \$10.94	Solar g	gains in	watts, ca	alculated	I for eac	h month			(83)m = S	Sum(74)m .	(82)m				
Casimal   Casi	(84)m= 478.74 555.55 645.62 744.69 806.9 797.68 780.17 701.5 624.94 530.33 468.09 452.51 (877.46.97 194.54	(83)m=	82.65	161.68	266.27	388.34	475.93	487.	2 463.83	398.42	309.69	191.85	103.06	67.97		(83)
The presentative of the properative of the proper	T. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21  (8)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  (8)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (8)  (8)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (8)  (8)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (8)  (8)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (8)  (8)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (8)  (8)  Temperature during heating periods in rest of dwelling, h2, m (see Table 9a)  Utilisation factor for gains for rest of dwelling, h2, m (see Table 9a)  Mean internal temperature in the rest of dwelling; h2, m (see Table 9a)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)  (90)  18,99  19,2 19,55 19,95 20,15 20,21 20,21 20,21 20,21 20,18 19,88 19,36 18,96 (9)  (92)  (92)  19,45 19,64 19,94 20,3 20,48 20,53 20,54 20,54 20,55 20,21 20,23 19,78 19,43 Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (83)  19,45 19,64 19,94 20,3 20,48 20,53 20,54 20,54 20,51 20,23 19,78 19,43 (9)  3. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Usingston factor for gains, hmc.  (94)  1, 0,99 0,97 0,3 0,74 0,52 0,37 0,41 0,7 0,95 0,99 1  (95)  Space heating requirement to reach month, kWh/month = 0,024 x ((97)m - (95)m) x (41)m  (95)  Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Usingston factor for gains using Table 9a  Useful gains, hmcm, W = (94)m x (84)m  (95)  Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Usingston factor for gains using Table 9a  Usingston factor for gains using Table 9a  Usingston factor for gains using Table 9a  19,45 19,45 1	Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (83)	m , watts		•	•	•	•	I	
The pertature during heating periods in the living area from Table 9, Th1 (°C)	Temperature during heating periods in the living area from Table 9, Th1 (°C)   21	(84)m=	478.74	555.55	645.62	744.69	808.9	797.6	760.17	701.5	624.94	530.33	468.09	452.51		(84)
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)    Again   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   (88)	Temperature during heating periods in the living area from Table 9, Th1 (*C)   21	7. Me	an inter	nal temp	erature	(heating	season	)	•	-	·					
Mean internal temperature in the rest of dwelling   T2 (follow steps 3 to 7 in Table 9c)   G8)   G90   G90   G90   G8)   G90	Sepace   Description   Sepace   Description   Sepace   Description   Sepace   Sepace   Description   Sepace								a from Ta	ble 9, Th	1 (°C)				21	(85)
Mean internal temperature in the rest of dwelling   T2 (follow steps 3 to 7 in Table 9c)   G89    G89	Sepace   Data   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   (86)me   1	Utilisa	ation fac	tor for a	ains for l	iving are	ea. h1.m	ı (see	Table 9a)		. ,					
(86)me	(86)me		_					<del>`</del> .		Aua	Sep	Oct	Nov	Dec		
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 20.11 20.26 20.5 20.78 20.96 20.99 21 21 20.97 20.72 20.36 20.09 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C)  (88)m= 20.18 20.18 20.19 20.2 20.2 20.21 20.21 20.21 20.21 20.22 20.2 20.	Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)me	(86)m=				· ·	<del>-</del>	<del>                                     </del>		<del>–</del>	<del>                                     </del>	-				(86)
(87)   (87)   (87)   (87)   (87)   (87)   (87)   (87)   (87)   (87)   (87)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (88)   (87)   (87)   (88)   (87)   (87)   (88)   (87)   (8	(87)me	` ′	. ,				<u>!</u>	<u> </u>		ļ.			<u> </u>			, ,
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.18 20.18 20.19 20.2 20.2 20.2 20.21 20.21 20.21 20.21 20.21 20.2 20.2	Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.18 20.18 20.19 20.2 20.2 20.2 20.21 20.21 20.21 20.21 20.21 20.2 20.2	ı					<del>- `</del>		<del>-i</del>	1	<del>-                                    </del>	00.70	00.00	00.00	l	(07)
(88)m= 20.18 20.18 20.19 20.2 20.2 20.2 1 20.21 20.21 20.21 20.21 20.21 20.21 20.21 20.22 20.2 20.	(88)m= 20.18 20.18 20.19 20.2 20.2 20.21 20.21 20.21 20.21 20.21 20.2 20.2	(87)m=	20.11	20.26	20.5	20.78	20.95	20.9	9 21	21	20.97	20.72	20.36	20.09		(01)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)ma 1 0.99 0.98 0.9 0.9 0.72 0.49 0.33 0.38 0.67 0.95 0.99 1 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)ma 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.18 19.88 19.36 18.96 (90)  (90)ma 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.18 19.88 19.36 18.96 (90)  (90)ma 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.18 19.88 19.36 18.96 (90)  (90)ma 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.21 20.18 19.88 19.36 18.96 (90)  (90)ma 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.21 20.18 19.88 19.36 18.96 (90)  (90)ma 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.21 20.18 19.88 19.36 18.96 (90)  (90)ma 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)ma 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  [94)ma 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1 0.90  Useful gains, hmGm, W = (94)m x (84)m  (95)ma 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54 (95)  Monthly average external temperature from Table 8  (96)ma 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)ma 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)ma 471.82 353.62 260.9 105.54 24.62 0 0 0 0 0 0 379.3 322.21 484.37  Total per year (kWh/year) = Sum(98)s. p = 2161.01 (98)	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.9 0.72 0.49 0.33 0.38 0.67 0.95 0.99 1  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.21 20.18 19.88 19.36 18.96  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm: (94)m= 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm, W = (94)m x (84)m (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.99 464.76 451.54  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)m 11.11.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98). s.s. v = 2161.01 (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98). s.s. v = 2161.01 (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Temp	erature	during h	eating p	eriods ir	n rest of	dwell	ng from Ta	able 9, T	h2 (°C)					
(89) (89) (89) (89) (89) (89) (89) (89)	(89)me 1 0.99 0.98 0.9 0.72 0.49 0.33 0.38 0.67 0.95 0.99 1  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)me 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.18 19.88 19.36 18.96 (90)  (LA = Living area + (4) = 0.42 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)me 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)me 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm:  (94)me 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm , W = (94)m x (84)m  (95)me 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54 (94)  Monthly average external temperature from Table 8  (96)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (94)  Heat loss rate for mean internal temperature, Lm , W = (39)m x (83)m - (96)m 1  (97)me 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (97)m = (111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (97)m = (111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (98)me 471.82 353.62 280.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37 Total per year (KWhylyear) = Sum(98)s. v = 2161.01 (98)me 471.82 353.62 280.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37 Total per year (KWhylyear) = Sum(98)s. v = 2161.01 (98)me 471.82 353.62 280.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37 Total per year (KWhylyear) = Sum(98)s. v = 2161.01 (98)me 471.82 353.62 280.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37 Total per year (KWhylyear) = Sum(98)s. v = 216	(88)m=	20.18	20.18	20.19	20.2	20.2	20.2	1 20.21	20.21	20.21	20.2	20.2	20.19		(88)
(89) (89) (89) (89) (89) (89) (89) (89)	(89)me 1 0.99 0.98 0.9 0.72 0.49 0.33 0.38 0.67 0.95 0.99 1  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)me 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.18 19.88 19.36 18.96 (90)  (LA = Living area + (4) = 0.42 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)me 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)me 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm:  (94)me 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm , W = (94)m x (84)m  (95)me 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54 (94)  Monthly average external temperature from Table 8  (96)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (94)  Heat loss rate for mean internal temperature, Lm , W = (39)m x (83)m - (96)m 1  (97)me 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (97)m = (111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (97)m = (111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (98)me 471.82 353.62 280.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37 Total per year (KWhylyear) = Sum(98)s. v = 2161.01 (98)me 471.82 353.62 280.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37 Total per year (KWhylyear) = Sum(98)s. v = 2161.01 (98)me 471.82 353.62 280.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37 Total per year (KWhylyear) = Sum(98)s. v = 2161.01 (98)me 471.82 353.62 280.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37 Total per year (KWhylyear) = Sum(98)s. v = 216	Utilisa	ation fac	tor for g	ains for ı	rest of d	welling,	h2,m	(see Table	9a)						
19.9   19.2   19.5   19.95   19.95   20.15   20.21   20.21   20.21   20.18   19.88   19.36   18.96   (90)	(9)m= 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.18 19.88 19.36 18.96 (9)me numbers of the state of th	ı							`	1	0.67	0.95	0.99	1		(89)
(90) me	(90)m= 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.21 19.88 19.86 18.96 18.96 18.99 19.2 19.55 19.95 20.15 20.21 20.21 20.21 20.21 20.18 19.88 19.36 18.96 18.96 18.4 18.99 19.20 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.51 20.23 19.78 19.43 20.53 20.54 20.54 20.54 20.55 20.5	Moon	intorna	tompor	oturo in i	the rest	of dwoll	ina Ta	/follow st	one 2 to	7 in Tabl	lo ()o)				
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2	Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2	ı					1	<del></del>	<u> </u>	ri e	1	· ·	10.36	18.96		(90)
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m=	Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m=	(50)111=	10.00	13.2	10.00	10.00	20.10	20.2	20.21	20.21	<u> </u>	Į	<u> </u>	!	0.42	<b></b> ` ′
(92)me	(92)m=												g aroa . (	., –	0.42	(31)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98)	Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)m= 10.04 19.45	Mean	interna	· ·	<u> </u>	r the wh	ole dwe	lling)	= fLA × T1	+ (1 – fl	_A) × T2			•	1	
(93)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98)s	(93)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)m= 19.45 19.64 19.94 20.3 20.48 20.53 20.54 20.54 20.51 20.23 19.78 19.43 (93)m= 19.45 19.43 (94)m= 10.99 10.97 10.99 10.74 10.52 10.37 10.41 10.7 10.95 10.99 1 (94)m= 10.99 10.97 10.99 10.74 10.52 10.37 10.41 10.7 10.95 10.99 1 (94)m= 10.99 10.97 10.99 11.7 10.6 16.6 16.4 14.1 10.6 7.1 10.6 7.1 10.6 10.6 16.6 16.4 14.1 10.6 7.1 10.6 10.6 10.6 10.7 10.9 10.9 10.9 11.7 10.9 11.1 10.9 11.1 10.9 11.1 10.9 10.9	(92)m=	19.45	19.64	19.94	20.3	20.48	20.5	3 20.54	20.54	20.51	20.23	19.78	19.43		(92)
8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98)	8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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  Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m)    (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98)s.12 = 2161.01 (98)  Space heating requirements – Individual heating systems including micro-CHP)  Space heating:	Apply	adjustn	nent to t	he mean	interna	l temper	ature	from Table	4e, whe	ere appro	opriate	1	1	Ī	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>1.48.12</sub> = 2161.01 (98)  Space heating requirement in kWh/m²/year	Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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  Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m ) (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98)1s12 = 2161.01 (91)	` ′					20.48	20.5	3 20.54	20.54	20.51	20.23	19.78	19.43		(93)
the utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	the utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec															
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec					•		ned at	step 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	:ulate	
Utilisation factor for gains, hm:  (94)m= 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>1-5.9-12</sub> 2161.01 (98)  Space heating requirement in kWh/m²/year	Utilisation factor for gains, hm:  (94)m= 1	tne ut	_					1		Λ	Con		Nex	Daa		
(94)m= 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>1-59.12</sub> = 2161.01 (98)  Space heating requirement in kWh/m²/year	(94)m= 1 0.99 0.97 0.9 0.74 0.52 0.37 0.41 0.7 0.95 0.99 1  Useful gains, hmGm , W = (94)m x (84)m (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m – (96)m ] (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>1.59.12</sub> = 2161.01 (95)  Space heating requirements – Individual heating systems including micro-CHP)  Space heating:	   Litilian					Iviay	Ju	n j Jul	Aug	Sep	Oct	INOV	Dec		
Useful gains, hmGm , W = (94)m x (84)m  (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98)15912 = 2161.01 (98)  Space heating requirement in kWh/m²/year	Useful gains, hmGm , W = (94)m x (84)m  (95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98)15912 = 2161.01 (98)						0.74	0.50	0 0 37	0.41	0.7	0.95	0.00	1		(94)
(95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54 (95)  Monthly average external temperature from Table 8  (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m— (96)m] (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m— (95)m] x (41)m (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 2161.01 (98)  Space heating requirement in kWh/m²/year	(95)m= 477.32 551.27 628.74 670.95 595.07 415.48 277.56 290.65 436.88 503.39 464.76 451.54  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  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m ]  (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98)15912 = 2161.01 (95)  Space heating requirements – Individual heating systems including micro-CHP)  Space heating:	ı	·				ļ	0.52	0.57	0.41	1 0.7	0.93	0.99	'		(0.)
Monthly average external temperature from Table 8  (96)m= 4.3	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  Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]  (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 2161.01 (98)  Space heating requirements in kWh/m²/year 26.01 (98)  Space heating:	ı			<del>- `</del>	<del></del>	<del> </del>	115	18 277 56	290.65	136.88	503 30	164.76	151 51		(95)
(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= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 2161.01 (98)  Space heating requirement in kWh/m²/year	(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  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98)15912 = 2161.01 (98)  Space heating requirements - Individual heating systems including micro-CHP)  Space heating:						<u> </u>	<u> </u>		290.03	430.00	303.39	404.70	431.34		(00)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m-(96)m] (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 2161.01 (98)  Space heating requirement in kWh/m²/year 26.01 (99)	Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m – (96)m ]  (97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58  Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>15.912</sub> 2161.01 (98)  Space heating requirement in kWh/m²/year 26.01 (98)  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating:		_							16.4	14.1	10.6	71	4.2		(96)
(97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 2161.01 (98)  Space heating requirement in kWh/m²/year 26.01 (99)	(97)m= 1111.49 1077.49 979.41 817.53 628.16 418.61 277.83 291.23 454.58 688.78 912.27 1102.58 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37 Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 2161.01 (98) Space heating requirement in kWh/m²/year 26.01 (98) Space heating:									L	<u> </u>		L '	7.2		(00)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 2161.01 (98)  Space heating requirement in kWh/m²/year 26.01 (99)	Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 2161.01 (98)  Space heating requirement in kWh/m²/year 26.01 (98)  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating:	ı				<u>_</u>			<del></del>	<del>- `                                   </del>	<del>, ` ´ </del>	<del></del>	012 27	1102 58		(97)
(98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 2161.01 (98)  Space heating requirement in kWh/m²/year 26.01 (99)	(98)m= 471.82 353.62 260.9 105.54 24.62 0 0 0 0 137.93 322.21 484.37  Total per year (kWh/year) = Sum(98) <sub>15.912</sub> = 2161.01 (98)  Space heating requirement in kWh/m²/year 26.01 (98)  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating:	` ′						<u> </u>		l	l			1102.30		(37)
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> = 2161.01 (98) Space heating requirement in kWh/m²/year 26.01 (99)	Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 2161.01 (98) Space heating requirement in kWh/m²/year 26.01 (98)  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating:						1				i	<del>i                                    </del>	r e	191 27		
Space heating requirement in kWh/m²/year 26.01 (99)	Space heating requirement in kWh/m²/year  26.01  9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating:	(90)111=	47 1.02	333.02	200.9	105.54	24.02			<u> </u>			<u> </u>	<u> </u>	0404.04	7(00)
	9a. Energy requirements – Individual heating systems including micro-CHP)  Space heating:									lota	al per year	(kwh/yeai	r) = Sum(9	8) <sub>15,912</sub> =	2161.01	(98)
9a. Energy requirements – Individual heating systems including micro-CHP)	Space heating:	Space	e heatin	g require	ement in	kWh/m²	²/year								26.01	(99)
	·	0a End	ergy rec	uiremer	nts – Indi	vidual h	eating s	ystem	s including	micro-C	CHP)					
Space heating:	Fraction of appear heat from according/augustems assets as	Ja. LIII						,		,	/					
	Fraction of space heat from secondary/supplementary system 0 (2)	Space		•							,					_

Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.4	(206)
Efficiency of secondary/supplementary heating s	system	, %						0	(208)
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)  471.82   353.62   260.9   105.54   24.62	<u>, I</u>	0	0	0	137.93	322.21	404.07	1	
	0	0	0	0	137.93	322.21	484.37		(211)
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ 505.16  378.61  279.33  112.99  26.36 $	0	0	0	0	147.68	344.97	518.6		(211)
			Tota	l (kWh/yea	ar) =Sum(2	L 211) <sub>15,1012</sub>	<u> </u>	2313.72	(211)
Space heating fuel (secondary), kWh/month									_
= {[(98)m x (201)] } x 100 ÷ (208)								1	
(215)m= 0 0 0 0 0	0	0	0 Tata	0	0	0	0		7(0.45)
Water booting			Tota	i (Kvvii/yea	ar) =Surri(2	215) <sub>15,1012</sub>	=	0	(215)
Water heating Output from water heater (calculated above)									
	141.66	135.72	151.29	152.96	174.18	185.93	199.5		
Efficiency of water heater								80.3	(216)
` '	80.3	80.3	80.3	80.3	84.47	86.42	87.2		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	176.41	169.01	188.41	190.49	206.2	215.14	228.78		
			Tota	I = Sum(2	19a) <sub>112</sub> =	•		2429.96	(219)
Annual totals	· ·		Tota	I = Sum(2		Wh/year		kWh/yea	
Space heating fuel used, main system 1			Tota	I = Sum(2 <sup>-</sup>		Wh/year		kWh/yeai 2313.72	
Space heating fuel used, main system 1 Water heating fuel used	•		Tota	I = Sum(2 <sup>-</sup>		Wh/year		kWh/yea	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot	•		Tota	I = Sum(2 <sup>-</sup>		Wh/year		kWh/yeai 2313.72	
Space heating fuel used, main system 1 Water heating fuel used	•		Tota	I = Sum(2		Wh/year	30	kWh/yeai 2313.72	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot	•		Tota	I = Sum(2		Wh/year		kWh/yeai 2313.72	(230c)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:				I = Sum(2'	k¹		30	kWh/yeai 2313.72	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue					k¹		30	kWh/year 2313.72 2429.96	(230c) (230e)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year	ns inclu	ıding mi	sum	of (230a).	k¹		30	kWh/year 2313.72 2429.96	(230c) (230e) (231)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting			sum	of (230a).	<b>k</b> 1		30 45	kWh/year 2313.72 2429.96 75 368.35	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	End	iding midergy ergy h/year	sum	of (230a).	<b>k</b> 1	ion fac	30 45	kWh/year 2313.72 2429.96	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	<b>En</b> ekW	ergy	sum	of (230a).	(230g) =	ion fac 2/kWh	30 45	kWh/year 2313.72 2429.96 75 368.35	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems	<b>En</b> ekW	ergy h/year	sum	of (230a).	(230g) =  Emiss kg CO	ion fac 2/kWh	30 45 <b>tor</b>	kWh/year 2313.72 2429.96 75 368.35 Emissions kg CO2/ye	(230c) (230e) (231) (232)
Space heating fuel used, main system 1  Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump:  boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)	End kW	ergy h/year ) ×	sum	of (230a).	Emiss kg CO:	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b>	kWh/year 2313.72 2429.96 75 368.35 Emissions kg CO2/ye	(230c) (230e) (231) (232) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	End kW (211 (215 (219	ergy h/year x x x x x x x x x x x x x x x x x x x	sum	of (230a).	(230g) =  Emiss kg CO:	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b> = =	kWh/year 2313.72 2429.96 75 368.35 Emissions kg CO2/ye 499.76 0	(230c) (230e) (231) (232) (232) (261) (263) (264)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating Space and water heating	End kW (211 (215 (219 (261	ergy h/year ) x b) x c) x ) x	sum	of (230a).	Emiss kg CO: 0.2	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b> = =	kWh/year 2313.72 2429.96 75 368.35 Emissions kg CO2/ye 499.76 0 524.87	(230c) (230e) (231) (232) (232) (261) (263) (264) (265)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	End kW (211 (215 (219 (261 (231	ergy h/year x x x x x x x x x x x x x x x x x x x	sum	of (230a).	Emiss kg CO:	ion fac 2/kWh 16 19	30 45 <b>tor</b> = =	kWh/year 2313.72 2429.96 75 368.35 Emissions kg CO2/ye 499.76 0	(230c) (230e) (231) (232) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1254.73 (272)

TER = 15.1 (273)

			lloor D	) otoilo						
Assessor Name:	Joseph Treanor		User D	Strom	a Num	hor:		STRC	0032062	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.14	
		Р	roperty	Address	P7					
Address :	, Gondar Gardens,	London,	NW6 1H	HG						
1. Overall dwelling dim	nensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	3)
Ground floor			4	19.09	(1a) x	2	2.55	(2a) =	125.18	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 4	19.09	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	125.18	(5)
2. Ventilation rate:										
		econdar heating	У	other		total			m³ per hou	ır
Number of chimneys	0 +	0	] + [	0	] = [	0	X e	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī = Ē	0	x :	20 =	0	(6b)
Number of intermittent f	ans				, <u> </u>	2	x	10 =	20	(7a)
Number of passive vent	ts				F	0	x	10 =	0	(7b)
Number of flueless gas						0	x	40 =	0	(7c)
realiser of fluciess gas	11100					0			0	(70)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (	6a)+(6b)+(7	'a)+(7b)+(	(7c) =	Г	20		÷ (5) =	0.16	(8)
If a pressurisation test has	been carried out or is intend	led, procee	d to (17),	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber				•	ruction			0	(11)
	present, use the value corre nings); if equal user 0.35	sponaing to	ine great	ler wall are	a (aner					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
•	e, q50, expressed in cu		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeab	lies if a pressurisation test ha					is heina u	sed		0.41	(18)
Number of sides shelter		io boon don	io oi a ao	groo an po	modelinty	io boilig a	ocu		2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.35	(21)
Infiltration rate modified	for monthly wind spee	d								<u> </u>
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	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 Foster (00-)	22\m : 4									
Wind Factor $(22a)m = (22a)m = 1.27$	<del></del>	0.95	0.95	0.92	1	1.08	1 12	1.18	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.44	0.44	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41		
Calculate effe If mechanic		_	rate for t	he appli	cable ca	se						0	(23
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	wise (23b	) = (23a)			0	(23
If balanced wit									, , ,			0	(23
a) If balance	ed mech	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	)m = (2)	2b)m + (	23h) <b>x</b> ['	1 <i>– (2</i> 3c)		(20
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
b) If balance	ed mech	anical ve	entilation	without	heat red	overy (N	иV) (24b	)m = (22	<u>1</u> 2b)m + (2	 23b)	Į	J	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
c) If whole h				•	•		on from ( c) = (22k		5 × (23b	))	•	•	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
d) If natural if (22b)r					•		on from I 0.5 + [(2		0.5]		<u>I</u>	1	
24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	]	(24
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-	-	
25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(2
3. Heat losse	s and he	eat loss i	paramete	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-		A X k kJ/K
Vindows Type	e 1				4.72	x1	/[1/( 1.4 )+	0.04] =	6.26				(2
Vindows Type	e 2				2.29	x1	/[1/( 1.4 )+	0.04] =	3.04				(2
Valls Type1	21.9	9	7.01		14.98	x	0.18	= [	2.7				(2
Valls Type2	32.4	6	0		32.46	x	0.18	= [	5.84				(2
otal area of e	elements	, m²			54.45	5							(3
arty wall					23.76	x	0	=	0				(3
for windows and * include the are						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	n 3.2	
abric heat lo	ss, W/K	= S (A x	U)				(26)(30)	+ (32) =				17.83	(3
leat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	3915.6	(3
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(3
or design asses an be used inste				construct	ion are no	t known pi	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridg				usina Ac	pendix l	<						4.21	(3
details of therm	,	,		• .	•							7.21	
otal fabric he	at loss							(33) +	(36) =			22.05	(3
entilation he	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= 24.73	24.57	24.41	23.69	23.55	22.92	22.92	22.8	23.16	23.55	23.83	24.11		(3
eat transfer	coefficie	nt, W/K						(39)m	= (37) + (37)	38)m			
							1					•	
39)m= 46.77	46.62	46.46	45.73	45.6	44.96	44.96	44.85	45.21	45.6	45.87	46.16		

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.95	0.95	0.95	0.93	0.93	0.92	0.92	0.91	0.92	0.93	0.93	0.94		
Number of day	re in mo	oth (Tabl	lo 10)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.93	(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. Water heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9)	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13		66		(42)
Annual averag Reduce the annua	e hot wa Il average	hot water	usage by	5% if the a	welling is	designed t			se target o		3.7		(43)
not more that 125	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in								Оер	000	INOV	Dec		
(44)m= 81.07	78.13	75.18	72.23	69.28	66.33	66.33	69.28	72.23	75.18	78.13	81.07		
_	_					_				ım(44) <sub>112</sub> =	L	884.45	(44)
Energy content of										1			
(45)m= 120.23	105.16	108.51	94.6	90.77	78.33	72.58	83.29	84.29	98.23	107.22	116.44	1150.00	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Fotal = Su	ım(45) <sub>112</sub> =	• [	1159.66	(45)
(46)m= 18.03	15.77	16.28	14.19	13.62	11.75	10.89	12.49	12.64	14.73	16.08	17.47		(46)
Water storage	loss:								<u> </u>				
Storage volum	, ,		-			_		ame ves	sel		0		(47)
If community h Otherwise if no	•			•			` '	ora) onto	or 'O' in /	(47)			
Water storage		not wate	: (11115 11	iciuues i	iistaiitai	ieous co	יווטט וטוווי	ers) erite	31 U III (	(47)			
a) If manufact		eclared lo	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		-	-				(48) x (49)	) =			0		(50)
b) If manufact Hot water stora			-										(51)
If community h	_			C Z (KVVI	i/iiti G/GC	iy <i>)</i>					0		(31)
Volume factor	_										0		(52)
Temperature 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		(55)
Water storage	loss cal	culated f	or each	month		_	((56)m = (	55) × (41)ı	m				
(56)m= 0  If cylinder contains	0 dedicate	0 d solar sto	0 rage, (57)ı	0 m = (56)m	0 x [(50) – (	0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (	0 (H11) is fro	0 m Appendi	хН	(56)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	. 3					<u>I</u>		0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	55 × (41)	m			-		( - /
(modified by	factor f	rom Tabl	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

				<b>(- 1)</b>	<i>()</i>									
Combi loss		r		<del> </del>	<del></del>	1		. 1					1	(04)
(61)m= 41.3		38.31	35.62	35.31	32.71	33.8	35.3	!		38.31	38.53	41.31		(61)
	<del></del>		<del></del>				<del>`</del>	$\overline{}$	<del>`</del>		<del>`</del>	(57)m +	(59)m + (61)m	
(62)m= 161.	55 141.12	146.82	130.22	126.08	111.04	106.39	118	.6 119	.91	136.54	145.75	157.75		(62)
Solar DHW in									solar	contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \		applies	s, see Ap	pend	ix G)			1		1	
(63)m = 0	0	0	0	0	0	0	0	0		0	0	0		(63)
Output from	water hea	ter				_								
(64)m= 161.	55 141.12	146.82	130.22	126.08	111.04	106.39	118	.6 119	.91	136.54	145.75	157.75		,
							(	Output fro	m wa	iter heate	r (annual)₁	12	1601.76	(64)
Heat gains	from water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m] + 0	.8 x	[(46)m	+ (57)m	+ (59)m	1	
(65)m= 50.3	31 43.95	45.66	40.36	39.01	34.22	32.59	36.5	36.9	93	42.24	45.28	49.04		(65)
include (	57)m in cal	culation (	of (65)m	only if c	ylinder	is in the	dwelli	ng or ho	ot wa	ater is fr	om com	munity h	eating	
5. Interna	l gains (see	e Table 5	and 5a	):										
Metabolic g	ains (Table	e 5), Wat	ts											
Ja		Mar	Apr	May	Jun	Jul	Αι	ig Se	ер	Oct	Nov	Dec		
(66)m= 83.°	17 83.17	83.17	83.17	83.17	83.17	83.17	83.1	7 83.	17	83.17	83.17	83.17		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso se	ee Table	e 5		•	•	-	
(67)m= 13.	8 12.25	9.97	7.54	5.64	4.76	5.14	6.69	9 8.9	8	11.4	13.3	14.18		(67)
Appliances	gains (calc	ulated ir	. Append	dix L. ea	uation L	.13 or L1	3a). a	ulso see	Tab	ole 5	!	<u>!</u>	ı	
(68)m= 144.	<del>-                                    </del>	142.59	134.52	124.34	114.77	108.38	106.			118.73	128.91	138.48		(68)
Cooking ga	ins (calcula	ted in A	nnendix	L. eguat	ion L15	or L15a	L ), also	see Ta	—ц able	5			l	
(69)m= 31.3	<del>`</del>	31.32	31.32	31.32	31.32	31.32	31.3	$\overline{}$	_	31.32	31.32	31.32	]	(69)
Pumps and		(Table F	[ [a]	<u> </u>		<u> </u>	<u> </u>				l			
(70)m= 3		3	3	3	3	3	3	3	$\neg$	3	3	3	]	(70)
Losses e.g.			<u> </u>	<u> </u>	<u> </u>									( - /
(71)m= -66.	<del></del>	-66.53	-66.53	-66.53	-66.53	-66.53	-66.	53 -66.	53	-66.53	-66.53	-66.53	1	(71)
			-00.00	-00.55	-00.55	-00.55	-00.	55   -00.	33	-00.55	-00.55	-00.55		(, ,)
Water heat	<del></del>	<del></del>	56.06	52.43	47.53	43.8	49.0	9 51.2	20 [	FC 77	62.00	65.92	1	(72)
` '		61.37	36.06	32.43		ļ				56.77	62.89			(12)
Total inter	_ <del>_</del>		040.07	000 00		i)m + (67)m				, ,	<u> </u>		1	(72)
(73)m= 277.		264.87	249.07	233.36	218.02	208.27	213	.6 221	.88	237.85	256.06	269.53		(73)
6. Solar gains a	arre calculated	usina sola	r flux from	Table 6a	and acco	ciated equa	tions t	o convert	to the	annlicak	de orientat	ion		
Orientation		•	Area		Fli	·	1110113 1		10 1116	e applicat	FF	.1011.	Gains	
Offeritation	Table 6d		m <sup>2</sup>			ble 6a		g_ Table	6b	Т	able 6c		(W)	
West 0.9	9x 0.77	×	4.7	72	х	10.64	] <sub>x</sub> [	0.63	,	¬ , г	0.7		20.22	(80)
						19.64	ј L 1 Г	0.63			0.7	<b>=</b>	28.33	](80)
		×	2.2			19.64	]	0.63		_	0.7	=	13.75	
		X	4.7			38.42	]	0.63			0.7	_ =	55.42	](80) ] <sub>(80)</sub>
	9x 0.77	X	2.2		<b>—</b>	38.42	X	0.63		_	0.7	=	26.89	(80)
West 0.9	9x 0.77	X	4.7	72	Х	63.27	X	0.63	3	X	0.7	=	91.27	(80)

	-								,						_
West	0.9x	0.77	X	2.2	29	X	6	3.27	X	0.63	X	0.7	=	44.28	(80)
West	0.9x	0.77	X	4.7	72	X		2.28	X	0.63	X	0.7	=	133.11	(80)
West	0.9x	0.77	X	2.2	29	X		2.28	X	0.63	X	0.7	=	64.58	(80)
West	0.9x	0.77	X	4.7	72	X	1	13.09	X	0.63	X	0.7	=	163.14	(80)
West	0.9x	0.77	X	2.2	29	X	1	13.09	X	0.63	X	0.7	=	79.15	(80)
West	0.9x	0.77	X	4.7	72	X	1	15.77	X	0.63	X	0.7	=	167	(80)
West	0.9x	0.77	X	2.2	29	X	1	15.77	X	0.63	X	0.7	=	81.02	(80)
West	0.9x	0.77	X	4.7	72	X	1	10.22	X	0.63	X	0.7	=	158.99	(80)
West	0.9x	0.77	X	2.2	29	X	1	10.22	X	0.63	X	0.7	=	77.14	(80)
West	0.9x	0.77	X	4.7	72	X	9	4.68	X	0.63	X	0.7	=	136.57	(80)
West	0.9x	0.77	X	2.2	29	X	9	4.68	x	0.63	X	0.7	=	66.26	(80)
West	0.9x	0.77	X	4.7	72	X	7	3.59	x	0.63	X	0.7	=	106.15	(80)
West	0.9x	0.77	X	2.2	29	X	7	3.59	X	0.63	X	0.7	=	51.5	(80)
West	0.9x	0.77	X	4.7	72	X	4	5.59	X	0.63	X	0.7	=	65.76	(80)
West	0.9x	0.77	X	2.2	29	X	4	5.59	X	0.63	X	0.7	=	31.91	(80)
West	0.9x	0.77	X	4.7	72	X	2	4.49	X	0.63	X	0.7	=	35.33	(80)
West	0.9x	0.77	X	2.2	29	X	2	4.49	X	0.63	X	0.7	=	17.14	(80)
West	0.9x	0.77	X	4.7	72	X	1	6.15	x	0.63	X	0.7	=	23.3	(80)
West	0.9x	0.77	X	2.2	29	X	1	6.15	X	0.63	X	0.7	=	11.3	(80)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m= 42.08 82.31 135.55 197.7 242.28 248.02 236.13 202.83 157.65 97.67 52.46 34.6  Total gains – internal and solar (84)m = (73)m + (83)m , watts														]	(83)
(84)m=	319.31	357.3	400.42	446.77	475.64	4	66.04	444.4	416	.43 379.54	335.5	2 308.52	304.13		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	n)									
Temp	erature	during h	eating p	eriods ir	n the livi	ing	area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for ga	ains for	iving are	ea, h1,n	า (ร	ee Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93	0.8		0.6	0.44	0.4	9 0.76	0.96	0.99	1		(86)
Mean	interna	l tempera	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)					
(87)m=	20.08	20.21	20.44	20.73	20.92	2	20.99	21	2	1 20.95	20.7	20.34	20.06	]	(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dw	/elling	from Ta	able 9	9, Th2 (°C)				-	
(88)m=	20.12	20.13	20.13	20.14	20.14	1	20.15	20.15	20.		20.14	20.14	20.13	]	(88)
ı L İtilisə	tion fac	tor for ga	ains for	rest of d	welling	h2	m (se	e Table	(9a)	I		<u>I</u>		4	
(89)m=	1	0.99	0.97	0.91	0.75	1	0.53	0.36	0.4	4 0.69	0.94	0.99	1	1	(89)
	intorno	l tompor			<u> </u>			<u> </u>	2002	<u>!</u>				J	
(90)m=	18.9	19.09	19.42	19.83	20.06	Ť	20.15	20.15	20.	to 7 in Tab	19.8	19.29	18.87	1	(90)
(50)111-	.0.0	10.00		1 .0.00		<u></u>	-5.10		<u> </u>			ving area ÷ (	<u> </u>	0.5	(91)
								–				3 × 22 1 (	,	0.5	(01)
ı						_		<del> </del>	<del></del>	– fLA) × T2		40.04	40.40	1	(00)
(92)m=	19.49	19.65	19.93	20.27	20.49		20.56	20.57	20.		20.24		19.46	]	(92)
Apply	aujusti	neni io ii	ie mear	ппетта	tempe	all	11 to 11 to	iii rable	<del>4</del> 0,	where appr	opnate	;			

(93)m= 19.49 19.65 19.93 20.27 20.49 20.56 20.57 20.57 20.53 20.24 19.81 19.46		(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a	ate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 0.99 0.99 0.97 0.91 0.77 0.57 0.4 0.45 0.72 0.94 0.99 1		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 317.68 353.59 389.38 407.85 368.28 264.08 178.22 186.34 274.65 316.95 305.2 302.93		(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= 710.27 687.56 623.88 520.13 400.7 268.17 178.65 187.15 290.78 439.7 583.01 704.58		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		
(98)m= 292.09 224.43 174.47 80.84 24.12 0 0 0 91.33 200.03 298.82		,
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	1386.12	(98)
Space heating requirement in kWh/m²/year	28.24	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)		
Space heating:		
Fraction of space heat from secondary/supplementary system	0	(201)
Fraction of space heat from main system(s) (202) = 1 - (201) =	1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1	(204)
Efficiency of main space heating system 1	93.4	(206)
Efficiency of secondary/supplementary heating system, %	0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	kWh/yea	]` ′
Space heating requirement (calculated above)	KVVII/yea	u
292.09 224.43 174.47 80.84 24.12 0 0 0 0 91.33 200.03 298.82		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$		(211)
312.73 240.29 186.79 86.55 25.82 0 0 0 97.78 214.16 319.94		(211)
Total (kWh/year) =Sum(211) <sub>15,1012</sub> =	1484.07	(211)
Space heating fuel (secondary), kWh/month		J` ′
$= \{[(98) \text{m x } (201)]\} \times 100 \div (208)$		
(215)m= 0 0 0 0 0 0 0 0 0 0 0		
Total (kWh/year) =Sum(215) <sub>15,1012</sub> =	0	(215)
Water heating		J
Output from water heater (calculated above)		
161.55     141.12     146.82     130.22     126.08     111.04     106.39     118.6     119.91     136.54     145.75     157.75		_
Efficiency of water heater	80.3	(216)
(217)m= 86.52 86.21 85.49 83.89 81.77 80.3 80.3 80.3 80.3 84.06 85.85 86.64		(217)
Fuel for water heating, kWh/month		
$(219)m = (64)m \times 100 \div (217)m$ $(240)m = (64)m \times 100 \div (217)m$		
(219)m= 186.71   163.68   171.75   155.23   154.19   138.29   132.49   147.69   149.32   162.42   169.78   182.09    Total = Sum(219a) <sub>112</sub> =	1042.64	1(240)
L_	1913.64	(219)
Annual totals  Space heating fuel used, main system 1	<b>kWh/year</b> 1484.07	1
_		J

					_
Water heating fuel used				1913.64	
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 (23	30a)(230g) =		75	(231)
Electricity for lighting				243.65	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	<b>Energy</b> kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x	0.216	=	320.56	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	413.35	(264)
Space and water heating	(261) + (262) + (263) + (264) =	=		733.9	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	126.45	(268)
Total CO2, kg/year	SU	ım of (265)(271) =		899.28	(272)

TER =

(273)

18.32

			lloor D	) otoilo:						
Assessor Name:	Joseph Treanor		User D	Strom	a Num	her:		STRC	0032062	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.14	
		Р	roperty	Address	P8					
Address :	, Gondar Gardens,	London,	NW6 1	HG						
1. Overall dwelling dim	nensions:									
0 10				a(m²)			ight(m)	,	Volume(m <sup>3</sup>	<u> </u>
Ground floor			,	54.2	(1a) x	2	2.55	(2a) =	138.21	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) [	54.2	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	138.21	(5)
2. Ventilation rate:										
		econdar heating	у 	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 f	ans					2	X	10 =	20	(7a)
Number of passive vent	ts				Ē	0	x	10 =	0	(7b)
Number of flueless gas	fires				_ 	0	X 4	40 =	0	(7c)
3										( - /
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (	6a)+(6b)+(7	a)+(7b)+(	(7c) =	Γ	20		÷ (5) =	0.14	(8)
If a pressurisation test has	been carried out or is intend	led, procee	d to (17),	otherwise o	ontinue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration		_					[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber				•	uction			0	(11)
	present, use the value corre nings); if equal user 0.35	sponding ic	ine great	ler wall are	a (aner					
If suspended wooden	floor, enter 0.2 (unsea	iled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
•	e, q50, expressed in cu		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeab	Dility value, then (10) = [( lies if a pressurisation test ha					is haina u	sad		0.39	(18)
Number of sides shelter		is been don	ie or a de	gree an pe	пеаышу	is being u	seu		2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.34	(21)
Infiltration rate modified	for monthly wind spee	d								_
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	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	]	
	00)								-	
Wind Factor (22a)m = ( $\frac{1}{2}$	<del>'</del>	T 0.05	0.05	0.00	4	1 4 00	1 4 40	440	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	

0.43	0.42	e (allowi	ng for sr 0.37	0.36	d wind s	peed) = 0.32	(21a) x	(22a)m 0.34	0.36	0.38	0.39	1	
Calculate effec	-	l -	l		1		0.51	0.34	0.30	0.36	0.39	J	
If mechanica	al ventila	ition:										0	(2
If exhaust air he	eat pump ı	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(2
If balanced with	heat reco	overy: effici	iency in %	allowing f	or in-use fa	actor (fron	n Table 4h	) =				0	(2
a) If balance	d mecha	anical ve	entilation	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	]	(2
b) If balance		ı	entilation		ı	overy (I	ЛV) (24b	<u> </u>	<del> </del>	<del></del>		7	
(4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
c) If whole h				•	•				F (00)	,			
if (22b)n		(23b), t	<u> </u>	c) = (230)	o); otherv	,	<del></del>	o) m + 0.	· ` ·	<del></del>	Ι ,	1	(2
4c)m= 0	0		0			0	0		0	0	0	J	(2
d) If natural if (22b)n				•					0.51				
4d)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)	<u> </u>	<u>I</u>	!	J	
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	]	(
							ı		l		ı	1	
B. Heat losse	_	·			Nat Am		امدالا		AXU		ر بامید یا	_	ΑΧk
LEMENT	Gros area	-	Openin m		Net Ar A ,n		U-valı W/m2		(W/I	<b>〈</b> )	k-value kJ/m²·		kJ/K
indows Type	1				4.72	x1	/[1/( 1.4 )+	0.04] =	6.26	Ì			(
indows Type	2				2.29	x1	/[1/( 1.4 )+	0.04] =	3.04	=			(
oor					4.31	x	0.13		0.5603	<b>=</b>		$\neg$	(
/alls Type1	20.2	2	7.01		13.19	x	0.18	<b>=</b>	2.37	<b>=</b>		7 7	(:
alls Type2	31.4		0	=	31.46	=	0.18	<b>=</b>	5.66	<b>=</b>		7 F	(
otal area of e					55.97	_	00		0.00				(:
arty wall		,			26.04	=	0		0	<b>—</b> [			· (
or windows and	roof winde	ows, use e	effective wi	ndow U-va						L ns aiven in	paragrapi		(
include the area						a.co a a.og	, , , , , , , , , , , , , , , , , , , ,	1( ", 0 ' tall	.0, .0.0 ., 0	.c g	paragrap.	. 0.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				17.89	(
eat capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	4174.0	5 (
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(
or design assess				construct	ion are not	known pi	ecisely the	indicative	values of	TMP in Ta	able 1f		
<i>n be used inste</i> hermal bridge				icina An	nondiy k	•							
details of therma	,	•		• .	•	`						5.27	(
otal fabric he		are not kir	OWII (30) =	- 0.70 X (S	1)			(33) +	(36) =			23.17	. (
entilation hea	at 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	]	
8)m= 26.98	26.82	26.66	25.91	25.77	25.12	25.12	25	25.37	25.77	26.05	26.35	1	(
eat transfer o	coefficier	nt. W/K					!	(39)m	= (37) + (37)	38)m	!		
9)m= 50.14	49.98	49.82	49.08	48.94	48.29	48.29	48.17	48.54	48.94	49.22	49.51	1	
	· -	ı	ı .				l	·	·	L	<u> </u>	1	

Heat loss para	meter (I	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.93	0.92	0.92	0.91	0.9	0.89	0.89	0.89	0.9	0.9	0.91	0.91		
<b>.</b>									Average =	Sum(40) <sub>1</sub> .	12 /12=	0.91	(40)
Number of day Jan	rs in mo	nth (Tab	e 1a) Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
(41)1112			- 00	01	- 00	01	01				01		(,
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu	nancy	N									04		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9)	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		81		(42)
Annual averag									4		.28		(43)
Reduce the annua not more that 125	_				_	_	o acnieve	a water us	se target o	)†			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per				ctor from 7	Table 1c x		'	!	!			
(44)m= 85.01	81.92	78.83	75.73	72.64	69.55	69.55	72.64	75.73	78.83	81.92	85.01		
Energy content of	hat water	unad aal	ouloted m	onthly — 1	100 v Vd r	n v nm v [	Tm / 2600			m(44) <sub>112</sub> =	L	927.36	(44)
Energy content of													
(45)m= 126.06	110.26	113.77	99.19	95.18	82.13	76.11	87.33	88.38	102.99	112.42 m(45) <sub>112</sub> =	122.09	1215.91	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar – Su	111(43)112 -	- L	1213.91	(.o)
(46)m= 18.91	16.54	17.07	14.88	14.28	12.32	11.42	13.1	13.26	15.45	16.86	18.31		(46)
Water storage								•					
Storage volum	` ′		•			ŭ		ame ves	sei		0		(47)
If community h Otherwise if no	•			•			` '	ers) ente	er '0' in (	(47)			
Water storage			(-					, ,		,			
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		-	-		:		(48) x (49)	) =			0		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-								0		(51)
If community h	•			`		,					<u> </u>		,
Volume factor											0		(52)
Temperature fa											0		(53)
Energy lost fro		•	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or ( Water storage		•	or oach	month			((56)m = (	55\ × (41)	m		0		(55)
									1	Ι ο			(EC)
(56)m= 0  If cylinder contains	0 s dedicate	d solar sto	0 rage, (57)ı	0 m = (56)m	0 x [(50) – (	0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (	0 (H11) is fro	m Appendi	хH	(56)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3				•	•		0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calculated for each month (61)m = (60) $\div$ 365 × (41)m													
	_					<del>- ` `</del>			1		1	1	
(61)m= 43.32		40.17	37.35	37.02	34.3	35.44	37.02	<u>l</u>	40.17	40.4	43.32		(61)
Total heat re	quired for	water he				h month	<del>`</del>		(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 169.38	147.96	153.94	136.54	132.19	116.43	111.55	124.3	125.72	143.16	152.82	165.41		(62)
Solar DHW inpu									r contribut	tion to wate	er heating)		
(add addition	al lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix	<del></del>				1	
(63)m = 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	_	ter										1	
(64)m= 169.38	147.96	153.94	136.54	132.19	116.43	111.55	124.3	125.72	143.16	152.82	165.41		7
							O	utput from w	ater heate	er (annual)	12	1679.46	(64)
Heat gains fr	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	]	
(65)m= 52.75	46.09	47.87	42.32	40.9	35.88	34.17	38.29	38.72	44.29	47.48	51.42		(65)
include (57	)m in cald	culation of	of (65)m	only if c	ylinder i	s in the o	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										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 90.69	90.69	90.69	90.69	90.69	90.69	90.69	90.69	90.69	90.69	90.69	90.69		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5	•		•	•	
(67)m= 15.39	13.67	11.12	8.42	6.29	5.31	5.74	7.46	10.01	12.71	14.84	15.82	]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L. ea	uation L	13 or L1		so see Ta	ble 5	1	ļ.	ı	
(68)m= 158.12	<del>- `</del>	155.63	146.83	135.71	125.27	118.29	116.6		129.59	140.7	151.14	]	(68)
Cooking gain	s (calcula	ıted in Aı	opendix	L. eguat	ion L15	or L15a	L Lalso	 see Table	5	Į.	l .	ı	
(69)m= 32.07	<del></del>	32.07	32.07	32.07	32.07	32.07	32.07		32.07	32.07	32.07	]	(69)
Pumps and f	1	(Table F	[ [a]	<u> </u>			<u> </u>		<u> </u>	ı		I	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g. 6		ļ.		ļ								l	( - /
(71)m= -72.56	<u> </u>	-72.56	-72.56	-72.56	-72.56	-72.56	-72.56	6 -72.56	-72.56	-72.56	-72.56	1	(71)
` ′		<u> </u>	-72.50	-72.30	-72.30	-72.30	-72.50	72.50	-72.50	-72.50	-72.30	l	(, ,)
Water heatin (72)m= 70.9	68.58	64.34	58.78	54.97	49.84	45.92	51.47	53.78	59.53	65.95	69.12	1	(72)
			30.76	54.97			<u> </u>		l				(12)
Total interna	<del></del>		007.00	050.40				n + (69)m +	· · · · · ·	1		1	(72)
(73)m= 297.6°		284.3	267.22	250.19	233.63	223.16	228.79	237.79	255.04	274.69	289.29		(73)
6. Solar gains are		using solo	r flux from	Table 6a	and accor	iated equa	tions to	convert to th	o applical	blo orientat	tion		
Orientation:		ŭ	Area		Flu		ilions to		іс арріісаі	FF	iioii.	Gains	
Onemation.	Table 6d		m <sup>2</sup>			ble 6a		g_ Table 6b	Т	able 6c		(W)	
West 0.9x	0.77	x	4 7	72	v —	10.64	l <sub>x</sub> Γ	0.63	¬ , г	0.7		20.22	(80)
West 0.9x		_	4.7	==		19.64	╎ ⊨	0.63	_	0.7	╡ ፟	28.33	](80)
West 0.9x		X	2.2			19.64	X	0.63		0.7	=	13.75	1
		X	4.7			38.42	X	0.63		0.7	=	55.42	](80) ] <sub>(80)</sub>
		X	2.2	==	<b>-</b>	38.42	X	0.63		0.7	=	26.89	(80)
West 0.9x	0.77	X	4.7	72	x 6	3.27	X	0.63	X	0.7	=	91.27	(80)

									,		_				_
West	0.9x	0.77	X	2.2	29	X	6	3.27	X	0.63	X	0.7	=	44.28	(80)
West	0.9x	0.77	Х	4.7	72	X	9	2.28	X	0.63	X	0.7	=	133.11	(80)
West	0.9x	0.77	X	2.2	29	X	9	2.28	X	0.63	X	0.7	=	64.58	(80)
West	0.9x	0.77	X	4.7	<b>7</b> 2	X	1	13.09	X	0.63	X	0.7	=	163.14	(80)
West	0.9x	0.77	X	2.2	29	X	1	13.09	X	0.63	X	0.7	=	79.15	(80)
West	0.9x	0.77	X	4.7	72	X	1	15.77	X	0.63	X	0.7	=	167	(80)
West	0.9x	0.77	X	2.2	29	X	1	15.77	x	0.63	X	0.7	=	81.02	(80)
West	0.9x	0.77	X	4.7	72	X	1	10.22	x	0.63	X	0.7	=	158.99	(80)
West	0.9x	0.77	X	2.2	29	X	1	10.22	x	0.63	X	0.7	=	77.14	(80)
West	0.9x	0.77	X	4.7	72	X	9	94.68	X	0.63	X	0.7	=	136.57	(80)
West	0.9x	0.77	X	2.2	29	X	9	94.68	X	0.63	X	0.7	=	66.26	(80)
West	0.9x	0.77	X	4.7	72	X	7	'3.59	х	0.63	X	0.7	=	106.15	(80)
West	0.9x	0.77	X	2.2	29	X	7	'3.59	x	0.63	x	0.7	=	51.5	(80)
West	0.9x	0.77	X	4.7	72	x	4	15.59	x	0.63	X	0.7	=	65.76	(80)
West	0.9x	0.77	X	2.2	29	x	4	15.59	x	0.63	X	0.7	=	31.91	(80)
West	0.9x	0.77	X	4.7	72	X	2	24.49	x	0.63	x	0.7		35.33	(80)
West	0.9x	0.77	X	2.2	29	X	2	24.49	x	0.63	x	0.7	_ =	17.14	(80)
West	0.9x	0.77	X	4.7	72	x	1	6.15	x	0.63	X	0.7	=	23.3	(80)
West	0.9x	0.77	X	2.2	29	X	1	6.15	x	0.63	x	0.7		11.3	(80)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m = 42.08   82.31   135.55   197.7   242.28   248.02   236.13   202.83   157.65   97.67   52.46   34.6  Total gains – internal and solar (84)m = (73)m + (83)m , watts														(83)	
(84)m=	339.69	377.53	419.85	464.92	492.47	4	81.65	459.29	431	.62 395.44	352.7	327.16	323.89		(84)
7. Mea	an inter	nal temp	erature	(heating	seasor	1)									
				`			area	from Tal	ble 9	, Th1 (°C)				21	(85)
•		ctor for ga	•			-									
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Α	ug Sep	Oct	Nov	Dec	]	
(86)m=	1	0.99	0.98	0.94	0.82	(	0.63	0.46	0.5	0.78	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)	•	•	•	•	
(87)m=	20.1	20.22	20.44	20.72	20.91	1	20.99	21	2		20.69	20.35	20.08	]	(87)
Temp	erature	during h	eating r	erinds ir	rest of	dw	مااام	from Ta	ahla (	 9, Th2 (°C)	!		ļ.	J	
(88)m=	20.15	20.15	20.15	20.16	20.17	1	20.18	20.18	20.	<del>`                                    </del>	20.17	20.16	20.16	]	(88)
				<u> </u>	<u> </u>			<u> </u>					<u> </u>	I	
(89)m=	1	tor for ga	0.98	0.92	0.78	1	0.55	0.38	9a) 0.4	12 0.71	0.95	0.99	1	1	(89)
		<u>.                                    </u>		<u> </u>	<u> </u>			<u> </u>		<u>Į</u>		0.00	<u> </u>	J	(55)
r		<del></del>			i	Ť	,	i	r <del>i —</del>	to 7 in Tab	<u> </u>	10.22	10.00	1	(90)
(90)m=	18.94	19.12	19.44	19.83	20.08		20.17	20.17	20.		19.81	19.32 ving area ÷ (	18.92	0.50	<b>_</b> ``
											ı∟∧ ≓ Ll'	miy area - (	<del>-</del> ) –	0.52	(91)
Г				<del></del>	<del> </del>	$\overline{}$			_	– fLA) × T2				1	
(92)m=	19.55	19.7	19.96	20.3	20.52	1	20.6	20.61	20.		20.27		19.53		(92)
Apply	adjustr	nent to th	ne mear	ınterna	i tempe	ratu	ire fro	m Table	4e,	where appr	opriate				

(00) 40.55	40.7	40.00	00.0	00.50	00.0	00.04	00.04	00.50	00.07	10.00	40.50		(93)
(93)m= 19.55	19.7	19.96	20.3	20.52	20.6	20.61	20.61	20.56	20.27	19.86	19.53		(93)
8. Space hea				o obtoin	ad at at	n 11 of	Toble O	b oo tha	tTim /	76\m an	d ro colo	uloto	
Set Ti to the i					eu al Sil	эр 11 01	Table 9	0, 50 liia	t 11,111=(	rojili ali	u re-caic	uiale	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	:								•		
(94)m= 1	0.99	0.98	0.93	0.8	0.59	0.42	0.47	0.74	0.95	0.99	1		(94)
Useful gains,	ı — —	· ` `	<u> </u>				1						(0.5)
(95)m= 338.24	374.28	410.21	430.26	392.48	284.5	192.94	201.63	294.52	335.82	324.19	322.83		(95)
Monthly avera		1				40.0	1 40 4	144	40.0	7.4	4.0		(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 (97)m= 764.57	739.74	an intern 670.79	ai tempe 559.3	431.39	_m , vv = 289.56	=[(39)m 193.47	x [(93)m <sub>202.61</sub>	- (96)m 313.7	473.43	627.93	758.89		(97)
` ,	l						l	l		<u> </u>	756.69		(97)
Space heatin (98)m= 317.19	g require 245.59	193.87	92.91	28.95	0	n = 0.02	24 X [(97]	)m – (95)	102.38	218.69	324.43		
(90)111= 317.19	243.39	193.07	92.91	20.93	U	U						1524.01	(98)
							Tota	l per year	(Kwii/yeai	) = Sum(9	O) <sub>15,912</sub> =	1524.01	╡``
Space heatin	g require	ement in	kWh/m²	/year								28.12	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space heatir	ng:												_
Fraction of sp	ace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of sp	ace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of to	tal heati	ng from i	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiency of I	main spa	ace heat	ing syste	em 1								93.4	(206)
Efficiency of	seconda	ry/supple	ementar	y heating	g system	ո, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin	g require	ement (c	alculate	d above)	)						•		
317.19	245.59	193.87	92.91	28.95	0	0	0	0	102.38	218.69	324.43		
$(211)m = \{[(98)$	)m x (20	)4)] } x 1	00 ÷ (20	<b>16</b> )									(211)
339.6	262.95	207.57	99.47	30.99	0	0	0	0	109.62	234.15	347.36		
							Tota	ıl (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	1631.7	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month							·		
$= \{[(98)m \times (20)]\}$	)1)]	00 ÷ (20	8)										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)
Water heating	J												
Output from w						==	l						
169.38	147.96	153.94	136.54	132.19	116.43	111.55	124.35	125.72	143.16	152.82	165.41		7,
Efficiency of w												80.3	(216)
(217)m= 86.61	86.32	85.63	84.1	81.94	80.3	80.3	80.3	80.3	84.22	85.95	86.72		(217)
Fuel for water	•												
(219)m = (64) (219)m = 195.57	m x 100	7 ÷ (217) 179.77	m 162.34	161.32	144.99	138.91	154.86	156.57	169.98	177.8	190.74		
, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	I		3=.0.	<b></b>		1		I = Sum(2'		I		2004.27	(219)
Annual totals								•		Wh/year		kWh/year	<b>-</b>
Space heating		ed, main	system	1					ĸ	y cai		1631.7	7
			-									<u> </u>	_

Water heating fuel used				2004.27	٦
Electricity for pumps, fans and electric keep-hot					_
central heating pump:			30	1	(230c)
boiler with a fan-assisted flue			45	<u>,</u> ]	(230e)
Total electricity for the above, kWh/year	sum of (230	)a)(230g) =		75	(231)
Electricity for lighting		271.77	(232)		
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	<b>Energy</b> kWh/year	Emission fac	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	352.45	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	432.92	(264)
Space and water heating	(261) + (262) + (263) + (264) =			785.37	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	141.05	(268)
Total CO2, kg/year	sui	m of (265)(271) =		965.35	(272)

TER =

(273)

17.81

			lloor D	) otoilo:						
Assessor Name:	Joseph Treanor		User D	Strom	a Num	her:		STRC	032062	
Software Name:	Stroma FSAP 20	12		Softwa					n: 1.0.4.14	
		Р	roperty	Address	P9					
Address :	, Gondar Gardens,	London,	NW6 1H	HG						
1. Overall dwelling dim	nensions:									
0				a(m²)			ight(m)	٦,, ,	Volume(m <sup>3</sup>	<u>^</u>
Ground floor			9	94.22	(1a) x	2	2.55	(2a) =	240.26	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 9	94.22	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	240.26	(5)
2. Ventilation rate:									2 1	
		econdar 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 f	ans					3	x :	10 =	30	(7a)
Number of passive vent	ts				Ē	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	X 4	40 =	0	(7c)
gar					L					(, o)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (	6a)+(6b)+(7	'a)+(7b)+(	(7c) =	Γ	30		÷ (5) =	0.12	(8)
If a pressurisation test has	been carried out or is intend	led, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration		_					[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber				•	uction			0	(11)
	present, use the value corre nings); if equal user 0.35	sponding to	ine great	ler wall are	a (aner					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
•	e, q50, expressed in cu		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeab	Dility value, then (10) = [( lies if a pressurisation test ha					is heina u	sad		0.37	(18)
Number of sides shelter		is been don	ie or a de	gree an pe	THEADING	is being u	seu		2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	) x (20) =				0.32	(21)
Infiltration rate modified	for monthly wind spee	d								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	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	]	
Mind Factor (CC.)	00) 4								-	
Wind Factor (22a)m = $(22a)$ m =	<del></del>	1 005	0.05	0.00	4	1.00	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	J	

Adjusted infiltra	ation rate (al	lowing for s	helter an	nd wind s	speed) =	: (21a) x	(22a)m					
0.41	0.4 0.3	<del></del>	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37	]	
Calculate effec		-	the appli	cable ca	se	!	!		<u> </u>	<u>l</u>	J	
If mechanica			22h) (22	a) Fm. (	augtion (I	NEW atho	muiaa (22h	) (225)			0	(23a)
If exhaust air he								) = (23a)			0	(23b)
If balanced with	-	-	_					Ola ) (1	001.) [	(OO -)	0	(23c)
a) If balance			1	at recove	<del>- ` `                                 </del>	<del>- ´ ` -</del>	$\frac{a)m = (2)}{a}$	<del> </del>	23b) × [*	<del>``</del>	i ÷ 100] I	(24a)
(24a)m= 0	0 (		0		0	0		0		0	J	(24a)
b) If balance	o mechanica	1	Without	neat red	overy (i	VIV) (241 1 0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (2x)^{2}$	2b)m + (2 0	23b) 0	0	1	(24b)
( 1/					<u> </u>				0		J	(245)
c) If whole h	ouse extract ∩ < 0.5 × (23		•	•				5 × (23h	<b>)</b>			
(24c)m = 0	0 (20	<del></del>	0	0	0	0	0	0	0	0	1	(24c)
d) If natural	ventilation or	whole hou	se positi	ve input	ı ventilati	on from	I loft				J	
	n = 1, then (2							0.5]			_	
(24d)m= 0.58	0.58 0.5	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)
Effective air	change rate	- enter (24a	a) or (24l	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.58	0.58 0.5	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	]	(25)
3. Heat losse	s and heat lo	ss paramet	er:									
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²-		A X k kJ/K
Windows Type	, ,			4.14	<del></del>	/[1/( 1.4 )+	0.04] =	5.49	,			(27)
Windows Type	2			1.95	x1	/[1/( 1.4 )+	0.04] =	2.59				(27)
Windows Type	3			4	x1	/[1/( 1.4 )+	0.04] =	5.3				(27)
Windows Type	4			1.93	x1	/[1/( 1.4 )+	0.04] =	2.56				(27)
Windows Type	5			3.84	x1	/[1/( 1.4 )+	0.04] =	5.09				(27)
Windows Type	e 6			3.84	x1	/[1/( 1.4 )+	0.04] =	5.09				(27)
Windows Type	e 7			1.93	= .	/[1/( 1.4 )+	0.04] =	2.56				(27)
Walls Type1	72.92	23.5	6	49.36	x	0.18	— - i	8.88	=			(29)
Walls Type2	4.01	0		4.01	x	0.18	<del>-</del>	0.72	<b>=</b>			(29)
Total area of e				76.93	<u> </u>							(31)
Party wall				42.45		0	<b>—</b> = 1	0	п г			(32)
* for windows and ** include the area				alue calcui			  /[(1/U-valu		ns given in	paragraph	1 3.2	`` ′
Fabric heat los	ss, W/K = S (	A x U)	,			(26)(30	) + (32) =				40.84	(33)
Heat capacity	Cm = S(A x	< )					((28).	(30) + (32	2) + (32a).	(32e) =	5112.4	<del></del>
Thermal mass	parameter (	TMP = Cm	÷ TFA) ir	n kJ/m²K			Indica	tive Value:	: Medium		250	(35)
For design assess can be used inste	sments where th	e details of the	,			recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge			using Ap	pendix I	<						7.06	(36)
if details of therma	, ,			•								
Total fabric he	at loss						(33) +	(36) =			47.9	(37)

,	tion hea	IL IOSS Ca	liculated						` '	= 0.33 × (	1 (0)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m=	46.19	45.93	45.68	44.51	44.29	43.28	43.28	43.09	43.67	44.29	44.74	45.2		(3
leat tr	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
39)m=	94.08	93.83	93.58	92.41	92.19	91.17	91.17	90.99	91.57	92.19	92.64	93.1		_
leat lo	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> . (4)	12 /12=	92.41	(3
40)m=	1	1	0.99	0.98	0.98	0.97	0.97	0.97	0.97	0.98	0.98	0.99		
lumbe	er of day	s in mor	nth (Tab	le 1a)				-	,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.98	(4
	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		(4
•								•						
4. Wa	ater heat	ting ener	gy requi	rement:								kWh/ye	ar:	
		ipancy, l 9 N = 1		[1 - exp	(-0 0003	49 x (TF		)2)] + 0.0	)013 x (	ΓFA -13		68		(4
	A £ 13.9			i. oxb	( 0.0000	10 X (11	7. 10.0	<i>)</i> _/] . O.(	) N 010 N (		,			
								(25 x N)				7.83		(
		al average litres per p				_	_	to achieve	a water us	se target o	f	_		
). 	<del></del>					_								
ot wate	Jan	Feb n litres per	Mar day for ea	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ı														
4)m=	107.61	103.7	99.79	95.87	91.96	88.05	88.05	91.96	95.87	99.79	103.7	107.61		一,
nergy c	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	_	1173.97	
5)m=	159.59	139.58	144.03	125.57	120.49	103.97	96.34	110.56	111.88	130.38	142.32	154.55		
'									-	Γotal = Su	m(45) <sub>112</sub> =		1539.26	(
instant	taneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,	) to (61)					
16)m=	23.94	20.94	21.6	18.84	18.07	15.6	14.45	16.58	16.78	19.56	21.35	23.18		(-
/ater	storage													
	ie volum	e (litres)	includin	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(
_		_												
comr	munity h	eating a			•			(47)	\	· · · (0) : · · /	47\			
comr therw	munity h	stored			•				ers) ente	er '0' in (	47)			
comr otherw other s	munity h vise if no storage	stored loss:	hot wate	er (this in	cludes i	nstantan	eous co	(47)	ers) ente	er '0' in (		0		(
comr Otherw Vater s	munity h vise if no storage nanufact	stored loss: urer's de	hot wate	er (this in	cludes i	nstantan	eous co	(47)	ers) ente	er '0' in (		0		
comr otherw vater s a) If m	munity h vise if no storage nanufact erature fa	stored loss: urer's de	hot wate eclared le m Table	er (this in oss facto 2b	cludes i	nstantan	neous co	(47) ombi boil		er 'O' in (		0		(
comr otherw /ater s a) If m empe nergy	munity hower if no storage nanufact erature for the foot of the fo	o stored loss: urer's de actor fro m water	hot wate eclared le m Table storage	er (this in oss facto 2b , kWh/ye	cludes i or is kno ear	nstantan wn (kWh	neous co	(47)		er 'O' in (				(
comr otherw vater s a) If m empe nergy o) If m	munity howise if no storage nanufact erature for anufact planufact anufact	stored loss: urer's de	hot wate eclared le m Table storage eclared c	er (this in oss facto 2b , kWh/ye cylinder l	cludes i or is kno ear oss facto	nstantan wn (kWh or is not	neous co n/day): known:	(47) ombi boil		er '0' in (		0		(
comr otherw vater : a) If m empe nergy nergy o) If m	munity havise if no storage nanufacter ature for anufacter storage.	o stored loss: urer's de actor fro m water urer's de	hot wate eclared lem Table storage eclared of factor fr	er (this in oss facto 2b , kWh/ye cylinder I om Tabl	cludes i or is kno ear oss facto	nstantan wn (kWh or is not	neous co n/day): known:	(47) ombi boil		er 'O' in (		0		(
comretherwallaters  a) If memper  nergy  o) If memory  comreters  olume	munity howise if no storage nanufact prature for anufact ater storamunity how is a factor	o stored loss: urer's de actor fro urer's de age loss leating s from Tal	eclared lem Table storage eclared of factor free sections and the sections are the sections and the sections are the section are the sections are the section	er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	cludes i or is kno ear oss facto	nstantan wn (kWh or is not	neous co n/day): known:	(47) ombi boil		er '0' in (		0		(
comr Otherw Vater : a) If m empe nergy o) If m lot wa comr	munity howise if no storage nanufact prature for anufact ater storamunity how is a factor	o stored loss: urer's de actor fro urer's de age loss leating s	eclared lem Table storage eclared of factor free sections and the sections are the sections and the sections are the section are the sections are the section	er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	cludes i or is kno ear oss facto	nstantan wn (kWh or is not	neous co n/day): known:	(47) ombi boil		er 'O' in (		0 0		()
comr Otherw Vater : a) If m empe nergy o) If m lot wa comr colume empe nergy	munity havise if no storage nanufacter storage nanufacter storage munity have factor erature for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor factor for the factor fac	o stored loss: urer's de actor fro meating seating seating seator from Talactor from water	eclared less torage eclared of factor free sections ble 2a m Table	er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	cludes i or is kno ear oss facte e 2 (kWl	nstantan wn (kWh or is not	neous co n/day): known: ny)	(47) ombi boil	=			0 0		()
comr Otherw Vater : a) If m empe nergy b) If m dot wa comr olume empe nergy	munity havise if no storage nanufacter storage nanufacter storage munity have factor erature for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor for the factor factor for the factor fac	o stored loss: urer's de actor fro urer's de age loss leating s from Talactor fro	eclared less torage eclared of factor free sections ble 2a m Table	er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	cludes i or is kno ear oss facte e 2 (kWl	nstantan wn (kWh or is not	neous co n/day): known: ny)	(47) ombi boil (48) x (49)	=			0 0		() () () () () ()
commotherwork (a) If mergy (b) If mergy (c)	munity havise if no storage nanufacterature from the front of the fron	o stored loss: urer's de actor fro meating seating seating seator from Talactor from water	eclared less and the storage eclared of factor free sections ble 2a m Table storage (55)	er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3 2b , kWh/ye	cludes i or is kno ear oss facte e 2 (kWl	nstantan wn (kWh or is not	neous co n/day): known: ny)	(47) ombi boil (48) x (49)	= x (52) x (52)	53) =		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		((

•	ains dedicate	u solai sio	rage, (57)	111(00)111	x [(50) – (	1111)] - (5	0), 0.00 (0	<i>i</i> )iii = (30)	m where (	1111) 15 110	m Append	IX IT	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circ	uit loss (ar	nual) fro	m Table	3		-	-	-	-		0		(58)
Primary circ	uit loss cal	culated t	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m				•	
(modified	by factor f	rom Tabl	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss	calculated	for each	month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 50.9	6 46.03	50.85	47.28	46.86	43.42	44.87	46.86	47.28	50.85	49.32	50.96		(61)
Total heat re	equired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 210.5	55 185.6	194.88	172.85	167.35	147.39	141.21	157.42	159.16	181.23	191.64	205.51		(62)
Solar DHW inp	ut calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \	VWHRS	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= 210.5	55 185.6	194.88	172.85	167.35	147.39	141.21	157.42	159.16	181.23	191.64	205.51		_
							Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2114.8	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	1] + 0.8 >	( [(46)m	+ (57)m	+ (59)m	1	
(65)m= 65.8	57.92	60.6	53.57	51.78	45.43	43.25	48.48	49.02	56.06	59.65	64.13		(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
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= 133.9	96 133.96	133.96	133.96	133.96	133.96	133.96	133.96	133.96	133.96	133.96	133.96		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	equati	an I O a								(00)
(67)m= 21.9	9 19.53		•	L, Cquai	ion L9 oi	r L9a), a	lso see	Table 5			•		(00)
		15.88	12.02	8.99	7.59	r L9a), a 8.2	10.66	Table 5	18.16	21.2	22.6		(67)
Appliances	gains (calc		12.02	8.99	7.59	8.2	10.66	14.3	ļ	21.2	22.6		` '
Appliances (68)m= 246.6	<del>-                                    </del>		12.02	8.99	7.59	8.2	10.66	14.3	ļ	21.2	22.6		` '
	3 249.19	culated in	12.02 Append 229.01	8.99 dix L, eq	7.59 uation L 195.39	8.2 13 or L1 184.51	10.66 3a), also 181.95	14.3 see Ta 188.4	ble 5 202.13				(67)
(68)m= 246.6	249.19 ns (calcula	culated in	12.02 Append 229.01	8.99 dix L, eq	7.59 uation L 195.39	8.2 13 or L1 184.51	10.66 3a), also 181.95	14.3 see Ta 188.4	ble 5 202.13				(67)
(68)m= 246.6 Cooking gai	249.19 ns (calcula 36.4	culated in 242.74 ated in Ap 36.4	12.02 Append 229.01 opendix 36.4	8.99 dix L, equat 211.68 L, equat	7.59 uation L 195.39 ion L15	8.2 13 or L1 184.51 or L15a)	10.66 3a), also 181.95 , also se	14.3 see Ta 188.4 ee Table	ble 5 202.13	219.46	235.75		(67) (68)
(68)m= 246.6 Cooking gai (69)m= 36.4	249.19 ns (calcula 36.4	culated in 242.74 ated in Ap 36.4	12.02 Append 229.01 opendix 36.4	8.99 dix L, equat 211.68 L, equat	7.59 uation L 195.39 ion L15	8.2 13 or L1 184.51 or L15a)	10.66 3a), also 181.95 , also se	14.3 see Ta 188.4 ee Table	ble 5 202.13	219.46	235.75		(67) (68)
(68)m= 246.6 Cooking gai (69)m= 36.4 Pumps and	ns (calcula 36.4 fans gains	eulated in 242.74 ated in Ap 36.4 (Table 5	12.02 Append 229.01 opendix 36.4 5a)	8.99 dix L, eq 211.68 L, equat 36.4	7.59 uation L 195.39 ion L15 36.4	8.2 13 or L1 184.51 or L15a) 36.4	10.66 3a), also 181.95 ), also se 36.4	14.3 see Ta 188.4 ee Table 36.4	ble 5 202.13 5 36.4	219.46	235.75		(67) (68) (69)
(68)m= 246.6 Cooking gai (69)m= 36.4 Pumps and (70)m= 3	ns (calcula 36.4 fans gains 3 evaporatio	culated in 242.74  ated in Ap  36.4  (Table 5	12.02 Append 229.01 Dependix 36.4 Sa) 3 tive valu	8.99 dix L, eq 211.68 L, equat 36.4	7.59 uation L 195.39 ion L15 36.4	8.2 13 or L1 184.51 or L15a) 36.4	10.66 3a), also 181.95 ), also se 36.4	14.3 see Ta 188.4 ee Table 36.4	ble 5 202.13 5 36.4	219.46	235.75		(67) (68) (69)
(68)m= 246.6 Cooking gai (69)m= 36.4 Pumps and (70)m= 3 Losses e.g.	249.19 ns (calculated	ated in Ap 36.4 (Table 5 3 on (negat	12.02 Append 229.01 Dependix 36.4 Sa) 3 tive valu	8.99 dix L, equal 211.68 L, equal 36.4 3 es) (Tab	7.59 uation L 195.39 ion L15 36.4  3 le 5)	8.2 13 or L1 184.51 or L15a) 36.4	10.66 3a), also 181.95 ), also se 36.4	14.3 see Ta 188.4 ee Table 36.4	ble 5 202.13 5 36.4	219.46 36.4	235.75 36.4		(67) (68) (69) (70)
(68)m= 246.6 Cooking gai (69)m= 36.4 Pumps and (70)m= 3 Losses e.g. (71)m= -107.4	ns (calcula 36.4 fans gains 3 evaporatio 17 -107.17	ated in Ap 36.4 (Table 5 3 on (negat	12.02 Append 229.01 Dependix 36.4 Sa) 3 tive valu	8.99 dix L, equal 211.68 L, equal 36.4 3 es) (Tab	7.59 uation L 195.39 ion L15 36.4  3 le 5)	8.2 13 or L1 184.51 or L15a) 36.4	10.66 3a), also 181.95 ), also se 36.4	14.3 see Ta 188.4 ee Table 36.4	ble 5 202.13 5 36.4	219.46 36.4	235.75 36.4		(67) (68) (69) (70)
Cooking gai (69)m= 36.4  Pumps and (70)m= 3  Losses e.g. (71)m= -107.	249.19 ns (calculated as 36.4) fans gains 3 evaporation 17 -107.17 ng gains (74) 86.18	242.74  ated in Ap 36.4  (Table 5 3 on (negate 1-107.17)  Table 5)  81.46	12.02 Append 229.01 ppendix 36.4 5a) 3 tive valu -107.17	8.99 dix L, equat 211.68 L, equat 36.4 3 es) (Tab -107.17	7.59  uation L  195.39  ion L15  36.4  3  le 5)  -107.17	8.2 13 or L1 184.51 or L15a) 36.4 3	10.66 3a), also 181.95 ), also se 36.4  3	14.3 2 see Ta 188.4 3 see Table 36.4 3 -107.17	ble 5 202.13 5 36.4 3 -107.17	36.4 3 -107.17	36.4 3 -107.17		(67) (68) (69) (70) (71)
(68)m= 246.6 Cooking gai (69)m= 36.4 Pumps and (70)m= 3 Losses e.g. (71)m= -107.7 Water heatin (72)m= 88.4	249.19  ns (calculated as a several content of the	242.74  ated in Ap 36.4  (Table 5 3 on (negate 1-107.17)  Table 5)  81.46	12.02 Append 229.01 ppendix 36.4 5a) 3 tive valu -107.17	8.99 dix L, equat 211.68 L, equat 36.4 3 es) (Tab -107.17	7.59  uation L  195.39  ion L15  36.4  3  le 5)  -107.17	8.2 13 or L1 184.51 or L15a) 36.4 3	10.66 3a), also 181.95 ), also se 36.4  3  -107.17	14.3 2 see Ta 188.4 3 see Table 36.4 3 -107.17	ble 5 202.13 5 36.4 3 -107.17	36.4 3 -107.17	36.4 3 -107.17		(67) (68) (69) (70) (71)
(68)m= 246.6 Cooking gai (69)m= 36.4 Pumps and (70)m= 3 Losses e.g. (71)m= -107.7 Water heatin (72)m= 88.4 Total intern	249.19  ns (calculated of the second of the	242.74 ated in Aparted	12.02 12.02	8.99 dix L, equat 211.68 L, equat 36.4  3 es) (Tab -107.17	7.59 uation L 195.39 ion L15 36.4  3 le 5) -107.17  63.09 (66)	8.2 13 or L1 184.51 or L15a) 36.4 3 -107.17 58.13 m + (67)m	10.66 3a), also 181.95 ), also se 36.4  3  -107.17  65.16 1 + (68)m +	14.3 2 see Ta 188.4 3 ee Table 36.4 3 -107.17 68.08 + (69)m + (	ble 5 202.13 5 36.4 3 -107.17 75.36 (70)m + (7	219.46 36.4 3 -107.17 82.85 1)m + (72)	235.75  36.4  3  -107.17  86.19		(67) (68) (69) (70) (71) (72)
(68)m= 246.6 Cooking gai (69)m= 36.4 Pumps and (70)m= 3 Losses e.g. (71)m= -107. Water heatin (72)m= 88.4 Total intern (73)m= 423.2	17 -107.17 ng gains (74 86.18 al gains = 25 421.09 ins:	ated in Apart at	12.02 Appendix 229.01 ppendix 36.4 5a) 3 tive valu -107.17 74.41	8.99 dix L, equat 211.68 L, equat 36.4  3 es) (Tab -107.17  69.59	7.59 uation L 195.39 ion L15 36.4  3 le 5) -107.17  63.09 (66) 332.26	8.2 13 or L1 184.51 or L15a) 36.4  3  -107.17  58.13 m + (67)m 317.03	10.66 3a), also 181.95 ), also se 36.4  3  -107.17  65.16 1+(68)m+ 323.95	14.3 2 see Ta 188.4 3ee Table 36.4 3 -107.17 68.08 - (69)m + (336.97	ble 5 202.13 5 36.4 3 -107.17 75.36 (70)m + (7 361.84	36.4 36.4 3 -107.17 82.85 1)m + (72) 389.69	235.75  36.4  3  -107.17  86.19  m  410.73		(67) (68) (69) (70) (71) (72)

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

North	٥.٠.٠		1		l		1 1		١		1		7(74)
	0.9x	0.77	X	4	X	10.63	X	0.63	X	0.7	] = 1	13	(74)
North	0.9x	0.77	X	1.93	X	10.63	X	0.63	X	0.7	] = 1	12.54	(74)
North	0.9x	0.77	] X ]	3.84	X	10.63	X	0.63	X	0.7	] = 1	12.48	(74)
North	0.9x	0.77	X	4	X I	20.32	X	0.63	X	0.7	] = 1	24.84	(74)
North	0.9x	0.77	X	1.93	X	20.32	X	0.63	X	0.7	] = 1	23.97	(74)
North	0.9x	0.77	X	3.84	X	20.32	X	0.63	X	0.7	] = 1	23.85	(74)
North	0.9x	0.77	X	4	X	34.53	X	0.63	X	0.7	] = 1	42.21	(74)
North	0.9x	0.77	X	1.93	X	34.53	X	0.63	X	0.7	] =	40.73	(74)
North	0.9x	0.77	X	3.84	X	34.53	X	0.63	X	0.7	] =	40.52	(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	1.93	X	55.46	X	0.63	X	0.7	=	65.43	(74)
North	0.9x	0.77	X	3.84	X	55.46	X	0.63	X	0.7	=	65.09	<b>1</b> (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	1.93	X	74.72	X	0.63	X	0.7	=	88.14	<b>(74)</b>
North	0.9x	0.77	X	3.84	X	74.72	X	0.63	X	0.7	] =	87.68	(74)
North	0.9x	0.77	X	4	X	79.99	X	0.63	X	0.7	=	97.78	(74)
North	0.9x	0.77	X	1.93	X	79.99	X	0.63	X	0.7	=	94.36	(74)
North	0.9x	0.77	X	3.84	X	79.99	X	0.63	X	0.7	=	93.87	(74)
North	0.9x	0.77	X	4	X	74.68	X	0.63	X	0.7	=	91.29	(74)
North	0.9x	0.77	X	1.93	X	74.68	X	0.63	X	0.7	=	88.09	(74)
North	0.9x	0.77	X	3.84	X	74.68	X	0.63	X	0.7	=	87.64	(74)
North	0.9x	0.77	X	4	X	59.25	X	0.63	X	0.7	=	72.43	(74)
North	0.9x	0.77	X	1.93	X	59.25	X	0.63	X	0.7	=	69.89	(74)
North	0.9x	0.77	X	3.84	X	59.25	X	0.63	X	0.7	=	69.53	(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	1.93	X	41.52	X	0.63	X	0.7	=	48.98	(74)
North	0.9x	0.77	X	3.84	X	41.52	X	0.63	X	0.7	=	48.72	(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	X	1.93	X	24.19	X	0.63	X	0.7	=	28.54	(74)
North	0.9x	0.77	X	3.84	X	24.19	X	0.63	X	0.7	=	28.39	(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	1.93	X	13.12	X	0.63	X	0.7	=	15.47	(74)
North	0.9x	0.77	X	3.84	X	13.12	X	0.63	X	0.7	=	15.39	(74)
North	0.9x	0.77	X	4	X	8.86	X	0.63	x	0.7	=	10.84	(74)
North	0.9x	0.77	X	1.93	x	8.86	x	0.63	x	0.7	=	10.46	(74)
North	0.9x	0.77	X	3.84	x	8.86	X	0.63	X	0.7	=	10.4	(74)
East	0.9x	1	X	3.84	x	19.64	x	0.63	x	0.7	=	23.05	(76)
East	0.9x	1	X	1.93	x	19.64	x	0.63	x	0.7	=	11.58	(76)
East	0.9x	1	X	3.84	x	38.42	x	0.63	x	0.7	=	45.09	(76)
East	0.9x	1	x	1.93	x	38.42	x	0.63	x	0.7	=	22.66	(76)
East	0.9x	1	x	3.84	x	63.27	x	0.63	x	0.7	=	74.25	(76)

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East	0.9x	1	X	1.93	X	63.27	X	0.63	X	0.7	=	37.32	(76)
East	0.9x	1	X	3.84	X	92.28	X	0.63	X	0.7	=	108.3	(76)
East	0.9x	1	X	1.93	X	92.28	X	0.63	X	0.7	=	54.43	(76)
East	0.9x	1	X	3.84	X	113.09	х	0.63	X	0.7	=	132.72	(76)
East	0.9x	1	X	1.93	X	113.09	x	0.63	x	0.7	=	66.71	(76)
East	0.9x	1	X	3.84	X	115.77	X	0.63	X	0.7	=	135.86	(76)
East	0.9x	1	X	1.93	X	115.77	X	0.63	X	0.7	=	68.29	(76)
East	0.9x	1	X	3.84	X	110.22	x	0.63	x	0.7	=	129.35	(76)
East	0.9x	1	X	1.93	X	110.22	X	0.63	X	0.7	=	65.01	(76)
East	0.9x	1	X	3.84	X	94.68	x	0.63	X	0.7	=	111.11	(76)
East	0.9x	1	X	1.93	X	94.68	x	0.63	x	0.7	=	55.84	(76)
East	0.9x	1	X	3.84	X	73.59	x	0.63	x	0.7	=	86.36	(76)
East	0.9x	1	X	1.93	x	73.59	x	0.63	x	0.7	=	43.41	(76)
East	0.9x	1	X	3.84	x	45.59	x	0.63	x	0.7	=	53.5	(76)
East	0.9x	1	X	1.93	x	45.59	x	0.63	x	0.7	=	26.89	(76)
East	0.9x	1	X	3.84	x	24.49	х	0.63	х	0.7	=	28.74	(76)
East	0.9x	1	X	1.93	x	24.49	x	0.63	x	0.7	=	14.44	(76)
East	0.9x	1	X	3.84	X	16.15	x	0.63	x	0.7	=	18.95	(76)
East	0.9x	1	X	1.93	X	16.15	x	0.63	x	0.7	=	9.53	(76)
West	0.9x	0.77	X	4.14	X	19.64	x	0.63	x	0.7	=	24.85	(80)
West	0.9x	0.77	X	1.95	X	19.64	x	0.63	x	0.7	=	11.7	(80)
West	0.9x	0.77	X	4.14	x	38.42	х	0.63	х	0.7	=	48.61	(80)
West	0.9x	0.77	X	1.95	X	38.42	X	0.63	х	0.7	=	22.9	(80)
West	0.9x	0.77	X	4.14	x	63.27	x	0.63	х	0.7	=	80.06	(80)
West	0.9x	0.77	X	1.95	x	63.27	x	0.63	x	0.7	=	37.71	(80)
West	0.9x	0.77	X	4.14	x	92.28	x	0.63	X	0.7	=	116.76	(80)
West	0.9x	0.77	X	1.95	X	92.28	x	0.63	X	0.7	=	54.99	(80)
West	0.9x	0.77	X	4.14	X	113.09	x	0.63	x	0.7	=	143.09	(80)
West	0.9x	0.77	X	1.95	X	113.09	x	0.63	x	0.7	=	67.4	(80)
West	0.9x	0.77	X	4.14	X	115.77	x	0.63	x	0.7	=	146.48	(80)
West	0.9x	0.77	X	1.95	x	115.77	x	0.63	x	0.7	=	68.99	(80)
West	0.9x	0.77	X	4.14	x	110.22	x	0.63	x	0.7	=	139.45	(80)
West	0.9x	0.77	X	1.95	x	110.22	x	0.63	x	0.7	=	65.68	(80)
West	0.9x	0.77	x	4.14	x	94.68	x	0.63	х	0.7	=	119.79	(80)
West	0.9x	0.77	X	1.95	x	94.68	X	0.63	х	0.7	=	56.42	(80)
West	0.9x	0.77	x	4.14	x	73.59	x	0.63	x	0.7	] =	93.11	(80)
West	0.9x	0.77	x	1.95	x	73.59	x	0.63	х	0.7	] =	43.86	(80)
West	0.9x	0.77	x	4.14	x	45.59	x	0.63	х	0.7	] =	57.68	(80)
West	0.9x	0.77	x	1.95	x	45.59	x	0.63	x	0.7	] =	27.17	(80)
West	0.9x	0.77	x	4.14	x	24.49	x	0.63	х	0.7	j =	30.98	(80)
West	0.9x	0.77	x	1.95	x	24.49	x	0.63	х	0.7	j =	14.59	(80)
			-		-		-		-		-		_

	_					_									
West	0.9x	0.77	x	4.1	4	X	16	5.15	X	0.63	X	0.7	=	20.44	(80)
West	0.9x	0.77	x	1.9	95	x	16	5.15	X	0.63	x	0.7	=	9.63	(80)
Solar	gains in	watts, ca	alculated	for eac	h month				(83)m = S	Sum(74)m .	(82)m			-	
(83)m=	109.21	211.92	352.81	532.8	677.07	705	5.62	666.51	555	415.18	251.73	135.67	90.24		(83)
Total g	gains – ir	nternal a	and solar	(84)m =	= (73)m	+ (83	3)m ,	watts						_	
(84)m=	532.46	633.01	759.07	914.43	1033.52	103	7.88	983.54	878.96	752.15	613.57	525.36	500.97		(84)
7. Me	an inter	nal temp	perature	(heating	season	)									
Temp	erature	during h	neating p	eriods ir	n the livi	ng ai	rea fr	om Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(see	e Tab	ole 9a)							_
	Jan	Feb	Mar	Apr	May	Jı	un	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.98	0.92	0.76	0.5	55	0.41	0.47	0.77	0.97	1	1		(86)
Moon	interna	l tompor	ature in	living ar	oa T1 /f/	الصلا	, cton	s 3 to 7	in Tahl	0 90)	!			Į.	
(87)m=	19.93	20.1	20.37	20.72	20.93	20.	- i	21	21	20.94	20.63	20.21	19.91		(87)
					<u> </u>	<u> </u>				ļ	20.00	20.21	13.31		(0.)
-			neating p		i	1				1 ` ´				I	
(88)m=	20.08	20.09	20.09	20.1	20.1	20.	.11	20.11	20.11	20.11	20.1	20.1	20.09		(88)
Utilisa	ation fac	tor for g	ains for ı	est of d	welling,	h2,m	n (see	e Table	9a)						
(89)m=	1	0.99	0.98	0.9	0.71	0.4	48	0.33	0.38	0.69	0.96	1	1		(89)
Mean	interna	l tampar	ature in	tha rast	of dwelli	ina T	2 (fol	llow sta	ne 3 to	7 in Tahl	L			J	
(90)m=	18.65	18.89	19.29	19.78	20.04	20	·	20.11	20.11	20.07	19.67	19.07	18.62		(90)
(30)111=	10.00	10.00	15.25	13.70	20.04		, <u> </u>	20.11	20.11	<u> </u>		g area ÷ (4		0.24	<b>一</b> ` ′
										•	.E. ( = E. ( )	ig area . (-	., –	0.34	(91)
Mean	interna	temper	ature (fo	r the wh	ole dwe	lling)	) = fL	A × T1	+ (1 – fl	_A) × T2				•	
(92)m=	19.08	19.3	19.66	20.09	20.34	20	).4	20.41	20.41	20.36	19.99	19.46	19.05		(92)
Apply	/ adjustn	nent to t	he mean	interna	l temper	ature	e fron	n Table	4e, who	ere appro	opriate			•	
(93)m=	19.08	19.3	19.66	20.09	20.34	20	).4	20.41	20.41	20.36	19.99	19.46	19.05		(93)
8. Sp	ace hea	ting requ	uirement												
			ternal ter			ned a	at step	p 11 of	Table 9	b, so tha	ıt Ti,m=(	76)m an	d re-calc	ulate	
the ut			or gains											I	
	Jan	Feb	Mar	Apr	May	Jı	un	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm		1									1	
(94)m=	1	0.99	0.97	0.9	0.72	0.	.5	0.35	0.41	0.72	0.96	0.99	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (8	4)m					,				1	
(95)m=	530.99	628.33	739.46	821.43	746.66	523	3.74	346.75	363.47	539.42	586	522.01	499.97		(95)
Mont	hly avera	age exte	rnal tem	perature	from T	able	8							1	
(96)m=	4.3	4.9	6.5	8.9	11.7	14	1.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm ,	W =[	[(39)m	x [(93)m	– (96)m	]			•	
(97)m=	1390.98	1350.94	1231.24	1034.48	796.21	529	9.06	347.3	364.78	573.33	865.65	1144.65	1382.85		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k	Wh/n	nonth	า = 0.02	4 x [(97	")m – (95	)m] x (4	1)m		' -	
(98)m=	639.83	485.59	365.88	153.39	36.87	(	)	0	0	0	208.06	448.3	656.86		
									Tota	al per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	2994.77	(98)
Snac	e heatin	a requir	ement in	kW/h/m²	2/vear									31.78	(99)
•		• •												31.70	(```
			nts – Indi	vidual h	eating s	yster	ms in	cluding	micro-(	CHP)					
-	e heatir	_	ot from a	2005da	w/o!-	mer	ton.	ov roto							7/2041
rract	ion of sp	ace nea	at from se	econdar	y/supple	men	пагу 9	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) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.4	(206)
Efficiency of secondary/supplementary heating s	system	, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)  639.83   485.59   365.88   153.39   36.87	<u>, I</u>	0	0	0	200.06	440.0	656.06	1	
	0	0	0	0	208.06	448.3	656.86		(211)
$ (211) m = \{ [(98)m \times (204)] \} \times 100 \div (206) $	0	0	0	0	222.76	479.98	703.27		(211)
					ar) =Sum(2			3206.4	(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		<b>-</b>
			Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)
Water heating Output from water heater (calculated above)									
·	147.39	141.21	157.42	159.16	181.23	191.64	205.51		
Efficiency of water heater								80.3	(216)
(217)m= 87.67 87.36 86.61 84.75 81.95	80.3	80.3	80.3	80.3	85.4	87.12	87.77		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	183.55	175.86	196.04	198.2	212.22	219.97	234.15		
			Tota	I = Sum(2	19a) <sub>112</sub> =			2505.76	(219)
Annual totals					k\	Wh/year	•	kWh/yea	<u></u>
Space heating fuel used, main system 1									
								3206.4	╛
Water heating fuel used								3206.4 2505.76	
Water heating fuel used Electricity for pumps, fans and electric keep-hot									
•							30		(230c)
Electricity for pumps, fans and electric keep-hot							30 45		(230c) (230e)
Electricity for pumps, fans and electric keep-hot central heating pump:			sum	of (230a).	(230g) =				
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue			sum	of (230a).	(230g) =			2505.76	(230e)
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year	ns inclu	ding mi			(230g) =			2505.76 75	(230e) (231)
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting							45	2505.76 75 388.3	(230e) (231) (232)
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	Ene	ding mid ergy h/year				ion fac	45	2505.76 75	(230e) (231) (232)
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	Ene	e <b>rgy</b> h/year			Emiss	ion fac 2/kWh	45	2505.76  75  388.3  Emissions kg CO2/ye	(230e) (231) (232)
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)	<b>Ene</b> kW	e <b>rgy</b> h/year ) ×			Emiss kg CO2	ion fac 2/kWh	45	2505.76  75  388.3  Emissions kg CO2/ye  692.58	(230e) (231) (232) (232) (261)
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)	Ene kW (211) (215)	ergy h/year ) x			Emiss kg CO2 0.2 0.5	ion fac 2/kWh 16	45 tor =	2505.76  75  388.3  Emissions kg CO2/ye  692.58	(230e) (231) (232)  s ar (261) (263)
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	Ene kW (211) (215) (219)	ergy h/year ) × ) ×	cro-CHP		Emiss kg CO2	ion fac 2/kWh 16	45 tor = =	2505.76  75  388.3  Emissions kg CO2/ye  692.58  0  541.24	(230e) (231) (232)  s ar (261) (263) (264)
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Ene kW (211) (215) (219) (261)	ergy h/year ) x ) x ) x			Emiss kg CO2 0.2 0.5 0.2	ion fac 2/kWh 16 19 16	45 tor = = =	2505.76  75  388.3  Emissions kg CO2/ye  692.58  0  541.24  1233.82	(230e) (231) (232)  s ar (261) (263) (264) (265)
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	Ene kW (211) (215) (219)	ergy h/year ) x ) x ) x ) + (262) -	cro-CHP		Emiss kg CO2 0.2 0.5	ion fac 2/kWh 16 19	45 tor = =	2505.76  75  388.3  Emissions kg CO2/ye  692.58  0  541.24	(230e) (231) (232)  s ar (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1474.28 (272)

TER = 15.65 (273)

			lloor D	) otoilo						
Assessor Name:	Joseph Treanor		User D	Strom	a Num	bor		STDC	0032062	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.14	
		Р	roperty	Address						
Address :	, Gondar Gardens,									
1. Overall dwelling dim	nensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	³)
Ground floor			7	74.01	(1a) x	2	2.55	(2a) =	188.73	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) 7	74.01	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	188.73	(5)
2. Ventilation rate:										_
		econdar heating	'у — —	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 f	ans				Ī	3	X	10 =	30	(7a)
Number of passive vent	ts				Ē	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	X -	40 =	0	(7c)
· ·					L					` ′
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (	6a)+(6b)+(7	'a)+(7b)+(	(7c) =	Γ	30		÷ (5) =	0.16	(8)
	been carried out or is intend	led, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	O OF for atoal or timbor	· • • • • • • • • • • • • • • • • • • •	0.05 60				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corre				•	uction			0	(11)
	nings); if equal user 0.35	oponanig to	rino groat	or wan are	a (ano					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
•	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	stripped		0.05 (0.0	(4.4) 4	001			0	(14)
Window infiltration				0.25 - [0.2] (8) + (10)			. (15) -		0	(15)
Infiltration rate	e, q50, expressed in cu	hia matra	o por bo	. , , ,	, , ,	, , ,	, ,	oroo	0	(16)
If based on air permeat	• • • •		•	•	•	elle oi e	rivelope	alea	0.41	(17)
·	lies if a pressurisation test ha					is being u	sed		0.41	(10)
Number of sides shelter	red								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.35	(21)
Infiltration rate modified	for monthly wind spee	d	•				•		-	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind s	speed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (	22\m ∸ 4									
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
( == ,		1 5.55							J	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.44	0.43	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41	]	
Calculate effec		•	rate for t	he appli	cable ca	se	<u> </u>	!	<u>I</u>	<u> </u>	!	J	
If mechanica			l' N. (0	al.) (aa	<b>.</b> - (	/	15// (1	. (22)	\ (00 \			0	(23a)
If exhaust air h									) = (23a)			0	(23b)
If balanced with		-	-	_								0	(23c)
a) If balance		·			1	<del>-                                    </del>	<del>-                                    </del>	· · · ·	<del>-                                    </del>	<del></del>	<del> </del>	i ÷ 100] I	(246)
(24a)m= 0			0	0	0	0	0	0	0	0	0	J	(24a)
b) If balance	1	i			1	<del></del>	<del>- ^ ` ` - </del>	<del>i `</del>	<del> </del>	<u> </u>	Ι ,	1	(24h)
(24b)m= 0	0	0	0	0		0	0	0	0	0	0	J	(24b)
c) If whole h				•	•			outside o) m + 0.	5 v (23h	<b>,</b> )			
(24c)m = 0	0.5 7	0	0	0	0	0	0	0	0	0	0	1	(24c)
d) If natural		<u> </u>			<u> </u>							J	( -7
,				•	•			2b)m² x	0.5]				
(24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	]	(24d)
Effective air	change	rate - er	nter (24a	or (24k	o) or (24	c) or (24	d) in box	x (25)	!		•	•	
(25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	]	(25)
2 Hoot losso	e and he	ot loco r	ooromote	or:				•			•		
3. Heat losse <b>ELEMENT</b>	S and he	•	Openin		Net Ar	22	U-valı	IΙΔ	AXU		k-value	<u> </u>	ΑΧk
ELEWIENI	area	-	m		A,r		W/m2		(W/I	K)	kJ/m²-		kJ/K
Windows Type	e 1				10.11	x1.	/[1/( 1.4 )+	0.04] =	13.4				(27)
Windows Type	2				4.19	x1.	/[1/( 1.4 )+	0.04] =	5.55				(27)
Walls Type1	34.7	<b>'</b> 4	18.49	9	16.25	5 x	0.18		2.93			$\neg \vdash$	(29)
Walls Type2	45.6	3	0		45.63	3 x	0.18	<b>=</b> i	8.21	Ħ i		7 F	(29)
Total area of e	lements	, m²			80.37	<del>,</del>							(31)
Party wall					31.28	3 x	0		0	ΠГ			(32)
* for windows and	roof wind	ows, use e	effective wi	ndow U-va			formula 1			as given in	paragraph	 1 3.2	`` ′
** include the area	as on both	sides of in	nternal wal	ls and pan	titions								
Fabric heat los		•	U)				(26)(30)	) + (32) =				35.65	(33)
Heat capacity		,						((28)	(30) + (32	2) + (32a).	(32e) =	5120.	4 (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				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridge				usina Ac	pendix l	<						6.14	(36)
if details of therma	•	,		• .	•							0.14	(00)
Total fabric he								(33) +	(36) =			41.79	(37)
Ventilation 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= 37.26	37.02	36.79	35.69	35.49	34.54	34.54	34.36	34.9	35.49	35.9	36.33		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 79.05	78.81	78.58	77.49	77.28	76.33	76.33	76.15	76.7	77.28	77.7	78.13	]	
<u>-</u>								,	Average =	Sum(39) <sub>1</sub>	12 /12=	77.49	(39)

Heat lo	ss parar	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.07	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.06		
` ′ [	ļ.						<u> </u>		<u> </u>	L Average =	Sum(40) <sub>1</sub> .	12 /12=	1.05	(40)
Numbe	r of days	s in mor	nth (Tabl	e 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)
L														
4. Wat	ter heati	ng ener	gy requi	rement:								kWh/ye	ear:	
if TF	ed occu <sub> </sub> A > 13.9 A £ 13.9	, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		34		(42)
			ater usag									.76		(43)
			hot water i person per			_	_	o acnieve	a water us	se target o	T			
Г								Λιια	Con	Oct	Nov	Doo		
Hot wate.	Jan r usage in	Feb litres per	Mar day for ea	Apr	May Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
г								, ,	07.07		L 05.45	00.74		
(44)m=	98.74	95.15	91.56	87.97	84.38	80.79	80.79	84.38	87.97	91.56	95.15	98.74	1077.10	7(44)
Eneray c	ontent of I	hot water	used - cald	culated mo	onthly = 4.	190 x Vd.r	n x nm x D	)Tm / 3600			m(44) <sub>112</sub> = ables 1b. 1		1077.13	(44)
(45)m=	146.42	128.06	132.15	115.21	110.55	95.39	88.4	101.44	102.65	119.63	130.58	141.8		
(43)111=	140.42	120.00	132.13	113.21	110.55	95.59	00.4	101.44				l l	1412.29	(45)
If instanta	aneous wa	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar = Su	m(45) <sub>112</sub> =	= I	1412.29	(40)
(46)m=	21.96	19.21	19.82	17.28	16.58	14.31	13.26	15.22	15.4	17.94	19.59	21.27		(46)
` '	storage		19.02	17.20	10.30	14.51	13.20	13.22	15.4	17.54	19.59	21.21		(10)
	•		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comm	nunity he	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)			<u> </u>			
		-	hot wate		-			` '	ers) ente	er '0' in (	47)			
Water s	storage l	loss:												
a) If ma	anufactu	ırer's de	eclared lo	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	ctor fro	m Table	2b								0		(49)
Energy	lost from	n water	storage	, kWh/ye	ear			(48) x (49)	) =			0		(50)
•			eclared c	-										
		-	factor from		e 2 (kWl	h/litre/da	ıy)					0		(51)
	-	•	ee sectio	on 4.3										(==)
	factor f		oie ∠a m Table	2h							<b>—</b>	0		(52)
•								(47) (54)	) (EQ) (	50)		0		(53)
٠.			storage	, kVVh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
,	(50) or (	, ,	•					((50)	==\			0		(55)
vvater s	storage	loss cal	culated f	or eacn	montn		•	((56)m = (	55) × (41)	m <del></del>				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	r contains	dedicate	d solar stor	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=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Drimon												1		
rilliary	/ circuit	loss (an	inual) fro	m Table	3							0		(58)
-		•	inual) fro culated f			59)m = (	(58) ÷ 36	65 × (41)	m			0		(58)
Primary	/ circuit	loss cal	,	or each	month (	•	. ,	, ,		r thermo		0		(58)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
				<u> </u>		<del>- ` ` `</del>	<u> </u>	1	1	T		1	(04)
(61)m= 50.3		46.66	43.38	43	39.84	41.17	43	43.38	46.66	46.92	50.32		(61)
	<del>-i</del>		<del></del>				<del>`</del>		<del>`                                    </del>	(46)m +	<del>` ´                                     </del>	(59)m + (61)m	
(62)m= 196.7	74 171.86	178.81	158.59	153.55	135.23	129.56	144.4	3 146.03	166.28	177.5	192.12		(62)
Solar DHW inp									r contribut	tion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \		applies	s, see Ap	pendi	<del></del>				1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter				_							
(64)m= 196.7	74 171.86	178.81	158.59	153.55	135.23	129.56	144.4	3 146.03	166.28	177.5	192.12		,
							O	utput from w	ater heate	r (annual) <sub>1</sub>	12	1950.71	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61	)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	1	
(65)m= 61.2	7 53.53	55.6	49.15	47.51	41.68	39.68	44.48	3 44.98	51.44	55.15	59.73		(65)
include (5	7)m in cal	culation (	of (65)m	only if c	ylinder i	s in the	dwellir	ng 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													
Jai		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 116.9	7 116.97	116.97	116.97	116.97	116.97	116.97	116.9	7 116.97	116.97	116.97	116.97		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5		•	•	-	
(67)m= 18.4	1 16.35	13.3	10.07	7.52	6.35	6.86	8.92	11.98	15.21	17.75	18.92		(67)
Appliances	gains (calc	ulated in	. Append	dix L. ea	uation L	.13 or L1	3a). a	lso see Ta	ıble 5	1		ı	
(68)m= 206.4	<del>- ` `                                 </del>	203.21	191.72	177.21	163.57	154.46	152.3		169.21	183.72	197.36		(68)
Cooking gai	ns (calcula	ted in A	ppendix	L. eguat	ion L15	or L15a	), also	see Table	+ e 5		l .	l	
(69)m= 34.7	<del>_`</del>	34.7	34.7	34.7	34.7	34.7	34.7		34.7	34.7	34.7	]	(69)
Pumps and		(Table F	 5a)	<u> </u>		<u> </u>	<u> </u>		<u> </u>	<u> </u>			
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	]	(70)
Losses e.g.			<u> </u>	<u> </u>									( - /
(71)m= -93.5		-93.58	-93.58	-93.58	-93.58	-93.58	-93.5	8 -93.58	-93.58	-93.58	-93.58	1	(71)
	<u> </u>		-93.30	-93.30	-90.00	-93.30	-93.3	0 -93.30	-95.50	-93.30	-93.30		(, ,)
Water heating (72)m= 82.3	<del></del>	74.74	68.27	63.85	57.89	53.34	59.78	3 62.47	69.14	76.6	80.28	1	(72)
` '		<u> </u>	00.27	03.00		<u> </u>				<u> </u>	<u> </u>		(12)
Total intern	_ <del>_</del>		004.44	000 00				m + (69)m +	•	•	i	1	(72)
(73)m= 368.3		352.34	331.14	309.68	288.9	275.76	282.1	2 293.25	314.65	339.16	357.65		(73)
6. Solar ga		ucina colo	r flux from	Table 6a	and accor	riated equa	tions to	convert to the	no applicat	olo orientat	tion		
Orientation:		•	Area		Flu	•	ilions to		іс арріісаі	FF	iioii.	Gains	
Onemation.	Table 6d		m <sup>2</sup>			ble 6a		g_ Table 6b	Т	able 6c		(W)	
East 0.9	v 4		10	11	<b>,</b>	10.64	1 , г	0.62	<b>⊣</b> , г	0.7	<b>—</b> _	· , ,	(76)
East 0.9		×		==	-	19.64	]	0.63		0.7	╡ :	60.68	╡
		X				19.64	]	0.63	×	0.7	=	50.3	(76)
		X			-	38.42	]	0.63	X	0.7	=	118.71	<b></b> (76) <b></b> (70)
East 0.9		X	4.1		<b>-</b>	38.42	]	0.63	X	0.7	_ =	98.4	<b>(76)</b>
East 0.9	x 1	X	10.	11	х (	63.27	X	0.63	X	0.7	=	195.5	(76)

	_								_						
East	0.9x	2	X	4.	19	X	6	3.27	X	0.63	X	0.7	=	162.04	(76)
East	0.9x	1	Х	10.	11	X	9	2.28	X	0.63	X	0.7	=	285.12	(76)
East	0.9x	2	Х	4.	19	X	9	2.28	X	0.63	X	0.7	=	236.33	(76)
East	0.9x	1	X	10.	11	X	1	13.09	X	0.63	X	0.7	=	349.43	(76)
East	0.9x	2	Х	4.	19	X	1	13.09	x	0.63	X	0.7	=	289.63	(76)
East	0.9x	1	Х	10.	11	X	1	15.77	x	0.63	X	0.7	=	357.7	(76)
East	0.9x	2	X	4.	19	X	1	15.77	X	0.63	x	0.7	=	296.49	(76)
East	0.9x	1	X	10.	11	x	1	10.22	x	0.63	x	0.7	=	340.55	(76)
East	0.9x	2	X	4.	19	x	1	10.22	x	0.63	x	0.7	=	282.27	(76)
East	0.9x	1	X	10.	11	x	9	94.68	x	0.63	x	0.7		292.52	(76)
East	0.9x	2	X	4.	19	X	9	94.68	x	0.63	x	0.7	_ =	242.47	(76)
East	0.9x	1	х	10.	11	X	7	73.59	x	0.63	x	0.7	=	227.37	(76)
East	0.9x	2	X	4.	19	X	7	73.59	x	0.63	x	0.7	<del></del>	188.46	(76)
East	0.9x	1	X	10.	11	X	4	15.59	x	0.63	x	0.7	<u> </u>	140.86	(76)
East	0.9x	2	Х	4.	19	X	4	15.59	x	0.63	x	0.7	=	116.76	(76)
East	0.9x	1	X	10.	11	X	2	24.49	x	0.63	x	0.7	<u> </u>	75.67	(76)
East	0.9x	2	X	4.	19	X	2	24.49	x	0.63	x	0.7	<del></del> =	62.72	(76)
East	0.9x	1	X	10.	11	X	1	6.15	x	0.63	x	0.7	=	49.9	(76)
East	0.9x	2	X	4.	19	X	1	6.15	x	0.63	x	0.7	<u> </u>	41.36	(76)
	_														
Solar (	gains in	watts, ca	alculate	d for eac	h month	1		_	(83)m	n = Sum(74)m	n(82)n	1	_	_	
(83)m=	110.98	217.11	357.54	521.45	639.06	6	54.19	622.82	534	.99 415.84	257.6	138.38	91.27		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (	83)m	, watts						_	
(84)m=	479.3	582.82	709.88	852.6	948.74	9	943.1	898.58	817	.11 709.09	572.2	27 477.54	448.92		(84)
7. Me	an inter	nal temp	erature	(heating	seasoi	า)									
Temp	erature	during h	eating p	periods i	n the liv	ing	area	from Tal	ble 9	Th1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,n	n (s	ee Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug Sep	Oc	t Nov	Dec		
(86)m=	1	0.99	0.97	0.88	0.71		0.51	0.37	0.4	13 0.7	0.95	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (1	ollo	w ste	ps 3 to 7	7 in T	able 9c)					
(87)m=	19.92	20.11	20.42	20.76	20.94	2	20.99	21	2	1 20.96	20.6	6 20.22	19.88		(87)
Temp	erature	durina h	eating i	eriods i	n rest o	f dw	/ellina	from Ta	able 9	9, Th2 (°C)	,	•	•	_	
(88)m=	20.03	20.03	20.03	20.04	20.05	_	20.06	20.06	20.	<del>`                                    </del>	20.0	5 20.04	20.04		(88)
l Itilie:	etion fac	tor for g	aine for	rest of d	welling	h2	m (sc	L Tahla	(02)	<u> </u>	-!	<b>!</b>	<u>Į</u>		
(89)m=	1	0.99	0.96	0.85	0.65	1	0.44	0.29	0.3	34 0.62	0.93	0.99	1		(89)
				ļ.				ļ			<u> </u>				` ,
					1	Ť	•	i	r <del>i —</del>	to 7 in Tal		7 10.02	10.54	٦	(90)
(90)m=	18.58	18.87	19.31	19.78	19.99		20.05	20.06	20.	06 20.02		7 19.03 ving area ÷ (	18.54	0.4	(90)
												Ting area 7 (	.,, –	0.4	(81)
				1		$\overline{}$		i e	<del></del>	– fLA) × T			1	_	
(92)m=	19.11	19.36	19.75	20.17	20.37		20.43	20.43	20.		20.0		19.08		(92)
Apply	adjustn	nent to th	ne meai	n interna	I tempe	ratu	ıre fro	m Table	e 4e,	where app	ropriate	9			

(02)m	10.11	10.26	40.75	20.47	20.27	20.42	20.42	20.42	20.20	20.06	10.5	10.00		(93)
(93)m=	19.11	19.36	19.75	20.17	20.37	20.43	20.43	20.43	20.39	20.06	19.5	19.08		(93)
			uirement				44 -4	Table O	41	4 T: /	70)	-11-	late	
			or gains			ed at ste	ер ттог	rable 9i	o, so tha	t 11,m=(	rojm an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	:			,	,					•	
(94)m=	0.99	0.99	0.96	0.85	0.67	0.47	0.32	0.37	0.65	0.93	0.99	1		(94)
Usefu			W = (94)	<u> </u>			ı	,			1	1	1	
(95)m=	476.87	574.81	678.1	728.28	636.72	440.81	291.98	306.1	462.24	530.9	472.08	447.27		(95)
	nly aver	age exte	rnal tem	perature			•	,						
(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)
				<del></del>			<del>-``</del>	<del>- `                                   </del>	– (96)m					
			1041.11		670	444.63	292.39	306.98	482.78	731.33	963.71	1162.22		(97)
Space			ı		nonth, k\	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4 <sup>-</sup>	<del></del>		ı	
(98)m=	516.31	379.55	270.08	104.35	24.77	0	0	0	0	149.13	353.97	531.92		_
								Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	2330.07	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year								31.48	(99)
9a En	erav rea	uiremer	nts — Indi	ividual h	eating sy	vstems i	ncluding	micro-C	:HP)					_
	e heatir		ito iriai	vidual II	caming 5	y Storris r	ricidaling	inioio c	<i>/</i>					
•		•	at from s	econdar	v/supple	mentarv	svstem						0	(201)
	•		at from m			,	•	(202) = 1	- (201) =				1	] (202)
	•		ng from	-	. ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heat	-									93.4	(206)
	•	-	ry/supple	-		a svstem	າ. %						0	] (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	」` ´ ar
Space			ement (c	•			<u> </u>	/tug	СОР	001	1101	200	KVVIII y Oc	••
	516.31	379.55	270.08	104.35	24.77	0	0	0	0	149.13	353.97	531.92		
(211)m	n = {[(98	m x (20	(4)] } x 1	00 ÷ (20	16)		ļ.				<u>!</u>		l	(211)
(211)	552.79	406.37	289.16	111.73	26.52	0	0	0	0	159.66	378.98	569.51		(= )
									l (kWh/yea				2494.72	(211)
Space	o hootin	a fuel (e	ooondor	v) k)//b/	month					, (	715,1012		2404.72	](= )
•		• '	econdar 00 ÷ (20	• •	monun									
(215)m=		0	0 . (20	0	0	0	0	0	0	0	0	0		
( - /		_							l (kWh/yea	ar) =Sum(2	1 215), <sub>540 4</sub> ,	=	0	(215)
Motor	hootine									(	- /15,1012		0	_(=:0)
	heating		ter (calc	اد امطواریا	hove)									
Output	196.74	171.86	178.81	158.59	153.55	135.23	129.56	144.43	146.03	166.28	177.5	192.12		
Efficier	ncy of w	ater hea							l		l	l	80.3	(216)
(217)m=		86.99	86.09	84.03	81.57	80.3	80.3	80.3	80.3	84.78	86.76	87.48		」`´´´ (217)
. ,			kWh/mo					L	L	•	L	L		. ,
		•	) ÷ (217)											
	225.19	197.56	207.7	188.74	188.25	168.41	161.35	179.87	181.85	196.14	204.6	219.61		
								Tota	I = Sum(2	19a) <sub>112</sub> =			2319.28	(219)
Annua	al totals									k\	Wh/year	•	kWh/year	_
Space	heating	fuel use	ed, main	system	1								2494.72	
												!		_

Water heating fuel used			2319.28
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			325.07 (232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	538.86 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	500.96 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1039.82 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	168.71 (268)
Total CO2, kg/year	sum	of (265)(271) =	1247.46 (272)
TER =			16.86 (273)

		User Details:			
Assessor Name:	Joseph Treanor	Stroma Nur	nber: STRC	0032062	
Software Name:	Stroma FSAP 2012	Software Ve	ersion: Versi	on: 1.0.4.14	
	Pro	operty Address: P11			
Address :	, Gondar Gardens, London, N	IW6 1HG			
1. Overall dwelling dime	ensions:				
		Area(m²)	Av. Height(m)	Volume(m³)	
Ground floor		56.61 (1a) x	2.55 (2a) =	144.36	3a)
First floor		62.48 (1b) x	3 (2b) =	187.44	3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	119.09 (4)			
Dwelling volume		(3a)+(3	b)+ $(3c)+(3d)+(3e)+(3n) =$	331.8 (5	5)
2. Ventilation rate:			(1)	2	
	main secondary heating heating	other	total	m³ per hour	
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0 (6	6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0 (6	6b)
Number of intermittent fa	ins		4 x 10 =	40 (7	7a)
Number of passive vents	3		0 x 10 =	0 (7	<b>7</b> b)
Number of flueless gas fi	ires		0 x 40 =	0 (7	7c)
			Air c	nanges per hour	
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+(7a)$	)+(7b)+(7c) =			0)
	peen carried out or is intended, proceed		$\div$ (5) = $\frac{1}{1}$ from (9) to (16)	0.12	٥)
Number of storeys in the		, ,		0 (9	9)
Additional infiltration			$[(9)-1]\times 0.1 =$	0 (1	10)
Structural infiltration: 0	.25 for steel or timber frame or 0	0.35 for masonry cons	truction	0 (1	11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding to t nas): if equal user 0.35	he greater wall area (after		_	
	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0	)	0 (1	12)
If no draught lobby, en	ter 0.05, else enter 0			0 (1	13)
Percentage of windows	s and doors draught stripped			0 (1	14)
Window infiltration		0.25 - [0.2 x (14) ÷	100] =	0 (1	15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	0 (1	16)
Air permeability value,	q50, expressed in cubic metres	per hour per square r	metre of envelope area	5 (1	17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] + (8)$	, otherwise $(18) = (16)$		0.37	18)
Air permeability value applie	es if a pressurisation test has been done	or a degree air permeabilit	y is being used		
Number of sides sheltere	ed	(00) 4 [0.075]	(40)]	<del></del>	19)
Shelter factor		(20) = 1 - [0.075  x]			20)
Infiltration rate incorporate	•	(21) = (18) x (20) =	:	0.31 (2	21)
Infiltration rate modified f	<del></del>	<del></del>	<del>, , , , , , , , , , , , , , , , , , , </del>	7	
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov Dec	J	
Monthly average wind sp	peed from Table 7			_	

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

Wind Factor (	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Adjusted infilt	ration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.4	0.39	0.39	0.35	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37		
Calculate effe		•	rate for t	he appli	cable ca	ise		•	•	•	-		(23a
If exhaust air h			endix N. (2	(3b) = (23a	a) × Fmv (e	eguation (N	N5)) . othe	rwise (23b	) = (23a)			0	(23k
If balanced wit									, (,			0	(230
a) If balanc	ed mech	anical ve	entilation	with he	at recov	erv (MVI	HR) (24a	a)m = (2:	2b)m + (	23b) × [	1 – (23c		(200
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	<u></u>	(24a
b) If balanc	ed mech	anical ve	ntilation	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		(24b
c) If whole I	nouse ex	tract ven	tilation o	or positiv	e input	ventilatio	on from o	outside	-	-		_	
	m < 0.5 >	< (23b), t	hen (24)	c) = (23b	o); other	wise (24	c) = (22k	o) m + 0.	5 × (23b	) 	_	7	
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural	ventilation $m = 1$ , the				•				0.51				
(24d)m = 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.5 + [(2	0.55	0.56	0.56	0.57	1	(240
Effective air	ļ		<u> </u>	<u> </u>	<u> </u>	ļ		<u> </u>				J	
(25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	1	(25)
	1		l	l .									
2 Heat least	ond be	oot loog r	acromot	or:			ı			ı			
3. Heat losse					Net Ar	ea	U-valı	ue	AXU		k-value	e	ΑΧk
3. Heat losse ELEMENT	es and he Gros area	SS	oaramet Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-valu kJ/m²·		A X k kJ/K
	Gros area	SS	Openin	gs		m²		K.		K)			
ELEMENT	Gros area e 1	SS	Openin	gs	A ,r	m <sup>2</sup>	W/m2	(K 0.04] =	(W/	K)			kJ/K
<b>ELEMENT</b> Windows Typ	Gros area e 1 e 2	SS	Openin	gs	A ,r	m <sup>2</sup> x <sup>1</sup>	W/m2 /[1/( 1.4 )+	(0.04] = 0.04 = 0.04	(W/ 6.26	K)			kJ/K (27)
ELEMENT Windows Typ Windows Typ	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 4.72 2.29	m <sup>2</sup> x1 x1 x1	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+	$   \begin{array}{ccc}                                   $	6.26 3.04	K)			kJ/K (27) (27)
ELEMENT Windows Typ Windows Typ Windows Typ	Gros area e 1 e 2 e 3	ss (m²)	Openin	gs <sub>1</sub> <sup>2</sup>	A ,r 4.72 2.29 4.51	m <sup>2</sup> x1 x1 x1	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$   \begin{array}{ccc}                                   $	6.26 3.04 5.98	K)			kJ/K (27) (27)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ	Gros area e 1 e 2 e 3	ss (m²)	Openin m	gs <sub>1</sub> <sup>2</sup>	A ,r 4.72 2.29 4.51 2.26	m <sup>2</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x x x x x x x x x x x x x x x x x x x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] = 0.04] =	6.26 3.04 5.98	K)			kJ/K (27) (27) (27)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1	Gros area e 1 e 2 e 3 e 4	79 1	Openin m	gs <sub>1</sub> <sup>2</sup>	A ,r 4.72 2.29 4.51 2.26	m <sup>2</sup> x1. x1. x1. x1. x x x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/) 6.26 3.04 5.98 3	K)			kJ/K (27) (27) (27) (27) (27)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2	Gros area e 1 e 2 e 3 e 4 70.7	79 1 8	20.79	gs <sub>1</sub> <sup>2</sup>	A ,r 4.72 2.29 4.51 2.26 50 4.01	m <sup>2</sup> x1. x1. x1. x x x x x x x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	0.04] = 0.04]	(W/) 6.26 3.04 5.98 3 9	K)			kJ/K (27) (27) (27) (27) (29)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1	Gros area e 1 e 2 e 3 e 4  70.7  4.0  6.5	79 1 8	20.79 0	gs <sub>1</sub> <sup>2</sup>	A ,r 4.72 2.29 4.51 2.26 50 4.01 6.58	x1. x1. x1. x x x x x x x x x x x x x x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13	0.04] = 0.04]	(W/) 6.26 3.04 5.98 3 9 0.72	K)			kJ/K (27) (27) (27) (29) (29) (30)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2	Gros area e 1 e 2 e 3 e 4  70.7  4.0  6.5	79 1 8	20.79 0	gs <sub>1</sub> <sup>2</sup>	A ,r 4.72 2.29 4.51 2.26 50 4.01 6.58 62.48	x1. x1. x1. x x x x x x x x x x 66	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13	0.04] = 0.04]	(W/) 6.26 3.04 5.98 3 9 0.72	K)			kJ/K (27) (27) (27) (27) (29) (29) (30)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of e Party wall * for windows and	Gros area e 1 e 2 e 3 e 4  70.7  4.0  6.56  62.4 elements	79 1 8 48 5, m <sup>2</sup>	Openin m  20.79  0  0  0  effective wi	gs 9 	A ,r 4.72 2.29 4.51 2.26 50 4.01 6.58 62.48 143.8 109.7 alue calcul	x1. x1. x x x x x x x x x x x x x x x x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	0.04] =   0.04] =   0.04] =   0.04] =   =   =   =	(W/) 6.26 3.04 5.98 3 9 0.72 0.86 8.12		kJ/m²-	K	kJ/K (27) (27) (27) (27) (29) (30) (31)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of of Party wall * for windows and ** include the area	Gros area e 1 e 2 e 3 e 4  70.7  6.5  62.4 elements	79 1 18 18 19 19 19 19 19 19 19 19 19 19 19 19 19	20.79  0  0  offective wind sternal wall	gs 9 	A ,r 4.72 2.29 4.51 2.26 50 4.01 6.58 62.48 143.8 109.7 alue calcul	x1. x1. x1. x1. x2. x2. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	0.04] =   0.04] =   0.04] =   0.04] =   =   =   =   =	(W/) 6.26 3.04 5.98 3 9 0.72 0.86 8.12		kJ/m²-	K	kJ/K (27) (27) (27) (29) (30) (31) (32)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of a Party wall * for windows and ** include the are Fabric heat lo	Gros area e 1 e 2 e 3 e 4  70.7 4.0 6.56 62.4 elements d roof wind eas on both	79 1 8 48 5, m <sup>2</sup> dows, use e sides of int = S (A x	20.79  0  0  offective wind sternal wall	gs 9 	A ,r 4.72 2.29 4.51 2.26 50 4.01 6.58 62.48 143.8 109.7 alue calcul	x1. x1. x1. x1. x2. x2. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	0.04] =   0.04] =   0.04] =   0.04] =   =   =   =   /[(1/U-value) + (32) =	(W// 6.26 3.04 5.98 3 9 0.72 0.86 8.12	as given in	kJ/m²-	h 3.2	kJ/K (27) (27) (27) (29) (30) (31) (32)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of of Party wall * for windows and ** include the are Fabric heat lo Heat capacity	Gros area e 1 e 2 e 3 e 4  70.7  4.0  6.5  62.4 elements d roof wind as on both ss, W/K: Cm = S(	79 1 8 48 48 5, m <sup>2</sup> Fows, use e sides of in = S (A x (A x k)	20.79 0 0 0 stiffective winternal wall	gs p2 g g g g g g g g g g g g g g g g g g	A ,r 4.72 2.29 4.51 2.26 50 4.01 6.58 62.48 143.8 109.7 alue calculatitions	x1. x1. x1. x1. x2. x2. x2. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	0.04] =   0.04] =   0.04] =   0.04] =   =   =   =   //(1/U-value) + (32) = ((28).	(W// 6.26 3.04 5.98 3 9 0.72 0.86 8.12 0 (e)+0.04] a	as given in (32a)	kJ/m²-	h 3.2  46.2  8802	kJ/K (27) (27) (27) (29) (30) (31) (32)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of of Party wall * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass	Gros area e 1 e 2 e 3 e 4  70.7  4.0  6.5: 62.4 elements d roof winders on both ss, W/K: Cm = S(	79 1 8 48 5, m <sup>2</sup> ows, use e sides of in = S (A x (A x k)	Openin m  20.74  0  0  offective winternal wall U)  P = Cm -	gs 9 Indow U-va Is and pan	A ,r  4.72  2.29  4.51  2.26  50  4.01  6.58  62.48  143.8  109.7  alue calculatitions	x1. x1. x1. x1. x x x x x x x x x x x x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13 0.13 (26)(30)	0.04] =   0.04] =   0.04] =   0.04] =   =   =   =   =   /[(1/U-value) + (32) = ((28). Indical	(W// 6.26 3.04 5.98 3 9 0.72 0.86 8.12 0 (a)+0.04] a	as given in (2) + (32a): Medium	kJ/m²-	h 3.2	kJ/K (27) (27) (27) (29) (29) (30) (31) (32)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of operaty wall *for windows and **include the area Fabric heat lo Heat capacity	Gros area e 1 e 2 e 3 e 4  70.7  4.0  6.5  62.4 elements d roof windders on both as on both as yellow as paramee as ments who	79 1 8 18 18 18 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	20.79 20.79 0 0 0 offective with the sternal walk U)  P = Cm = tails of the	gs 9 Indow U-va Is and pan	A ,r  4.72  2.29  4.51  2.26  50  4.01  6.58  62.48  143.8  109.7  alue calculatitions	x1. x1. x1. x1. x x x x x x x x x x x x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13 0.13 (26)(30)	0.04] =   0.04] =   0.04] =   0.04] =   =   =   =   =   /[(1/U-value) + (32) = ((28). Indical	(W// 6.26 3.04 5.98 3 9 0.72 0.86 8.12 0 (a)+0.04] a	as given in (2) + (32a): Medium	kJ/m²-	h 3.2  46.2  8802	kJ/K (27) (27) (27) (29) (30) (31) (32)

if details of therm	0 0	are not kn	own (36) =	= 0.15 x (3	1)			(00)	(0.0)				<b>-</b>
Total fabric he			l a .a 41a 1a	_				` '	(36) =	(OE) (E)		65.75	(37)
Ventilation hea	1			<u> </u>		Ι	Α.	` ′	·	25)m x (5)		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(38)
(38)m= 63.58	63.23	62.9	61.32	61.02	59.65	59.65	59.39	60.18	61.02	61.62	62.24		(30)
Heat transfer	coefficier	nt, W/K			·	1	·		= (37) + (	38)m	1	1	
(39)m= 129.32	128.98	128.64	127.07	126.77	125.4	125.4	125.14	125.92	126.77	127.37	127.99		_
Heat loss para	motor /l	JI D) \\\	/m2l/						_	Sum(39) <sub>1</sub>	12 /12=	127.06	(39)
Heat loss para	1.08	<del></del>	1	1.06	1.05	1.05	1.05	` ′	= (39)m ÷	<u>`                                    </u>	1.07	1	
(40)m= 1.09	1.08	1.08	1.07	1.06	1.05	1.05	1.05	1.06	1.06	1.07	1.07	4.07	(40)
Number of day	ys in moi	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 / 1 Z=	1.07	(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. Water hea	ting ene	rgy requi	irement:								kWh/y	ear:	
												1	
Assumed occu if TFA > 13.			[1 - evn	( <u>-0 0003</u>	240 v (TE	-Δ -13 Ω	)2)1 ± 0 (	1013 v (	Γ <b>Γ</b> Δ <sub>-</sub> 13		.86		(42)
if TFA £ 13.		T 1.70 X	II - exp	(-0.000	743 X (11	A - 13.9	)Z)] + 0.0	) X C10X	11 / 13	.9)			
Annual averag	,	ater usaç	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		102	2.12	]	(43)
Reduce the annua	_		• •		-	-	to achieve	a water us	se target o	f		ı	
not more that 125	litres per j	person per	r day (all w	ater use, I	not and co	ia) •						,	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					,	
(44)m= 112.33	108.25	104.16	100.08	95.99	91.91	91.91	95.99	100.08	104.16	108.25	112.33		_
Energy content of	f hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1225.42	(44)
(45)m= 166.58	145.69	150.34	131.07	125.77	108.53	100.57	115.4	116.78	136.1	148.56	161.33	]	
` '	<u> </u>	l				<u> </u>		-	<u>I                                    </u>	<u>l</u> m(45) <sub>112</sub> =	 =	1606.72	(45)
If instantaneous v	vater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			( . • /2			` ′
(46)m= 24.99	21.85	22.55	19.66	18.87	16.28	15.09	17.31	17.52	20.41	22.28	24.2		(46)
Water storage			-			-		-	_				
Storage volum	ne (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			_			, ,						
Otherwise if n		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage a) If manufact		oclared l	occ fact	or ic kno	wp (k\\/k	2/d2v/):						1	(40)
,				JI IS KIIU	wii (Kvvi	i/uay).					0	] 1	(48)
Temperature f							(15)				0	] 1	(49)
Energy lost from b) If manufact		•	-		or ic not		(48) x (49)	) =			0		(50)
Hot water stor			-								0	1	(51)
If community h	-			(		··· <i>J</i> /					<u> </u>	J	(31)
Volume factor	_		-								0	]	(52)
Temperature f	actor fro	m Table	2b							-	0	1	(53)
Energy lost fro	m water	· storage	, kWh/ve	ear			(47) x (51)	x (52) x (	53) =		0	]	(54)
Enter (50) or		•						. , ,	•	<b>—</b>	0		(55)
	·												

Water	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er 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=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	rv circuit	loss (an	nual) fro	m Table	3							0		(58)
	•	•	•			59)m = (	(58) ÷ 36	65 × (41)	m				l	
(mo	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	i loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m		-			•	
(61)m=	50.96	46.03	50.96	49.32	48.92	45.32	46.83	48.92	49.32	50.96	49.32	50.96		(61)
Total h	neat requ	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	217.54	191.72	201.3	180.39	174.68	153.85	147.4	164.32	166.1	187.06	197.88	212.29		(62)
Solar DI	HW input of	calculated	using App	endix G oı	· Appendix	t H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	r heating)	l	
(add a	dditiona	I lines if	FGHRS	and/or \	vwhrs	applies	, see Ap	pendix (	3)			σ,		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter			•	•	•	•	•	•	•	'	
(64)m=	217.54	191.72	201.3	180.39	174.68	153.85	147.4	164.32	166.1	187.06	197.88	212.29		
						!	!	Outp	out from w	ater heate	r (annual)₁	12	2194.52	(64)
Heat g	ains fro	m water	heating,	kWh/me	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 :	x [(46)m	+ (57)m	+ (59)m	1	_
(65)m=	68.13	59.95	62.73	55.91	54.05	47.42	45.15	50.6	51.16	57.99	61.72	66.38		(65)
inclu	ude (57)	m in calc	culation o	of (65)m	only if c	vlinder i:	s in the ເ	dwellina	or hot w	ater is fr	om com	munity h	eating	
		ains (see			•	,						,		
	Ĭ	,			,·									
wetab	Jan	s (Table Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	142.99	142.99	142.99	142.99	142.99	142.99	142.99	142.99	142.99	142.99	142.99	142.99		(66)
` '						ion L9 o		<u> </u>	<u> </u>	1 12.00	1 12.00	1 12.00		(,
∟ıgı ı.ıı ı (67)m=	25.99	23.09	18.78	14.21	10.63	8.97	9.69	12.6	16.91	21.47	25.06	26.72		(67)
						<u> </u>	L	l	<u> </u>		23.00	20.72		(01)
		· ` `				uation L		· · · · · ·			050.70	074 40	1	(69)
(68)m=	284.02	286.97	279.54	263.73	243.77	225.02	212.48	209.54	216.96	232.77	252.73	271.49		(68)
		r <del>`</del>				tion L15						1	I	(00)
(69)m=	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3		(69)
•		ns gains	<u> </u>									1	ı	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio		tive valu	es) (Tab	le 5)							•	
(71)m=	-114.39	-114.39	-114.39	-114.39	-114.39	-114.39	-114.39	-114.39	-114.39	-114.39	-114.39	-114.39		(71)
Water	heating	gains (T	able 5)											
(72)m=	91.57	89.21	84.31	77.65	72.64	65.86	60.68	68.01	71.05	77.95	85.73	89.22		(72)
Totali	internal	gains =				(66)	)m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72)	 )m		
i Otai i	a.	940 -												
(73)m=		468.17	451.53	424.5	395.94	368.74	351.75	359.04	373.82	401.09	432.42	456.32		(73)

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

Orientation	n:	Access Factor Table 6d	·	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East (	).9x	1	X	4.51	x	19.64	x	0.63	x	0.7	=	27.07	(76)
East (	).9x	1	X	2.26	x	19.64	X	0.63	x	0.7	=	13.57	(76)
East (	).9x	1	X	4.51	x	38.42	X	0.63	x	0.7	=	52.96	(76)
East (	).9x	1	X	2.26	х	38.42	x	0.63	x	0.7	=	26.54	(76)
East (	).9x	1	X	4.51	x	63.27	X	0.63	x	0.7	=	87.21	(76)
East (	).9x	1	x	2.26	x	63.27	x	0.63	x	0.7	=	43.7	(76)
East (	).9x	1	X	4.51	x	92.28	x	0.63	x	0.7	=	127.19	(76)
East (	).9x	1	X	2.26	X	92.28	X	0.63	X	0.7	=	63.74	(76)
East (	).9x	1	X	4.51	x	113.09	x	0.63	x	0.7	=	155.88	(76)
East (	).9x	1	X	2.26	x	113.09	X	0.63	X	0.7	=	78.11	(76)
East (	).9x	1	X	4.51	X	115.77	X	0.63	X	0.7	=	159.57	(76)
East (	).9x	1	X	2.26	x	115.77	x	0.63	x	0.7	=	79.96	(76)
East (	).9x	1	X	4.51	X	110.22	X	0.63	X	0.7	=	151.92	(76)
East (	).9x	1	X	2.26	x	110.22	X	0.63	X	0.7	=	76.13	(76)
East (	).9x	1	X	4.51	x	94.68	X	0.63	X	0.7	=	130.49	(76)
East (	).9x	1	X	2.26	X	94.68	X	0.63	X	0.7	=	65.39	(76)
East (	).9x	1	X	4.51	x	73.59	X	0.63	X	0.7	=	101.43	(76)
East (	).9x	1	X	2.26	x	73.59	X	0.63	X	0.7	=	50.83	(76)
East (	).9x	1	X	4.51	X	45.59	X	0.63	X	0.7	=	62.84	(76)
East (	).9x	1	X	2.26	x	45.59	X	0.63	x	0.7	=	31.49	(76)
East (	).9x	1	X	4.51	x	24.49	X	0.63	X	0.7	=	33.75	(76)
East (	).9x	1	X	2.26	X	24.49	X	0.63	X	0.7	=	16.91	(76)
East (	).9x	1	X	4.51	X	16.15	x	0.63	x	0.7	=	22.26	(76)
East (	).9x	1	X	2.26	X	16.15	x	0.63	x	0.7	=	11.16	(76)
West (	).9x	0.77	X	4.72	x	19.64	x	0.63	x	0.7	=	56.66	(80)
West (	).9x	0.77	X	2.29	X	19.64	X	0.63	X	0.7	=	27.49	(80)
	).9x	0.77	X	4.72	X	38.42	X	0.63	X	0.7	=	110.84	(80)
West (	).9x	0.77	X	2.29	X	38.42	X	0.63	X	0.7	=	53.78	(80)
	).9x	0.77	X	4.72	X	63.27	X	0.63	X	0.7	=	182.54	(80)
	).9x	0.77	X	2.29	X	63.27	X	0.63	X	0.7	=	88.56	(80)
	).9x	0.77	X	4.72	X	92.28	X	0.63	X	0.7	=	266.23	(80)
	).9x	0.77	X	2.29	X	92.28	X	0.63	X	0.7	=	129.17	(80)
	).9x	0.77	X	4.72	X	113.09	X	0.63	X	0.7	=	326.27	(80)
West (	).9x	0.77	X	2.29	X	113.09	X	0.63	X	0.7	=	158.3	(80)
West (	).9x	0.77	X	4.72	X	115.77	X	0.63	X	0.7	=	334	(80)
	).9x	0.77	X	2.29	x	115.77	x	0.63	x	0.7	=	162.04	(80)
West (	).9x	0.77	X	4.72	x	110.22	x	0.63	x	0.7	=	317.98	(80)
	).9x	0.77	X	2.29	x	110.22	x	0.63	x	0.7	=	154.27	(80)
West (	).9x	0.77	X	4.72	x	94.68	х	0.63	x	0.7	=	273.14	(80)

	_					_											_
West	0.9x	0.77	X	2.2	29	X	94	1.68	X		0.63	x	0.7		=	132.52	(80)
West	0.9x	0.77	X	4.7	'2	x	73	3.59	x		0.63	x	0.7		=	212.3	(80)
West	0.9x	0.77	Х	2.2	29	x	73	3.59	X		0.63	x [	0.7		=	103	(80)
West	0.9x	0.77	X	4.7	'2	x	45	5.59	х		0.63	х	0.7		=	131.52	(80)
West	0.9x	0.77	X	2.2	29	x [	45	5.59	х		0.63	_ x [	0.7		=	63.81	(80)
West	0.9x	0.77	X	4.7	<b>'</b> 2	x [	24	1.49	х		0.63	_ x [	0.7		=	70.65	(80)
West	0.9x	0.77	X	2.2	29	x [	24	1.49	х		0.63	x	0.7		=	34.28	(80)
West	0.9x	0.77	X	4.7	<b>'</b> 2	x [	16	3.15	х		0.63	_ x [	0.7		=	46.6	(80)
West	0.9x	0.77	X	2.2	29	x [	16	6.15	х		0.63	_ x [	0.7		=	22.61	(80)
	_					_											
Solar g	gains in	watts, ca	alculate	d for eac	h month				(83)m	= Su	ım(74)m .	(82)m					
(83)m=	124.79	244.11	402.02	586.32	718.56	73	5.57	700.29	601.	.54	467.56	289.66	155.6	102.	62		(83)
Total g	jains – ir	nternal a	nd sola	r (84)m =	= (73)m	+ (8	3)m ,	watts		•			•	•		ı	
(84)m=	595.27	712.28	853.55	1010.82	1114.5	110	04.31	1052.05	960.	.58	841.39	690.75	588.02	558.	94		(84)
7. Me	an inter	nal temp	erature	(heating	season	)											
				periods in		<i></i>	rea fr	om Tah	ole 9	Th1	l (°C)					21	(85)
-		_	٠.	living are		_			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		( 0)						_(00)
Otilise	Jan	Feb	Mar	Apr	May	Ė	lun	Jul	۸.	ug	Sep	Oct	Nov	De	00		
(86)m=	1	1	0.99	0.96	0.87	_	69	0.52	0.5	<del>-  </del>	0.86	0.98	1	1	<del>,</del> 0		(86)
(00)111=	'	'	0.99	0.90	0.07		.03	0.52	0.5	<u>° 1</u>	0.00	0.30	<u> </u>	<u> </u>			(00)
Mean				living are	<u> </u>	1	<del>i</del>	s 3 to 7		_	9c)		,				
(87)m=	19.75	19.91	20.19	20.55	20.83	20	.96	20.99	20.9	99	20.88	20.49	20.05	19.7	'3		(87)
Temp	erature	during h	eating p	oeriods ir	rest of	dwe	elling f	from Ta	ble 9	), Th	2 (°C)						
(88)m=	20.01	20.01	20.02	20.03	20.03	20	.04	20.04	20.0	04	20.04	20.03	20.03	20.0	)2		(88)
Utilisa	ation fac	tor for a	ains for	rest of d	welling	h2 n	n (see	e Table	9a)							•	
(89)m=	1	1	0.99	0.95	0.82	<del>-</del>	.6	0.41	0.4	7	0.79	0.98	1	1			(89)
							<del></del>			<del></del>				<u> </u>		l	
		<u> </u>		the rest		<del>-</del>	<del>`</del>		<del></del>	_			1 40 70	10.		1	(00)
(90)m=	18.33	18.57	18.97	19.49	19.86	20	.02	20.04	20.0	J4	19.94	19.42	18.78	18.:	3		(90)
												LA = LIVII	ng area ÷ (	+) =		0.23	(91)
Mean	interna	temper	ature (fo	or the wh	ole dwe	lling	) = fL	A × T1	+ (1 -	– fL/	4) × T2		_				
(92)m=	18.66	18.88	19.25	19.74	20.09	20	.24	20.26	20.2	26	20.16	19.67	19.08	18.6	3		(92)
Apply	adjustn	nent to th	ne meai	n interna	temper	atur	e fron	n Table	4e, ۱	whe	re appro	priate	_				
(93)m=	18.66	18.88	19.25	19.74	20.09	20	.24	20.26	20.2	26	20.16	19.67	19.08	18.6	3		(93)
8. Sp	ace hea	ting requ	uiremen	t													
						ned a	at ste	p 11 of	Table	e 9b	, so tha	t Ti,m=	(76)m an	d re-d	calc	culate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a			-			-					ı	
	Jan	Feb	Mar	Apr	May	J	lun	Jul	Αι	ug	Sep	Oct	Nov	De	ЭС		
		tor for g		1		_										I	(0.1)
(94)m=	1	1	0.98	0.94	0.82	0.	62	0.43	0.5	5	8.0	0.97	1	1			(94)
			<u> </u>	4)m x (8										1		l	(0.7)
(95)m=	594.26	709.05	840.37	950.74	916.05			455.84	476.	.76	672.31	671.92	585.76	558.	26		(95)
				nperature						. 1				ı			(00)
(96)m=	4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.		14.1	10.6	7.1	4.2			(96)
				nal tempe		<del></del>	<del> </del>		<u> </u>	<del>_</del>			1	Γ.			(07)
(97)m=	1857.27	1802.76	1640.38	1376.86	1063.07	706	6.66	458.79	482.	.65	762.67	1149.43	1525.57	1847	.45		(97)

Space heating 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= 939.68 734.97	595.21	306.81	109.39	0	0	0	0	355.26	676.66	959.15		_
						Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	4677.13	(98)
Space heating requir	ement in	kWh/m²	²/year								39.27	(99)
9a. Energy requireme	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:			مام میں مارین							Г		7(204)
Fraction of space hea				mentary	-		(201) -			Ĺ	0	(201)
Fraction of space hea		•	, ,			(202) = 1	, ,	(202)] _		Ĺ	1	(202)
Fraction of total heati	_	•				(204) = (2	02) <b>x</b> [1 –	(203)] =		Ĺ	1	(204)
Efficiency of main sp					0.4					Į	93.4	(206)
Efficiency of seconda	· · ·				·	ı	ı	ı	ı		0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requir 939.68 734.97	595.21	306.81	109.39	0	0	0	0	355.26	676.66	959.15		
(211)m = {[(98)m x (20	ļ	<u> </u>						000.20	070.00	300.10		(211)
1006.08 786.9	637.27	328.49	117.12	0	0	0	0	380.37	724.48	1026.93		(211)
			<u> </u>			Tota	l (kWh/yea	ar) =Sum(2			5007.63	(211)
Space heating fuel (s	econdar	y), kWh/	month							L		
= {[(98)m x (201)] } x 1		• ,										
(215)m = 0 0	0	0	0	0	0	0	0	0	0	0		_
						Tota	ıl (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<del>-</del>	0	(215)
Water heating		م اممدان	h a a \									
Output from water hea	201.3	180.39	174.68	153.85	147.4	164.32	166.1	187.06	197.88	212.29		
Efficiency of water hea	iter	l	l				l	l			80.3	(216)
(217)m= 88.31 88.11	87.61	86.38	83.91	80.3	80.3	80.3	80.3	86.64	87.9	88.39		(217)
Fuel for water heating	kWh/mo	onth										
(219)m = $(64)$ m x $100(219)$ m = $246.33$ $217.6$	$\frac{0 \div (217)}{1229.76}$	m 208.84	208.18	191.6	183.56	204.63	206.84	215.9	225.12	240.18		
(219)111= 240.33   217.0	229.70	200.04	200.10	191.0	103.30		I = Sum(2		223.12	240.10	2578.54	(219)
Annual totals							`		Wh/year	. L	kWh/yea	
Space heating fuel use	ed, main	system	1						you		5007.63	Ħ
Water heating fuel use	ed									Ī	2578.54	Ħ
Electricity for pumps, f	ans and	electric	keep-ho	t						L		
central heating pump			-							30		(230
boiler with a fan-assis							1 (055 )	(005.)		45		(230
Total electricity for the	above, l	kWh/yea	ır			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting											459.05	(232)
12a. CO2 emissions	– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHF	)					

Energy

kWh/year

**Emissions** 

kg CO2/year

**Emission factor** 

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	1081.65	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	556.96	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1638.61	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	238.25	(268)
Total CO2, kg/year	sum o	of (265)(271) =		1915.78	(272)

TER =

(273)

16.09

		User Details:				
				OTDO	22222	
Assessor Name:	Joseph Treanor	Stroma Nur			032062	
Software Name:	Stroma FSAP 2012	Software V	ersion:	versio	n: 1.0.4.14	
A ddrago	Condar Cardons Londo	Property Address: P12				
Address: 1. Overall dwelling dime	, Gondar Gardens, Londonsions:	on, NVVO THG				
1. Overall dwelling diffie	11310113.	Area(m²)	Av. Height(m	1)	Volume(m³)	`
Ground floor		45.01 (1a) x	2.55	(2a) =	114.78	(3a)
First floor		71.14 (1b) x	3	(2b) =	213.42	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+	.(1n) 116.15 (4)				_
Dwelling volume		(3a)+(3	Bb)+(3c)+(3d)+(3e)+	(3n) =	328.2	(5)
2. Ventilation rate:				_		
	main secon heating heatir		total		m³ per houi	r
Number of chimneys	0 + 0	<del></del>	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0	x 20 =	0	(6b)
Number of intermittent far	าร		4	x 10 =	40	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fin	res		0	x 40 =	0	(7c)
				Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)$	o)+(7a)+(7b)+(7c) =	40	÷ (5) =	0.12	(8)
•	een carried out or is intended, pro			- (5)	0.12	(-)
Number of storeys in the	e dwelling (ns)				0	(9)
Additional infiltration				(9)-1]x0.1 =	0	(10)
	25 for steel or timber frame	•	truction		0	(11)
if both types of wall are pr deducting areas of openin	esent, use the value correspondir (as): if equal user 0.35	ng to the greater wall area (after				
= -	loor, enter 0.2 (unsealed) c	or 0.1 (sealed), else enter (	)	Г	0	(12)
If no draught lobby, ent	er 0.05, else enter 0			ļ	0	(13)
Percentage of windows	and doors draught strippe	d		Ţ	0	(14)
Window infiltration		0.25 - [0.2 x (14) -	- 100] =	ļ	0	(15)
Infiltration rate		(8) + (10) + (11) +	(12) + (13) + (15) =	Ī	0	(16)
Air permeability value,	q50, expressed in cubic me	etres per hour per square	metre of envelor	oe area	5	(17)
	ty value, then $(18) = [(17) \div 20]$		·	Ţ	0.37	(18)
Air permeability value applies	s if a pressurisation test has been	done or a degree air permeabili	ty is being used			
Number of sides sheltere	d				2	(19)
Shelter factor		(20) = 1 - [0.075  x]	(19)] =	[	0.85	(20)
Infiltration rate incorporat	ing shelter factor	$(21) = (18) \times (20) =$	=		0.32	(21)
Infiltration rate modified for	or monthly wind speed		,			
Jan Feb	Mar Apr May Ju	ın Jul Aug Ser	Oct No	v Dec		

4.3

3.8

3.8

3.7

4.3

4.5

4.7

Wind Factor (	(22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Adjusted infilt	tration rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.4	0.4	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37	]	
Calculate effe		•	rate for t	he appli	cable ca	se							
If mechanic			andiv N. (2	25h) - (22c	a) v Emy (	oguation (f	NEV otho	rwico (22h	n) = (33a)			0	(23a)
If balanced wi		0		, ,	,		,, .	•	i) = (23a)			0	(23b)
a) If balance		•	•	•		,		•	2h\m + (	'23h) ∨ [	1 _ (23c)	0 : 1001	(23c)
(24a)m= 0		0	0	0	0	0	0	0	0	0	$\frac{1 - (230)}{0}$	]	(24a)
b) If balance		anical ve	<u> </u>	<u> </u>	heat red	covery (N	<u>l</u>	<u>l</u>	<u> </u>	23b)	1	J	` '
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole	 house ex	tract ven	tilation o	r positiv	/e input	ventilatio	on from o	utside				J	
,	m < 0.5 ×			•					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natura				•	•							-	
	m = 1, the	<del>`</del>	<u>`</u>	<del></del>	<u>`</u>		<del>- `</del>	<del>-                                    </del>	<del>-</del>		T	1	(0.4.4)
(24d)m= 0.58	0.58	0.57	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)
Effective ai	o.58	rate - en	nter (24a 0.56	or (24b) 0.56	o) or (24 0.55	c) or (24 0.55	(d) in box	<del>`</del>	1 0.50	0.50	1 0.57	1	(25)
(25)m= 0.58	0.56	0.57	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	]	(23)
3. Heat loss	es and he	eat loss p	paramet	er:									
<b>ELEMENT</b>	0												
	Gros	_	Openin	-	Net Ar		U-val		A X U		k-value		A X k
Windows Typ	area	_	Openin m	-	Net Ar A ,r 4.72	m²	U-valı W/m2 /[1/( 1.4 )+	2K	A X U (W/		k-value kJ/m²-		A X k kJ/K
Windows Typ	area oe 1	_	•	-	A ,r	m <sup>2</sup>	W/m2	2K - 0.04] =	(W/				kJ/K
Windows Typ	area ne 1 ne 2	_	•	-	A ,r	m <sup>2</sup> x <sup>1</sup>	W/m2 /[1/( 1.4 )+	2K $0.04 = 0.04 = 0.04$	(W/ 6.26				kJ/K (27) (27)
Windows Typ	area oe 1 oe 2 oe 3	_	•	-	A ,r 4.72 2.29 4.51	m <sup>2</sup> x1 x1 x1	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K · 0.04] =   · 0.04] =   · 0.04] =	6.26 3.04 5.98				kJ/K (27) (27) (27)
Windows Typ Windows Typ Windows Typ	area oe 1 oe 2 oe 3 oe 4	(m²)	m	ŋ²	A ,r 4.72 2.29 4.51 2.26	m <sup>2</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K · 0.04] =   · 0.04] =   · 0.04] =	(W/ 6.26 3.04 5.98				kJ/K (27) (27) (27) (27)
Windows Typ Windows Typ Windows Typ Walls Type1	area oe 1 oe 2 oe 3 oe 4	(m²)	20.79	ŋ²	A ,r 4.72 2.29 4.51 2.26 46.5	m <sup>2</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =	(W/) 6.26 3.04 5.98 3 8.37				kJ/K (27) (27) (27) (27) (29)
Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2	area oe 1 oe 2 oe 3 oe 4 67.2	(m²)	20.76 0	ŋ²	A ,r 4.72 2.29 4.51 2.26 46.5 55.89	m <sup>2</sup>	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =	(W/ 6.26 3.04 5.98 3 8.37				kJ/K (27) (27) (27) (27) (29)
Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1	area  oe 1  oe 2  oe 3  oe 4  67.2  55.8	(m²)	20.79 0	ŋ²	A ,r 4.72 2.29 4.51 2.26 46.5 55.89 4.24	m <sup>2</sup>	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =	(W/ 6.26 3.04 5.98 3 8.37 10.06				kJ/K (27) (27) (27) (27) (29) (29) (30)
Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2	area oe 1 oe 2 oe 3 oe 4 67.2 55.8 4.2	29 39 4	20.76 0	ŋ²	A ,r 4.72 2.29 4.51 2.26 46.5 55.89 4.24 71.14	m <sup>2</sup>	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =	(W/ 6.26 3.04 5.98 3 8.37				kJ/K (27) (27) (27) (27) (29) (29) (30)
Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of	area oe 1 oe 2 oe 3 oe 4 67.2 55.8 4.2	29 39 4	20.79 0	ŋ²	A ,r 4.72 2.29 4.51 2.26 46.5 55.88 4.24 71.14	m <sup>2</sup>	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.18 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	(W// 6.26 3.04 5.98 3 8.37 10.06 0.55				kJ/K (27) (27) (27) (27) (29) (29) (30) (30) (31)
Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of Party wall * for windows and	area oe 1 oe 2 oe 3 oe 4 67.2 55.8 4.2 71.1 elements	29 39 4 14 3, m <sup>2</sup> ows, use e	20.79 0 0 0	9 9	A ,r 4.72 2.29 4.51 2.26 46.5 55.89 4.24 71.14 198.5 69.63 alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	(W/ 6.26 3.04 5.98 3 8.37 10.06 0.55 9.25	K)	kJ/m²-		kJ/K (27) (27) (27) (29) (29) (30)
Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of Party wall * for windows an ** include the area	area oe 1 oe 2 oe 3 oe 4 67.2 55.8 4.2 71.1 elements	(m²)  29  39  4  4  which is a significant of the sides of interest of the sides of	20.79 0 0 0 offective with atternal wall	9 9	A ,r 4.72 2.29 4.51 2.26 46.5 55.89 4.24 71.14 198.5 69.63 alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	(W/ 6.26 3.04 5.98 3 8.37 10.06 0.55 9.25	K)	kJ/m²-	K	kJ/K (27) (27) (27) (29) (29) (30) (31) (32)
Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of Party wall * for windows an ** include the are Fabric heat lo	area oe 1 oe 2 oe 3 oe 4 67.2 55.8 4.2 71.1 elements od roof windleas on both oss, W/K =	29 39 4 14 1, m <sup>2</sup> ows, use e sides of in = S (A x	20.79 0 0 0 offective with atternal wall	9 9	A ,r 4.72 2.29 4.51 2.26 46.5 55.89 4.24 71.14 198.5 69.63 alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =   =   //[(1/U-value) ) + (32) =	(W/ 6.26 3.04 5.98 3 8.37 10.06 0.55 9.25	K)	kJ/m²-	1 3.2 55.79	kJ/K (27) (27) (27) (29) (30) (30) (31) (32)
Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of Party wall * for windows an ** include the are Fabric heat lo	area oe 1 oe 2 oe 3 oe 4 67.2 55.8 4.2 71.1 elements od roof windees on both oss, W/K: / Cm = S(	29 39 4 4 4 5, m <sup>2</sup> ows, use e sides of in = S (A x (A x k)	20.79 0 0 offective with ternal wall	9 indow U-va	A ,r 4.72 2.29 4.51 2.26 46.5 55.89 4.24 71.14 198.5 69.63 alue calculatitions	x1 x1 x1 x1 x x x x x x x x x x x x x x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =   -   -   -   -   -   -   -   -	(W// 6.26 3.04 5.98 3 8.37 10.06 0.55 9.25	K)	kJ/m²-	7 3.2 55.79 9955.	kJ/K (27) (27) (27) (29) (29) (30) (31) (32)
Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of Party wall *for windows an **include the are Fabric heat lo Heat capacity Thermal mas For design asses	area  oe 1  oe 2  oe 3  oe 4  67.2  55.8  4.2  71.1  elements  od roof windleas on both  oss, W/K:  y/Cm = S(  ss parame  ssments wh	(m²)  29  39  4  4  4  5, m²  cows, use e sides of ine = S (A x (A x k )  eter (TMF)	20.79 0 0 0 offective with ternal wall U) $P = Cm + tails of the ternal wall$	9 	A ,r  4.72  2.29  4.51  2.26  46.5  55.86  4.24  71.14  198.5  69.63  alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13 0.13 (26)(30)	2K - 0.04] =   - 0	(W// 6.26 3.04 5.98 3 8.37 10.06 0.55 9.25	K)  as given in  2) + (32a)	kJ/m²-	1 3.2 55.79	kJ/K (27) (27) (27) (29) (30) (30) (31) (32)
Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of Party wall * for windows an ** include the are Fabric heat lo Heat capacity Thermal mas	area area area area area area area area	(m²)  29  39  4  4  5, m²  cows, use e sides of in e S (A x k)  eter (TMF)  eter the detailed calculations and the sides of control of the sides of control of the sides of control of the sides of control of the sides of control of the sides of control of the sides	20.79 0 0 0 offective with ternal wall U)  P = Cm - tails of the culation.	9 9   Indow U-valls and part	A ,r  4.72  2.29  4.51  2.26  46.5  55.89  4.24  71.14  198.5  69.63  alue calculatitions  n kJ/m²K	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13 0.13 (26)(30)	2K - 0.04] =   - 0	(W// 6.26 3.04 5.98 3 8.37 10.06 0.55 9.25	K)  as given in  2) + (32a)	kJ/m²-	7 3.2 55.79 9955.	kJ/K (27) (27) (27) (29) (29) (30) (30) (31) (32)

if details	of therma	l bridging	are not kn	own (36) =	= 0.15 x (3	1)						_		
	abric he								(33) +	(36) =			74.5	(37)
Ventila	tion hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × (	(25)m x (5)	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	62.95	62.61	62.27	60.7	60.41	59.04	59.04	58.78	59.56	60.41	61	61.62		(38)
Heat tr	ansfer o	oefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	137.45	137.11	136.77	135.2	134.91	133.54	133.54	133.28	134.07	134.91	135.5	136.13		
Heat Id	oss para	meter (F	HLP), W/	 /m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	135.2	(39)
(40)m=	1.18	1.18	1.18	1.16	1.16	1.15	1.15	1.15	1.15	1.16	1.17	1.17		
` ,										L Average =	Sum(40) <sub>1</sub> .	12 /12=	1.16	(40)
Numbe	er of day	s in mor	nth (Tabl	le 1a)						Ü	` '	L		
	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)
						ı								
4 Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ar:	
4. VVC	ilei neai	ing ener	igy requi	rement.								KVVII/ y C	ai.	
		pancy, I										85		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)	)2)] + 0.0	0013 x (	ΓFA -13.	.9)			
		•	ater usag	no in litre	s ner de	y Vd ay	erage –	(25 v NI)	<b>+</b> 36		40.	4.00		(42)
			hot water							se target o		1.82		(43)
		_	person per			_	_							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii		day for ea		,	ctor from T	Table 1c x	•	•	<u> </u>	1	l		
(44)m=	112	107.93	103.86	99.78	95.71	91.64	91.64	95.71	99.78	103.86	107.93	112		
						<u> </u>	ı	l	-	Γotal = Su	m(44) <sub>112</sub> =	! =	1221.83	(44)
Energy (	content of	hot water	used - cald	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x D	07m / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	166.09	145.27	149.9	130.69	125.4	108.21	100.27	115.06	116.44	135.7	148.12	160.85		
						ı				Γotal = Su	m(45) <sub>112</sub> =	=	1602.01	(45)
If instant	taneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)	) to (61)			L		
(46)m=	24.91	21.79	22.49	19.6	18.81	16.23	15.04	17.26	17.47	20.35	22.22	24.13		(46)
Water	storage	loss:									·			
Storag	e volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	munity h	eating a	ind no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
	storage					(1.) 4 (1	/ I \							
,			eclared lo		or is kno	wn (kvvr	n/day):					0		(48)
_			m Table									0		(49)
• • •			storage	-				(48) x (49)	) =			0		(50)
•			eclared o	-								1		(54)
		_	factor free section		€∠ (KVVI	ii/iiti <del>U</del> /U2	1y <i>)</i>					0		(51)
	-	•		ار. <del>+</del> اار								0		(52)
											1	∪ <b>I</b>		(32)
Volum				2b										(53)
Volume Tempe	erature fa	actor fro	m Table		aar			(A7) v (E4)	v (52) v (	53) –		0		(53)
Volume Tempe Energy	erature fa	actor fro	m Table storage		ear			(47) x (51)	x (52) x (	53) =				(53) (54) (55)

Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)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= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circui	t loss (ar	nual) fro	m Table	3							0		(58)
Primary circui	t loss cal	culated t	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m				•	
(modified by	/ factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 50.96	46.03	50.96	49.21	48.77	45.19	46.7	48.77	49.21	50.96	49.32	50.96		(61)
Total heat req	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 217.05	191.29	200.86	179.9	174.17	153.4	146.97	163.84	165.65	186.66	197.44	211.81		(62)
Solar DHW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additiona	I lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	<del>3</del> )		ī	i	•	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter		•	•	•	•					•	
(64)m= 217.05	191.29	200.86	179.9	174.17	153.4	146.97	163.84	165.65	186.66	197.44	211.81		1
							Outp	out from wa	ater heate	r (annual)₁	12	2189.04	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	1] + 0.8 x	((46)m	+ (57)m	+ (59)m	]	
(65)m= 67.97	59.81	62.58	55.76	53.89	47.28	45.01	50.45	51.02	57.86	64 50	66.00		(65)
				00.00		40.01	30.43	31.02	37.00	61.58	66.22		(00)
include (57)	m in cal	culation o		!	<u> </u>	<u> </u>	<u> </u>					eating	(00)
include (57) 5. Internal g			of (65)m	only if c	<u> </u>	<u> </u>	<u> </u>					eating	(00)
, ,	ains (see	e Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>	<u> </u>					eating	(00)
5. Internal g	ains (see	e Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>	<u> </u>					eating	(00)
5. Internal g	ains (see	E Table 5	of (65)m and 5a	only if c	ı :ylinder i:	s in the o	dwelling	or hot w	ater is fr	rom com	munity h	eating	(66)
5. Internal g  Metabolic gair  Jan	ns (Table Feb 142.36	2 Table 5 2 5), Wat Mar 142.36	of (65)m and 5a ts Apr 142.36	only if constant of the consta	Jun 142.36	Jul 142.36	Aug 142.36	or hot w Sep 142.36	ater is fr	om com	munity h	eating	
5. Internal g  Metabolic gain  Jan  (66)m= 142.36	ns (Table Feb 142.36	2 Table 5 2 5), Wat Mar 142.36	of (65)m and 5a ts Apr 142.36	only if constant of the consta	Jun 142.36	Jul 142.36	Aug 142.36	or hot w Sep 142.36	ater is fr	om com	munity h	eating	
5. Internal g  Metabolic gain  Jan  (66)m= 142.36  Lighting gains	res (Table Feb 142.36 (calcula 22.67	e Table 5 e 5), Wat Mar 142.36 ted in Ap 18.44	of (65)m and 5a ts Apr 142.36 opendix 13.96	only if construction only if c	Jun 142.36 ion L9 o	Jul 142.36 r L9a), a	Aug 142.36 Iso see	Sep 142.36 Table 5	Oct 142.36	Nov 142.36	Dec	eating	(66)
5. Internal g  Metabolic gain  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53	res (Table Feb 142.36 (calcula 22.67	e Table 5 e 5), Wat Mar 142.36 ted in Ap 18.44	of (65)m and 5a ts Apr 142.36 opendix 13.96	only if construction only if c	Jun 142.36 ion L9 o	Jul 142.36 r L9a), a	Aug 142.36 Iso see	Sep 142.36 Table 5	Oct 142.36	Nov 142.36	Dec	eating	(66)
5. Internal g  Metabolic gain  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53  Appliances ga	res (Table Feb 142.36 (calcula 22.67 ins (calcula 283.02	e Table 5 e 5), Wat Mar 142.36 ted in Ap 18.44 culated in 275.69	of (65)m and 5a ts Apr 142.36 opendix 13.96 Appendix 260.1	May 142.36 L, equat 10.44 dix L, eq 240.42	Jun 142.36 ion L9 o 8.81 uation L 221.92	Jul 142.36 r L9a), a 9.52 13 or L1 209.56	Aug 142.36 Iso see 12.37 3a), also 206.65	Sep 142.36 Table 5 16.61 see Ta 213.98	Oct 142.36  21.09 ble 5 229.57	Nov 142.36	Dec 142.36	eating	(66) (67)
5. Internal g  Metabolic gair  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53  Appliances ga  (68)m= 280.11	res (Table Feb 142.36 (calcula 22.67 ins (calcula 283.02	e Table 5 e 5), Wat Mar 142.36 ted in Ap 18.44 culated in 275.69	of (65)m and 5a ts Apr 142.36 opendix 13.96 Appendix 260.1	May 142.36 L, equat 10.44 dix L, eq 240.42	Jun 142.36 ion L9 o 8.81 uation L 221.92	Jul 142.36 r L9a), a 9.52 13 or L1 209.56	Aug 142.36 Iso see 12.37 3a), also 206.65	Sep 142.36 Table 5 16.61 see Ta 213.98	Oct 142.36  21.09 ble 5 229.57	Nov 142.36	Dec 142.36	eating	(66) (67)
5. Internal g  Metabolic gain  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53  Appliances ga  (68)m= 280.11  Cooking gains	res (Table Feb 142.36 (calcula 22.67 ins (calcula 283.02 (calcula 37.24	Mar 142.36 ted in Ap 18.44 culated in 275.69 ated in Ap 37.24	of (65)m s and 5a ts Apr 142.36 opendix 13.96 Appendix 260.1 opendix 37.24	May 142.36 L, equat 10.44 dix L, eq 240.42 L, equat	Jun 142.36 ion L9 of 8.81 uation L 221.92 tion L15	Jul 142.36 r L9a), a 9.52 13 or L1 209.56 or L15a)	Aug 142.36 Iso see 12.37 3a), also 206.65	Sep 142.36 Table 5 16.61 see Ta 213.98 ee Table	Oct 142.36  21.09 ble 5 229.57 5	Nov 142.36 24.61	Dec 142.36 26.24 267.75	eating	(66) (67) (68)
5. Internal g  Metabolic gain  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53  Appliances ga  (68)m= 280.11  Cooking gains  (69)m= 37.24	res (Table Feb 142.36 (calcula 22.67 ins (calcula 283.02 (calcula 37.24	Mar 142.36 ted in Ap 18.44 culated in 275.69 ated in Ap 37.24	of (65)m s and 5a ts Apr 142.36 opendix 13.96 Appendix 260.1 opendix 37.24	May 142.36 L, equat 10.44 dix L, eq 240.42 L, equat	Jun 142.36 ion L9 of 8.81 uation L 221.92 tion L15	Jul 142.36 r L9a), a 9.52 13 or L1 209.56 or L15a)	Aug 142.36 Iso see 12.37 3a), also 206.65	Sep 142.36 Table 5 16.61 see Ta 213.98 ee Table	Oct 142.36  21.09 ble 5 229.57 5	Nov 142.36 24.61	Dec 142.36 26.24 267.75	eating	(66) (67) (68)
5. Internal g  Metabolic gair  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53  Appliances ga  (68)m= 280.11  Cooking gains  (69)m= 37.24  Pumps and fa	res (Table Feb 142.36 (calcula 22.67 ins (calcula 37.24 rs gains 3	Mar 142.36 ted in Ap 18.44 culated in 275.69 ated in Ap 37.24 (Table 5	of (65)m and 5a ts Apr 142.36 ppendix 13.96 Appendix 260.1 ppendix 37.24 5a) 3	only if construction only if c	Jun 142.36 ion L9 o 8.81 uation L 221.92 tion L15 37.24	Jul 142.36 r L9a), a 9.52 13 or L1 209.56 or L15a) 37.24	Aug 142.36 Iso see 12.37 3a), also 206.65 ), also se 37.24	Sep 142.36 Table 5 16.61 see Ta 213.98 ee Table 37.24	Oct 142.36  21.09 ble 5 229.57 5 37.24	Nov 142.36 24.61 249.25	Dec 142.36 26.24 267.75	eating	(66) (67) (68) (69)
5. Internal g  Metabolic gain  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53  Appliances ga  (68)m= 280.11  Cooking gains  (69)m= 37.24  Pumps and fa  (70)m= 3	res (Table Feb 142.36 (calcula 22.67 ins (calcula 37.24 res gains 3 vaporatio	Mar 142.36 ted in Ap 18.44 culated in 275.69 ated in Ap 37.24 (Table 5	of (65)m and 5a ts Apr 142.36 ppendix 13.96 Appendix 260.1 ppendix 37.24 5a) 3	only if construction only if c	Jun 142.36 ion L9 o 8.81 uation L 221.92 tion L15 37.24	Jul 142.36 r L9a), a 9.52 13 or L1 209.56 or L15a) 37.24	Aug 142.36 Iso see 12.37 3a), also 206.65 ), also se 37.24	Sep 142.36 Table 5 16.61 see Ta 213.98 ee Table 37.24	Oct 142.36  21.09 ble 5 229.57 5 37.24	Nov 142.36 24.61 249.25	Dec 142.36 26.24 267.75	eating	(66) (67) (68) (69)
Metabolic gair  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53  Appliances ga  (68)m= 280.11  Cooking gains  (69)m= 37.24  Pumps and fa  (70)m= 3  Losses e.g. ev	res (Table Feb 142.36 (calcula 22.67 ins (calcula 37.24 res gains 3 reporation -113.89	e Table 5 e 5), Wat Mar 142.36 ted in Ap 18.44 culated in 275.69 ated in Ap 37.24 (Table 5 3 on (negat	of (65)m s and 5a ts Apr 142.36 opendix 13.96 Append 260.1 opendix 37.24 5a) 3 tive valu	only if construction only if c	Jun 142.36 ion L9 o 8.81 uation L 221.92 tion L15 37.24	Jul 142.36 r L9a), a 9.52 13 or L1 209.56 or L15a) 37.24	Aug 142.36 Iso see 12.37 3a), also 206.65 , also se 37.24	Sep 142.36 Table 5 16.61 see Ta 213.98 ee Table 37.24	Oct 142.36  21.09 ble 5 229.57 5 37.24	Nov 142.36 24.61 249.25 37.24	Dec 142.36 26.24 267.75 37.24	eating	(66) (67) (68) (69)
5. Internal g  Metabolic gair  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53  Appliances ga  (68)m= 280.11  Cooking gains  (69)m= 37.24  Pumps and fa  (70)m= 3  Losses e.g. et  (71)m= -113.89	res (Table Feb 142.36 (calcula 22.67 ins (calcula 37.24 res gains 3 reporation -113.89	e Table 5 e 5), Wat Mar 142.36 ted in Ap 18.44 culated in 275.69 ated in Ap 37.24 (Table 5 3 on (negat	of (65)m s and 5a ts Apr 142.36 opendix 13.96 Append 260.1 opendix 37.24 5a) 3 tive valu	only if construction only if c	Jun 142.36 ion L9 o 8.81 uation L 221.92 tion L15 37.24	Jul 142.36 r L9a), a 9.52 13 or L1 209.56 or L15a) 37.24	Aug 142.36 Iso see 12.37 3a), also 206.65 , also se 37.24	Sep 142.36 Table 5 16.61 see Ta 213.98 ee Table 37.24	Oct 142.36  21.09 ble 5 229.57 5 37.24	Nov 142.36 24.61 249.25 37.24	Dec 142.36 26.24 267.75 37.24	eating	(66) (67) (68) (69)
5. Internal g  Metabolic gain  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53  Appliances ga  (68)m= 280.11  Cooking gains  (69)m= 37.24  Pumps and fa  (70)m= 3  Losses e.g. ev  (71)m= -113.89  Water heating	res (Table Feb 142.36 (calcula 22.67 ins (calcula 37.24 res gains 3 vaporatio gains (Table 89	e Table 5 e 5), Wat Mar 142.36 ted in Ap 18.44 culated in 275.69 ated in Ap 37.24 (Table 5 3 on (negation of the culated in Ap -113.89 Table 5) 84.12	of (65)m s and 5a ts Apr 142.36 ependix 13.96 Appendix 260.1 ependix 37.24 5a) 3 tive valu -113.89	only if construction only if c	Jun 142.36 ion L9 o 8.81 uation L 221.92 tion L15 37.24  3 ble 5) -113.89	Jul 142.36 r L9a), a 9.52 13 or L1 209.56 or L15a) 37.24	Aug 142.36 Iso see 12.37 3a), also 206.65 0, also se 37.24 3	Sep 142.36 Table 5 16.61 See Ta 213.98 ee Table 37.24 3 -113.89	Oct 142.36  21.09 ble 5 229.57 5 37.24  3 -113.89	Nov 142.36 24.61 249.25 37.24 3	Dec 142.36 26.24 267.75 37.24 3	eating	(66) (67) (68) (69) (70)
Metabolic gair  Jan  (66)m= 142.36  Lighting gains  (67)m= 25.53  Appliances ga  (68)m= 280.11  Cooking gains  (69)m= 37.24  Pumps and fa  (70)m= 3  Losses e.g. ev  (71)m= -113.89  Water heating  (72)m= 91.35	res (Table Feb 142.36 (calcula 22.67 ins (calcula 37.24 res gains 3 vaporatio gains (Table 89	e Table 5 e 5), Wat Mar 142.36 ted in Ap 18.44 culated in 275.69 ated in Ap 37.24 (Table 5 3 on (negation of the culated in Ap -113.89 Table 5) 84.12	of (65)m s and 5a ts Apr 142.36 ependix 13.96 Appendix 260.1 ependix 37.24 5a) 3 tive valu -113.89	only if construction only if c	Jun 142.36 ion L9 o 8.81 uation L 221.92 tion L15 37.24  3 ble 5) -113.89	Jul 142.36 r L9a), a 9.52 13 or L1 209.56 or L15a) 37.24	Aug 142.36 Iso see 12.37 3a), also 206.65 0, also se 37.24 3	Sep 142.36 Table 5 16.61 See Ta 213.98 ee Table 37.24 3 -113.89	Oct 142.36  21.09 ble 5 229.57 5 37.24  3 -113.89	Nov 142.36 24.61 249.25 37.24 3	Dec 142.36 26.24 267.75 37.24 3	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.

Orientation		Access Factor Table 6d	·	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East (	).9x	1	X	4.51	x	19.64	x	0.63	x	0.7	=	27.07	(76)
East (	).9x	1	X	2.26	x	19.64	X	0.63	x	0.7	=	13.57	(76)
East (	).9x	1	X	4.51	x	38.42	X	0.63	x	0.7	=	52.96	(76)
East (	).9x	1	X	2.26	x	38.42	x	0.63	x	0.7	=	26.54	(76)
East (	).9x	1	X	4.51	x	63.27	X	0.63	x	0.7	=	87.21	(76)
East (	).9x	1	x	2.26	x	63.27	x	0.63	x	0.7	=	43.7	(76)
East (	).9x	1	X	4.51	x	92.28	x	0.63	x	0.7	=	127.19	(76)
East (	).9x	1	X	2.26	x	92.28	X	0.63	X	0.7	=	63.74	(76)
East (	).9x	1	X	4.51	x	113.09	x	0.63	x	0.7	=	155.88	(76)
East (	).9x	1	X	2.26	x	113.09	X	0.63	X	0.7	=	78.11	(76)
East (	).9x	1	X	4.51	X	115.77	X	0.63	X	0.7	=	159.57	(76)
East (	).9x	1	X	2.26	x	115.77	x	0.63	x	0.7	=	79.96	(76)
East (	).9x	1	X	4.51	X	110.22	X	0.63	X	0.7	=	151.92	(76)
East (	).9x	1	X	2.26	x	110.22	X	0.63	X	0.7	=	76.13	(76)
East (	).9x	1	X	4.51	x	94.68	X	0.63	X	0.7	=	130.49	(76)
East (	).9x	1	X	2.26	X	94.68	X	0.63	X	0.7	=	65.39	(76)
East (	).9x	1	X	4.51	x	73.59	X	0.63	X	0.7	=	101.43	(76)
East (	).9x	1	X	2.26	x	73.59	X	0.63	X	0.7	=	50.83	(76)
East (	).9x	1	X	4.51	X	45.59	X	0.63	X	0.7	=	62.84	(76)
East (	).9x	1	X	2.26	x	45.59	X	0.63	X	0.7	=	31.49	(76)
East (	).9x	1	X	4.51	x	24.49	X	0.63	X	0.7	=	33.75	(76)
East (	).9x	1	X	2.26	X	24.49	X	0.63	X	0.7	=	16.91	(76)
East (	).9x	1	X	4.51	X	16.15	x	0.63	x	0.7	=	22.26	(76)
East (	).9x	1	X	2.26	X	16.15	x	0.63	x	0.7	=	11.16	(76)
West (	).9x	0.77	X	4.72	x	19.64	x	0.63	x	0.7	=	56.66	(80)
West (	).9x	0.77	X	2.29	X	19.64	X	0.63	X	0.7	=	27.49	(80)
	).9x	0.77	X	4.72	X	38.42	X	0.63	X	0.7	=	110.84	(80)
West (	).9x	0.77	X	2.29	X	38.42	X	0.63	X	0.7	=	53.78	(80)
	).9x	0.77	X	4.72	X	63.27	X	0.63	X	0.7	=	182.54	(80)
	).9x	0.77	X	2.29	X	63.27	X	0.63	X	0.7	=	88.56	(80)
	).9x	0.77	X	4.72	X	92.28	X	0.63	X	0.7	=	266.23	(80)
	).9x	0.77	X	2.29	X	92.28	X	0.63	X	0.7	=	129.17	(80)
	).9x	0.77	X	4.72	X	113.09	X	0.63	X	0.7	=	326.27	(80)
West (	).9x	0.77	X	2.29	X	113.09	X	0.63	X	0.7	=	158.3	(80)
	).9x	0.77	X	4.72	X	115.77	X	0.63	X	0.7	=	334	(80)
	).9x	0.77	X	2.29	x	115.77	x	0.63	X	0.7	=	162.04	(80)
	).9x	0.77	X	4.72	x	110.22	x	0.63	x	0.7	=	317.98	(80)
	).9x	0.77	X	2.29	x	110.22	x	0.63	x	0.7	=	154.27	(80)
West (	).9x	0.77	X	4.72	x	94.68	х	0.63	x	0.7	=	273.14	(80)

	_															
West	0.9x	0.77	Х	2.2	29	X	9	4.68	X		0.63	X	0.7	=	132.52	(80)
West	0.9x	0.77	X	4.7	'2	X	7	3.59	X		0.63	X	0.7	-	212.3	(80)
West	0.9x	0.77	Х	2.2	29	x	7	3.59	X		0.63	x	0.7	=	103	(80)
West	0.9x	0.77	X	4.7	<b>'</b> 2	x	4	5.59	X		0.63	x	0.7	-	131.52	(80)
West	0.9x	0.77	х	2.2	29	x	4	5.59	х		0.63	x	0.7	-	63.81	(80)
West	0.9x	0.77	х	4.7	'2	x	2	4.49	х		0.63	х	0.7	-	70.65	(80)
West	0.9x	0.77	х	2.2	29	x	2	4.49	х		0.63	x	0.7	=	34.28	(80)
West	0.9x	0.77	x	4.7	'2	x	1	6.15	х		0.63	x	0.7		46.6	(80)
West	0.9x	0.77	x	2.2	29	x	1	6.15	х		0.63	x	0.7		22.61	(80)
						-										
Solar ç	gains in v	watts, ca	alculated	d for eac	h month				(83)m	= Su	ım(74)m .	(82)m				
(83)m=	124.79	244.11	402.02	586.32	718.56	73	35.57	700.29	601.	.54	467.56	289.66	155.6	102.62	2	(83)
Total g	ains – ir	nternal a	nd sola	r (84)m =	= (73)m	+ (8	33)m	, watts		•			•	•		
(84)m=	590.49	707.51	848.98	1006.53	1110.55	11	00.67	1048.58	957.	.08	837.71	686.79	583.7	554.33	3	(84)
7. Me	an inter	nal temp	erature	(heating	season	)										
				eriods ir		<i></i>	area f	rom Tab	ole 9.	Th1	(°C)				21	(85)
•		_	٠.	living are		_			,		( - /					``
	Jan	Feb	Mar	Apr	May	Ė	Jun	Jul	Αı	ug	Sep	Oct	Nov	Dec	$\overline{\Box}$	
(86)m=	1	1	0.99	0.96	0.88	_	0.71	0.55	0.6	<del>-  </del>	0.87	0.99	1	1	<u>^</u>	(86)
` '				<u> </u>		I						0.00	1 .	<u> </u>		()
	1			living are	<u> </u>	_						00.44	10.05	100		(07)
(87)m=	19.63	19.79	20.08	20.46	20.78	20	0.94	20.99	20.9	98	20.84	20.41	19.95	19.6		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	), Th	2 (°C)					
(88)m=	19.93	19.94	19.94	19.95	19.95	19	9.96	19.96	19.9	96	19.96	19.95	19.95	19.94		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)							
(89)m=	1	1	0.99	0.95	0.83		).62	0.42	0.4	9	0.81	0.98	1	1		(89)
Mean	internal	temper	atura in	the rest	of dwell	ina	T2 (fd	allow ste	ne 3	to 7	in Tahl	a 9c)				
(90)m=	18.1	18.34	18.76	19.31	19.73	Ť	9.92	19.96	19.9		19.83	19.25	18.58	18.07		(90)
(00)=	10.1	10.01	10.70	10.01	10.70	L.'	0.02	10.00	10.0				ng area ÷ (		0.26	(91)
													.9 (	• /	0.20	(01)
			· ·	or the wh		$\overline{}$			+ (1 -	– fL/	4) × T2		T			
(92)m=	18.5	18.72	19.11	19.62	20.01		0.19	20.23	20.2		20.1	19.56	18.94	18.47		(92)
				interna		_				$\overline{}$		<u> </u>		•		
(93)m=	18.5	18.72	19.11	19.62	20.01	20	0.19	20.23	20.2	23	20.1	19.56	18.94	18.47		(93)
•	ace heat															
				mperatu		ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=(	76)m an	d re-ca	lculate	
the ut				using Ta		1	1				0	0.1	I NI.			
Litilion	Jan   ation fac	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Al	ug	Sep	Oct	Nov	Dec	<u>;                                    </u>	
(94)m=	1	1	0.98	0.94	0.84		0.64	0.46	0.5	2	0.82	0.97	1	1		(94)
		·		1 0.94 4)m x (8			7.04	0.40	0.5	,2	0.02	0.31	<u>'</u>			(0.1)
(95)m=	589.33	704.03	835.7	950.01	929.19	70	09.14	479.24	499.	64	683.52	668.48	581.25	553.53	$\Box$	(95)
	l l			perature				710.24	- <del>1</del> 33.		JUU.UZ	000.40	1 001.20	1 000.0		(30)
(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)
				l o.s nal tempe		_							I '.'	I 7.2		(30)
(97)m=	1952.3	1895.3	1724.77	<del></del>	1120.66	_	, vv =	484.68	509.	<del>´</del> T	803.78	1208.87	1604.64	1943.1	7	(97)
(0.)				1	10.00	L ' '		.555			300.70		1 .0004	1 .0 .0.1		(- )

Space heating require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m= 1014.05 800.53	661.47	359.31	142.45	0	0	0	0	402.06	736.84	1033.89		
						Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	5150.6	(98)
Space heating require	ement in	kWh/m²	<sup>2</sup> /year								44.34	(99)
9a. Energy requiremen	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:			/I-							г		7(004)
Fraction of space hea				mentary	-		(204)			Ļ	0	(201)
Fraction of space hea		•	. ,			(202) = 1	, ,	(000)1		Ļ	1	(202)
Fraction of total heati	•	•				(204) = (2	02) <b>x</b> [1 –	(203)] =		Į	1	(204)
Efficiency of main spa										Ļ	93.4	(206)
Efficiency of seconda	ry/suppl	ementar ·	y heating	g systen	า, % <del></del>				1		0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating require 1014.05 800.53	661.47	359.31	142.45	0	0	0	0	402.06	736.84	1033.89		
$(211)$ m = {[(98)m x (20	<u> </u>	<u> </u>	<u> </u>					402.00	700.04	1000.00		(211)
1085.7 857.1	708.21	384.7	152.52	0	0	0	0	430.47	788.91	1106.95		(211)
		<u> </u>				Tota	l (kWh/yea	ar) =Sum(2			5514.56	(211)
Space heating fuel (s	econdar	y), kWh/	month							L		
$= \{[(98)m \times (201)]\} \times 1$	00 ÷ (20	8)				_						
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0		_
						Tota	ıl (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<u>_</u> =	0	(215)
Water heating	tor (oolo	ulatad a	hovo)									
Output from water hea	200.86	179.9	174.17	153.4	146.97	163.84	165.65	186.66	197.44	211.81		
Efficiency of water hea	ıter	<u>I</u>		<u> </u>	<u>I</u>		<u>I</u>	<u>I</u>	<u>I</u>	<b>'</b>	80.3	(216)
(217)m= 88.44 88.26	87.83	86.76	84.55	80.3	80.3	80.3	80.3	86.93	88.06	88.51		(217)
Fuel for water heating,						•	•					
$(219)m = (64)m \times 100$ $(219)m = 245.43 \times 216.74$	) ÷ (217) 228.7	m 207.35	206	191.03	183.03	204.03	206.28	214.71	224.21	239.32		
(213)111= 243.43   210.74	220.1	207.00	200	131.03	100.00		I = Sum(2		227.21	255.52	2566.84	(219)
Annual totals							·		Wh/yeaı	, L	kWh/yea	
Space heating fuel use	ed, main	system	1						, <b>-</b>	Γ	5514.56	
Water heating fuel use	ed									Ī	2566.84	Ħ
Electricity for pumps, f	ans and	electric	keep-ho	t						L		
central heating pump	•		·							30		(2300
boiler with a fan-assis												
			_			61155	of (220a)	(220~)		45		(2306
Total electricity for the	above, I	kvvn/yea	ır			sum	oi (∠sua).	(230g) =			75	(231)
Electricity for lighting											450.84	(232)
12a. CO2 emissions	– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHF	)					

Energy

kWh/year

Stroma FSAP 2012 Version: 1.0.4.14 (SAP 9.92) - http://www.stroma.com

**Emissions** 

kg CO2/year

**Emission factor** 

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	1191.15	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	554.44	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1745.58	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	233.99	(268)
Total CO2, kg/year	sum	of (265)(271) =		2018.5	(272)

TER = 17.38 (273)

			5							
			User D	etails:						
Assessor Name:	Joseph Treand			Strom	a Num	ber:			032062	
Software Name:	Stroma FSAP	2012		Softwa	are Ve	rsion:		Versio	n: 1.0.4.14	
				Address	: P13					
Address :	, Gondar Garde	ns, London, I	۱W6 1H	HG						
Overall dwelling dimens	nsions:		_							
Ground floor				a(m²) 5.86	(1a) x	Av. Hei	ght(m) 55	(2a) =	Volume(m³)	(3a)
First floor				8.47	(1b) x		3	](2b) =	265.41	](3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)-	+(1e)+(1n		34.33	] (4)			<b>」</b> ` ′		`′
Dwelling volume	, , , , , , ,	. , , .			j	)+(3c)+(3d	)+(3e)+	(3n) =	382.35	(5)
2. Ventilation rate:										<u>``</u>
2. Ventilation rate.	main heating	secondary heating	/	other		total			m³ per hour	r
Number of chimneys		+ 0	] + [	0	] = [	0	x	40 =	0	(6a)
Number of open flues	0	+ 0	Ī + Ē	0		0	×	20 =	0	(6b)
Number of intermittent far	ns		_			4	x	10 =	40	(7a)
Number of passive vents						0	x	10 =	0	(7b)
Number of flueless gas fir	es					0	X	40 =	0	(7c)
								Δir ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans	= (6a)+(6b)+(7a	a)+(7b)+(	7c) =	Г	40		÷ (5) =	0.1	\(\begin{array}{c} (8) \\ \end{array}
If a pressurisation test has be	•				continue fi			. (0) –	0.1	
Number of storeys in th	e dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or tim	ber frame or	0.35 fo	r mason	ry consti	ruction			0	(11)
if both types of wall are pro deducting areas of opening			the great	er wall are	ea (after					_
If suspended wooden fl			1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else ente	r 0							0	(13)
Percentage of windows	and doors draug	ht stripped						•	0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (	12) + (13) +	- (15) =		0	(16)
Air permeability value, o	q50, expressed in	cubic metres	s per ho	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ty value, then (18)	$= [(17) \div 20] + (8)$	), otherw	se (18) =	(16)				0.35	(18)
Air permeability value applies	s if a pressurisation tes	st has been don	e or a de	gree air pe	ermeability	is being us	sed			
Number of sides sheltered	d			(22)		. = \ 7			2	(19)
Shelter factor					[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorporati				(21) = (18	3) x (20) =				0.3	(21)
Infiltration rate modified for	<del></del>	1 1		•		•		1	ı	
Jan Feb	Mar Apr N	1ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	eed from Table 7									

4.9

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

5.1

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	nd wind s	speed) =	= (21a) x	(22a)m					
0.38	0.38	0.37	0.33	0.32	0.29	0.29	0.28	0.3	0.32	0.34	0.35	]	
Calculate effect		•	rate for t	he appli	cable ca	se	-		•				(220
If exhaust air h			endix N. (2	(23a) = (23a	a) × Fmv (e	eguation (	N5)) othe	rwise (23h	n) = (23a)			0	(23a)
If balanced with									(200)			0	(23c)
a) If balance		•	-	_					2h)m + (	23h) 🗴 [	1 – (23c)		(230)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If balance	ed mech	∟ anical v∈	entilation	without	heat red	coverv (	1 MV) (24k	o)m = (22	2b)m + (	23b)		J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If whole h	ouse ex	tract ver	ntilation o	or positiv	ve input v	ventilati	on from (	outside	!	!	ļ	J	
	n < 0.5 ×			-	-				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural									_			-	
	n = 1, the	<del>-                                    </del>	· ·	·	·	<del> </del>	T	<del> </del>	T -		T	1	(0.4.4)
(24d)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56	J	(24d)
								v (25)					
Effective air			<del>`</del>	<u> </u>	<del>´``</del>	<del>ŕ `</del>	<del></del>	<del>``</del>	0.55		0.50	1	(05)
Effective air (25)m= 0.57	change 0.57	rate - er	o.55	0.55	0) or (24)	c) or (24 0.54	0.54	0.55	0.55	0.56	0.56	]	(25)
	0.57	0.57	0.55	0.55	<del>´``</del>	<del>ŕ `</del>	<del></del>	<del>``</del>	0.55	0.56	0.56		(25)
(25)m= 0.57	0.57	0.57 eat loss p	0.55	0.55 er:	<del>´``</del>	0.54 rea	<del></del>	0.55 ue	0.55 A X U (W/		0.56 k-value kJ/m²-		(25) A X k kJ/K
(25)m= 0.57 3. Heat losse	0.57 es and he Gros	0.57 eat loss p	0.55 paramete	0.55 er:	0.54 Net Ar	0.54 rea m²	0.54 U-val	0.55 ue 2K	AXU		k-value		AXk
(25)m= 0.57  3. Heat losse  ELEMENT	0.57 es and he Gros area	0.57 eat loss p	0.55 paramete	0.55 er:	0.54 Net Ar A ,r	0.54	U-val W/m2	0.55 ue 2K - 0.04] =	A X U (W/		k-value		A X k kJ/K
(25)m= 0.57  3. Heat losse  ELEMENT  Windows Type	0.57  os and he  Gros area  e 1	0.57 eat loss p	0.55 paramete	0.55 er:	0.54 Net Ar A ,r	0.54 rea m² x1	U-val W/m2	0.55 ue 2K - 0.04] =	A X U (W/		k-value		A X k kJ/K (27)
3. Heat losse  ELEMENT  Windows Type Windows Type	0.57  es and he  Gros area  e 1  e 2  e 3	0.57 eat loss p	0.55 paramete	0.55 er:	0.54  Net Ar A ,r 4.72	0.54  rea m² x1 x1	U-val W/m2 I/[1/( 1.4 )+	0.55  ue 2K  - 0.04] =   - 0.04] =	A X U (W/ 6.26		k-value		A X k kJ/K (27) (27)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type	0.57  es and he  Gros area  e 1  e 2  e 3	0.57 eat loss p	0.55 paramete	0.55 er:	0.54  Net Ar A ,r 4.72 2.29 4.51	0.54 rea m² x1 x1 x1	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+	0.55  ue 2K  - 0.04] =   - 0.04] =	A X U (W/ 6.26 3.04 5.98	K)	k-value		A X k kJ/K (27) (27) (27)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type Windows Type	0.57  es and he  Gros area  e 1  e 2  e 3	0.57 eat loss pass (m²)	0.55 paramete	0.55 er: gs <sub>12</sub>	0.54  Net Ar A ,r 4.72 2.29 4.51 2.26	0.54  rea m² x1 x1 x1 x1	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+	0.55  ue 2K  - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =	A X U (W/ 6.26 3.04 5.98	K)	k-value		A X k kJ/K (27) (27) (27) (27)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type Windows Type Windows Type Floor	0.57  Gros area e 1 e 2 e 3 e 4	0.57  eat loss pass (m²)	0.55 Openin m	0.55 er: gs <sub>12</sub>	0.54  Net Ar A ,r 4.72 2.29 4.51 2.26	0.54  rea m² x1 x1 x1 x1 x1 x1 x1	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ 0.13	0.55  ue 2K  - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =	A X U (W/ 6.26 3.04 5.98 3 2.0904	K)	k-value		A X k kJ/K (27) (27) (27) (27) (28)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type Windows Type Floor Walls Type1	0.57  es and he  Gros area e 1 e 2 e 3 e 4	0.57  eat loss page (m²)	Openin m	0.55 er: gs <sub>12</sub>	0.54  Net Ar A ,r 4.72 2.29 4.51 2.26 16.08	0.54  rea m² x1 x1 x1 x1 x1 x1 x1	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ 0.13 0.18	0.55  ue 2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =	A X U (W/ 6.26 3.04 5.98 3 2.0904 7.4 11.71	K)	k-value		A X k kJ/K (27) (27) (27) (27) (28) (29)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Type1	0.57  Gros area  1 2 2 2 3 3 4 4 66.6 65.0 4	0.57  eat loss page (m²)	0.55  Openin m  25.5	0.55 er: gs <sub>12</sub>	0.54  Net Ar A ,r 4.72 2.29 4.51 2.26 16.08 41.11 65.03	0.54  rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ 0.13 0.18 0.18	0.55  ue 2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =	A X U (W/ 6.26 3.04 5.98 3 2.0904 7.4 11.71 0.52	K)	k-value		A X k kJ/K (27) (27) (27) (28) (29) (29) (30)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Type1 Roof Type2	0.57  es and he  Gros area e 1 e 2 e 3 e 4  66.6  65.0  4  88.4	0.57  eat loss page (m²)	Openin m 25.5	0.55 er: gs <sub>12</sub>	0.54  Net Ar A ,r 4.72 2.29 4.51 2.26 16.08 41.11 65.03 4 88.47	0.54  rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ 0.13 0.18	0.55  ue 2K  - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	A X U (W/ 6.26 3.04 5.98 3 2.0904 7.4 11.71	K)	k-value		A X k kJ/K (27) (27) (27) (27) (28) (29) (29) (30) (30)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Roor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of e	0.57  es and he  Gros area e 1 e 2 e 3 e 4  66.6  65.0  4  88.4	0.57  eat loss page (m²)	0.55  Openin m  25.5	0.55 er: gs <sub>12</sub>	0.54  Net Ar A ,r 4.72 2.29 4.51 2.26 16.08 41.11 65.03 4 88.47 240.2	0.54  rea m² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ 0.13 0.18 0.13 0.13	0.55  ue 2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	A X U (W/ 6.26 3.04 5.98 3 2.0904 7.4 11.71 0.52 11.5	K)	k-value		A X k kJ/K (27) (27) (27) (28) (29) (29) (30) (30) (31)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Type1 Roof Type2	0.57  See and here Gross area  1	0.57  eat loss page (m²)  62  73  747  747	0.55  Openin m  25.5	0.55 er: gs 1	0.54  Net Ar A ,r 4.72 2.29 4.51 2.26 16.08 41.11 65.03 4 88.47 240.2 51.82	0.54  rea m² x1 x1 x1 x1 x1 x2 x x x x x x x	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ 0.13 0.18 0.13 0.13	0.55  ue 2K - 0.04] =   - 0.04	A X U (W/ 6.26 3.04 5.98 3 2.0904 7.4 11.71 0.52 11.5	K)	k-value kJ/m²-		A X k kJ/K (27) (27) (27) (27) (28) (29) (29) (30) (30)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of e Party wall	0.57  Gros area  9 1  9 2  9 3  9 4  66.6  65.0  4  88.4	0.57  eat loss page (m²)  32  33  47  ows, use e	0.55  Openin m  25.5  0  0  openin m  continuous settle continuous	0.55 er: gs 1	0.54  Net Ar A ,r 4.72 2.29 4.51 2.26 16.08 41.11 65.03 4 88.47 240.2 51.82 alue calcul	0.54  rea m² x1 x1 x1 x1 x1 x2 x x x x x x x	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ 0.13 0.18 0.13 0.13	0.55  ue 2K - 0.04] =   - 0.04	A X U (W/ 6.26 3.04 5.98 3 2.0904 7.4 11.71 0.52 11.5	K)	k-value kJ/m²-		A X k kJ/K (27) (27) (27) (28) (29) (29) (30) (30) (31)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of e Party wall * for windows and ** include the area Fabric heat los	0.57  Ses and he Gros area  1 1 2 2 2 3 3 4 4 66.6 65.0 4 88.4 88.4 88.4 88.4 88.4 88.4 88.4	0.57  eat loss part of the sides of irrespondence of the sides of irrespondence of the sides of	0.55  Openin m  25.5  0  0  otherwise the control of the control o	0.55 er: gs 1	0.54  Net Ar A ,r 4.72 2.29 4.51 2.26 16.08 41.11 65.03 4 88.47 240.2 51.82 alue calcul	0.54  rea m² x1 x1 x1 x1 x1 x2 x x x x x x x	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ 0.13 0.18 0.13 0.13	0.55  ue 2K - 0.04] =   - 0.04	A X U (W/ 6.26 3.04 5.98 3 2.0904 7.4 11.71 0.52 11.5	K)	k-value kJ/m²-		A X k kJ/K (27) (27) (27) (28) (29) (30) (31) (32)
3. Heat losse ELEMENT Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type1 Roof Type1 Roof Type2 Total area of e Party wall *for windows and *** include the area	0.57  See and he Gros area  1	0.57  eat loss part los part	0.55  Openin m  25.5  0  0  openin m	0.55 er: gs 1 Indow U-vals and part	0.54  Net Ar A ,r 4.72 2.29 4.51 2.26 16.08 41.11 65.03 4 88.47 240.2 51.82 alue calculatitions	0.54  rea m² x1 x1 x1 x1 x2 x2 x4 dated using	U-val W/m2 I/[1/( 1.4 )+ I/[1/( 1.4 )+ I/[1/( 1.4 )+ 0.13 0.18 0.13 0.13	0.55  ue 2K  - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =     =     =     =     =     + (32) =	A X U (W/ 6.26 3.04 5.98 3 2.0904 7.4 11.71 0.52 11.5	K)	k-value kJ/m²-	K	A X k kJ/K (27) (27) (27) (28) (29) (30) (31) (32)

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can be used instead of a detailed calculation.

Therm		<b>.</b>										ı		_
	nal bridge	•	,			•	<b>\</b>						20.67	(36)
	s of therma abric he		are not kn	own (36) =	= 0.15 X (3	1)			(33) +	(36) =		j	87.7	(37)
	ation hea		alculated	l monthly	,				` '	` '	(25)m x (5)		01.1	(07)
VOITE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	72.41	72.04	71.69	70.02	69.71	68.26	68.26	67.99	68.82	69.71	70.34	71		(38)
Heat t	ransfer o	roefficier	nt \/\/K						(39)m	= (37) + (	38)m			
(39)m=		159.75	159.39	157.73	157.42	155.97	155.97	155.7	156.52	157.42	158.05	158.71		
(55)						100101					Sum(39) <sub>1</sub>		157.73	(39)
Heat lo	oss para	meter (H	HLP), W	m²K				-		= (39)m ÷				
(40)m=	1.19	1.19	1.19	1.17	1.17	1.16	1.16	1.16	1.17	1.17	1.18	1.18		_
Numb	er of day	o in ma	oth (Toh	lo 1o\					,	Average =	Sum(40) <sub>1</sub>	.12 /12=	1.17	(40)
Nullib	Jan	Feb	Mar	<del></del>	May	Jun	Jul	Λιια	Sep	Oct	Nov	Dec		
(41)m=		28	31	Apr 30	May 31	30	31	Aug 31	30 30	31	30	31		(41)
(+1)111=	<u> </u>				01	00	01	01	- 00			01		(11)
4 \\/		lina ana	****									14\A/b /24	. O.W.	
4. VV	ater heat	ing enei	rgy requi	rement:								kWh/ye	ear:	
	ned occu										2.	91		(42)
	FA > 13.9 FA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)	)2)] + 0.0	0013 x (	ΓFA -13.	.9)			
	al averag	•	ater usag	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		10	3.2		(43)
	the annua	_				_	_	o achieve	a water us	se target o	f			
not mor	e that 125								_			_		
Hot wat	Jan ter usage ii	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
		109.4	· · · · · ·	101.14	97.01	92.88	92.88	97.01			1	113.52		
(44)m=	113.52	109.4	105.27	101.14	97.01	92.00	92.00		101 11	105 27	1 100 1			
Energy	content of	hot water	used - cal					07.01	101.14	105.27	109.4		1238 44	<b>—</b> (44)
(45)m=	168.35			culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x D		-	L Total = Su	109.4 m(44) <sub>112</sub> = ables 1b, 1		1238.44	(44)
		147.24	151.94	culated mo	127.1	190 x Vd,n	m x nm x D 101.64		-	L Total = Su	m(44) <sub>112</sub> =		1238.44	(44)
		147.24						)Tm / 3600	kWh/mor 118.02	Total = Su oth (see Ta 137.54	m(44) <sub>112</sub> = ables 1b, 1c	c, 1d)	1238.44	(44)
If instan	ntaneous w		151.94	132.47	127.1	109.68	101.64	0Tm / 3600 116.63	kWh/mor 118.02	Total = Su oth (see Ta 137.54	m(44) <sub>112</sub> = ables 1b, 1c	c, 1d)		` ^
(46)m=	25.25	rater heatii 22.09	151.94	132.47	127.1	109.68	101.64	0Tm / 3600 116.63	kWh/mor 118.02	Total = Su oth (see Ta 137.54	m(44) <sub>112</sub> = ables 1b, 1c	c, 1d)		` ^
(46)m= Water	25.25 storage	vater heatil 22.09 IOSS:	151.94 ng at point 22.79	132.47 of use (no	127.1 hot water 19.07	109.68 storage),	101.64 enter 0 in 15.25	DTm / 3600 116.63 boxes (46) 17.49	118.02 1 to (61)	Total = Su  oth (see Ta  137.54  Total = Su  20.63	m(44) <sub>112</sub> = ables 1b, 1c   150.14   m(45) <sub>112</sub> = 22.52	163.04 24.46		(45)
(46)m= Water Storag	25.25 storage ge volum	22.09 loss: e (litres)	151.94  ng at point 22.79  includir	132.47  of use (not) 19.87  ng any so	127.1 hot water 19.07	109.68 storage), 16.45	101.64  enter 0 in  15.25  storage	27m / 3600 116.63 boxes (46, 17.49 within sa	118.02 1 to (61)	Total = Su  oth (see Ta  137.54  Total = Su  20.63	m(44) <sub>112</sub> = ables 1b, 1c   150.14   m(45) <sub>112</sub> = 22.52	163.04		(45)
(46)m= Water Storag	25.25 storage ge volum munity h	22.09 loss: e (litres)	151.94  ng at point 22.79  includir and no ta	132.47  of use (not) 19.87  ng any so	127.1  2 hot water 19.07  Dlar or W velling, e	109.68 * storage), 16.45 /WHRS :	enter 0 in 15.25 storage	27m / 3600 116.63 boxes (46, 17.49 within sa (47)	118.02 1 to (61) 17.7	Total = Su  oth (see Ta  137.54  Total = Su  20.63  sel	m(44) <sub>112</sub> = ables 1b, 1c 150.14 m(45) <sub>112</sub> =	163.04 24.46		(45)
(46)m= Water Storag	25.25 storage ge volum	22.09 loss: le (litres) leating a	151.94  ng at point 22.79  includir and no ta	132.47  of use (not) 19.87  ng any so	127.1  2 hot water 19.07  Dlar or W velling, e	109.68 * storage), 16.45 /WHRS :	enter 0 in 15.25 storage	27m / 3600 116.63 boxes (46, 17.49 within sa (47)	118.02 1 to (61) 17.7	Total = Su  oth (see Ta  137.54  Total = Su  20.63  sel	m(44) <sub>112</sub> = ables 1b, 1c 150.14 m(45) <sub>112</sub> =	163.04 24.46		(45)
(46)m= Water Storag If com Other Water	25.25 storage ge volum munity h	22.09 loss: e (litres) eating a stored loss:	151.94  ng at point 22.79  includir and no ta hot wate	132.47  of use (not) 19.87  ng any so nk in dw er (this in	127.1 19.07 Dlar or Welling, e	109.68  storage), 16.45  /WHRS: nter 110 nstantan	enter 0 in 15.25 storage	27m / 3600 116.63 boxes (46, 17.49 within sa (47)	118.02 1 to (61) 17.7	Total = Su  oth (see Ta  137.54  Total = Su  20.63  sel	m(44) <sub>112</sub> = ables 1b, 1c   150.14   m(45) <sub>112</sub> = 22.52	163.04 24.46		(45)
(46)m= Water Storag If com Other Water a) If n	25.25 storage ge volum munity h wise if no storage	22.09 loss: e (litres) eating a o stored loss: urer's de	151.94  ng at point 22.79  includir and no ta hot wate	132.47  of use (not) 19.87  ng any so ank in dwer (this in oss factors)	127.1 19.07 Dlar or Welling, e	109.68  storage), 16.45  /WHRS: nter 110 nstantan	enter 0 in 15.25 storage	27m / 3600 116.63 boxes (46, 17.49 within sa (47)	118.02 1 to (61) 17.7	Total = Su  oth (see Ta  137.54  Total = Su  20.63  sel	m(44) <sub>112</sub> = ables 1b, 1c   150.14   m(45) <sub>112</sub> = 22.52	24.46		(45) (46) (47)
(46)m= Water Storag If com Other Water a) If n Tempe Energy	25.25 storage ge volum munity h wise if no storage nanufact erature fi	22.09 loss: le (litres) leating a lostored loss: lurer's de lactor fro	151.94  ng at point 22.79  includir and no ta hot wate eclared I m Table	132.47  of use (not) 19.87  ng any so nk in dw er (this in) oss facto 2b	127.1  2 hot water 19.07  Dlar or Water velling, eacludes in the control of the c	109.68 r storage), 16.45 /WHRS : nter 110 nstantan	enter 0 in 15.25 storage of litres in neous con/day):	27m / 3600 116.63 boxes (46, 17.49 within sa (47)	118.02 1 to (61) 17.7 17.7 17.7 17.7 17.7	Total = Su  oth (see Ta  137.54  Total = Su  20.63  sel	m(44) <sub>112</sub> = m(44) <sub>112</sub> = 150.14 m(45) <sub>112</sub> = 22.52	24.46		(45) (46) (47) (48)
(46)m= Water Storag If com Othero Water a) If n Tempe Energy b) If n	25.25 storage ge volum munity h wise if no storage nanufact erature for	22.09 loss: le (litres) leating a loss: urer's de lactor fro lactor fro urer's de	151.94  ng at point 22.79  includir and no ta hot wate eclared I m Table storage	132.47  of use (not) 19.87  ng any so nk in dw er (this in coss facto 2b cylinder l	127.1  19.07  Dlar or Welling, encludes in the control of the cont	109.68  storage), 16.45  /WHRS: nter 110 nstantan wn (kWh	enter 0 in 15.25 storage of litres in neous con/day): known:	116.63 boxes (46, 17.49 within sa (47)	118.02 1 to (61) 17.7 17.7 17.7 17.7 17.7	Total = Su  oth (see Ta  137.54  Total = Su  20.63  sel	m(44) <sub>112</sub> = ables 1b, 1c   150.14   m(45) <sub>112</sub> = 22.52	24.46		(45) (46) (47) (48) (49) (50)
(46)m= Water Storag If com Other Water a) If n Tempe Energy b) If n Hot wa	25.25 storage ge volum munity h wise if no storage nanufact erature fi y lost fro nanufact ater stora	22.09 Toss:  e (litres) teating a control toss: turer's defined actor from water turer's defined age loss	151.94  ng at point 22.79  includir and no ta hot wate eclared I m Table storage eclared of	132.47  of use (not) 19.87  ng any so ank in dw er (this in) coss facto 2b c, kWh/ye cylinder l	127.1  19.07  Dlar or Welling, encludes in the control of the cont	109.68  storage), 16.45  /WHRS: nter 110 nstantan wn (kWh	enter 0 in 15.25 storage of litres in neous con/day): known:	116.63 boxes (46, 17.49 within sa (47)	118.02 1 to (61) 17.7 17.7 17.7 17.7 17.7	Total = Su  oth (see Ta  137.54  Total = Su  20.63  sel	m(44) <sub>112</sub> = ables 1b, 1c   150.14   m(45) <sub>112</sub> = 22.52	24.46		(45) (46) (47) (48) (49)
(46)m= Water Storag If com Other Water a) If n Tempe Energy b) If n Hot wa	25.25 storage ge volum munity h wise if no storage nanufact erature for	22.09 loss: e (litres) eating a o stored loss: urer's de actor fro m water urer's de age loss eating s	151.94  ng at point 22.79  includir and no ta hot wate eclared I m Table estorage eclared of	132.47  of use (not) 19.87  ng any so ank in dw er (this in) coss facto 2b c, kWh/ye cylinder l	127.1  19.07  Dlar or Welling, encludes in the control of the cont	109.68  storage), 16.45  /WHRS: nter 110 nstantan wn (kWh	enter 0 in 15.25 storage of litres in neous con/day): known:	116.63 boxes (46, 17.49 within sa (47)	118.02 1 to (61) 17.7 17.7 17.7 17.7 17.7	Total = Su  oth (see Ta  137.54  Total = Su  20.63  sel	m(44) <sub>112</sub> = ables 1b, 1c   150.14   m(45) <sub>112</sub> = 22.52	24.46		(45) (46) (47) (48) (49) (50)
(46)m= Water Storag If com Other Water a) If n Tempe Energy b) If n Hot wa If com Volum	25.25 storage ge volum munity h wise if no storage nanufact erature fi y lost fro nanufact ater stora munity h	22.09 loss: e (litres) eating a stored loss: urer's de actor fro m water urer's de age loss eating s from Ta	151.94  ng at point 22.79  includir and no ta hot wate eclared I m Table storage eclared of factor fr see section	132.47  of use (not) 19.87  ng any so ink in dw er (this in oss facto 2b cylinder I com Tabl on 4.3	127.1  19.07  Dlar or Welling, encludes in the control of the cont	109.68  storage), 16.45  /WHRS: nter 110 nstantan wn (kWh	enter 0 in 15.25 storage of litres in neous con/day): known:	116.63 boxes (46, 17.49 within sa (47)	118.02 1 to (61) 17.7 17.7 17.7 17.7 17.7	Total = Su  oth (see Ta  137.54  Total = Su  20.63  sel	m(44) <sub>112</sub> = ables 1b, 1c   150.14   m(45) <sub>112</sub> = 22.52	24.46		(45) (46) (47) (48) (49) (50) (51)

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (	53) =	(	0		(54)
Enter (50) or (54) in (55)			(	)		(55)
Water storage loss calculated for each month	((56)m = $(55)$ × $(41)$ n	m				
(56)m= 0 0 0 0 0 0	0 0	0	0	0		(56)
If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] = (56)m \times [(50) -$	(50), else (57)m = (56)	m where (H	l11) is fro	m Append	ix H	
(57)m= 0 0 0 0 0 0 0	0 0	0	0	0		(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 he	ating and a cylinde	r thermos	tat)			
(59)m= 0 0 0 0 0 0	0 0	0	0	0		(59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (60)$	41)m					
(61)m= 50.96 46.03 50.96 49.32 49.44 45.81 47.3	3 49.44 49.32	50.96	49.32	50.96		(61)
Total heat required for water heating calculated for each mor	$nth (62)m = 0.85 \times ($	(45)m + (4	46)m +	(57)m +	(59)m + (61)m	
(62)m= 219.31 193.27 202.9 181.78 176.54 155.49 148.9	<del></del>	188.5	199.45	214		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative qual	ntity) (enter '0' if no sola	r contributio	n to wate	r 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		(63)
Output from water heater	•	•				
(64)m= 219.31 193.27 202.9 181.78 176.54 155.49 148.9	97 166.06 167.34	188.5	199.45	214		
	Output from wa	ater heater (	(annual) <sub>1.</sub>	12	2213.61	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45	s)m + (61)m] + 0.8 x	κ [(46)m +	- (57)m	+ (59)m	1	-
(65)m= 68.72 60.46 63.26 56.37 54.62 47.92 45.6	<del>`                                    </del>	<del>-`` /</del> -	62.25		1	
	0   01   01.07	58.47	62.23	66.95		(65)
include (57)m in calculation of (65)m only if cylinder is in the		LL			eating	(65)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):		LL			eating	(65)
5. Internal gains (see Table 5 and 5a):		LL			eating	(65)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	ne dwelling or hot w	rater is fro	om com	munity h	eating	(65)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	ne dwelling or hot w	rater is fro	om com	munity h	eating	(65)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 145.27 145.27 145.27 145.27 145.27 145.27 145.27	Aug Sep	rater is fro	om com	munity h	eating	
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 145.27 145.27 145.27 145.27 145.27 145.27 145.27 145.27 145.27	Aug Sep 1 145.27 145.27 1, also see Table 5	Oct 145.27	Nov 145.27	Dec 145.27	eating	(66)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 145.27 145.	Aug Sep 1 45.27 145.27 1, also see Table 5 2 13.26 17.8	Oct 145.27	om com	munity h	eating	
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 145.27 145	Aug Sep 1 Aug Sep 27 145.27 145.27 1, also see Table 5 2 13.26 17.8 L13a), also see Ta	Oct 145.27 22.6 ble 5	Nov 145.27 26.38	Dec 145.27	eating	(66) (67)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 145.27 145.27 145.27 145.27 145.27 145.27 145.27 145.27  Lighting gains (calculated in Appendix L, equation L9 or L9a)  (67)m= 27.36 24.3 19.76 14.96 11.18 9.44 10.2  Appliances gains (calculated in Appendix L, equation L13 or (68)m= 302.87 306.01 298.09 281.23 259.95 239.94 226.5	Aug Sep 1 Aug Sep 27 145.27 145.27 1, also see Table 5 2 13.26 17.8 1, also see Table 5 2 2 13.26 2 17.8 1, also see Table 5 2 2 3.44 231.36	Oct 145.27 22.6 ble 5 248.22	Nov 145.27	Dec 145.27	eating	(66)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 145.27 145.27 145.27 145.27 145.27 145.27 145.27  Lighting gains (calculated in Appendix L, equation L9 or L9a)  (67)m= 27.36 24.3 19.76 14.96 11.18 9.44 10.2  Appliances gains (calculated in Appendix L, equation L13 or (68)m= 302.87 306.01 298.09 281.23 259.95 239.94 226.5  Cooking gains (calculated in Appendix L, equation L15 or L15)	Aug Sep 27 145.27 145.27  , also see Table 5 2 13.26 17.8  L13a), also see Table 58 223.44 231.36  5a), also see Table	Oct 145.27 22.6 ble 5 248.22 5 5	Nov 145.27 26.38	Dec 145.27 28.12 289.5	eating	(66) (67) (68)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 145.27 145.27 145.27 145.27 145.27 145.27 145.27 145.27  Lighting gains (calculated in Appendix L, equation L9 or L9a)  (67)m= 27.36 24.3 19.76 14.96 11.18 9.44 10.2  Appliances gains (calculated in Appendix L, equation L13 or (68)m= 302.87 306.01 298.09 281.23 259.95 239.94 226.5  Cooking gains (calculated in Appendix L, equation L15 or L15 of	Aug Sep 27 145.27 145.27  , also see Table 5 2 13.26 17.8  L13a), also see Table 58 223.44 231.36  5a), also see Table	Oct 145.27 22.6 ble 5 248.22	Nov 145.27 26.38	Dec 145.27	eating	(66) (67)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 145.27 145.	Aug Sep 145.27 145.27 145.27 145.27 17.8 L13a), also see Table 5 2 13.26 17.8 L13a), also see Table 55a), also see Table 3 37.53 37.53	Oct 145.27 22.6 ble 5 248.22 5 37.53	Nov 145.27 26.38 269.5	Dec 145.27 28.12 289.5 37.53	eating	(66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 145.27 145.	Aug Sep 27 145.27 145.27  , also see Table 5 2 13.26 17.8  L13a), also see Table 58 223.44 231.36  5a), also see Table	Oct 145.27 22.6 ble 5 248.22 5 5	Nov 145.27 26.38	Dec 145.27 28.12 289.5	eating	(66) (67) (68)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul  (66)m= 145.27 145.27 145.27 145.27 145.27 145.27 145.27 145.27  Lighting gains (calculated in Appendix L, equation L9 or L9a)  (67)m= 27.36 24.3 19.76 14.96 11.18 9.44 10.2  Appliances gains (calculated in Appendix L, equation L13 or (68)m= 302.87 306.01 298.09 281.23 259.95 239.94 226.5  Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 37.53 37.53 37.53 37.53 37.53 37.53 37.53 37.53  Pumps and fans gains (Table 5a)  (70)m= 3 3 3 3 3 3 3 3 3 3  Losses e.g. evaporation (negative values) (Table 5)	Aug Sep 1 Aug Sep 27 145.27 145.27 1, also see Table 5 2 13.26 17.8 1, also see Table 5 2 23.44 231.36 5a), also see Table 3 37.53 3 3 3	22.6 ble 5 248.22 5 37.53	Nov 145.27 26.38 269.5 37.53	Dec 145.27 28.12 289.5 37.53	eating	(66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 145.27 145.	Aug Sep 1 Aug Sep 27 145.27 145.27 1, also see Table 5 2 13.26 17.8 1, also see Table 5 2 23.44 231.36 5a), also see Table 3 37.53 3 3 3	22.6 ble 5 248.22 5 37.53	Nov 145.27 26.38 269.5	Dec 145.27 28.12 289.5 37.53	eating	(66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 145.27 145.	Aug Sep 1 Aug Sep 27 145.27 145.27 1, also see Table 5 2 13.26 17.8 L13a), also see Ta 58 223.44 231.36 5a), also see Table 3 37.53 37.53  3 3  22 -116.22 -116.22	22.6 ble 5 248.22 5 37.53	Nov 145.27 26.38 269.5 37.53	Dec 145.27 28.12 289.5 37.53 3	eating	(66) (67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 145.27 145.	Aug Sep 145.27 145.27 145.27 145.27 145.27 17.8 13.26 17.8 14.36 17.8 14.36 17.8 14.36 15.3 13.3 13.3 13.3 13.3 13.3 13.3 13.3	22.6 ble 5 248.22 5 37.53 3 -116.22 78.59	Nov 145.27 26.38 269.5 37.53 3 -116.22	Dec 145.27 28.12 289.5 37.53 3 -116.22 89.99	eating	(66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 145.27 145.	Aug Sep 145.27 145.27 145.27 145.27 145.27 17.8 17.8 17.8 17.8 17.8 17.8 17.8 17.	22.6 ble 5 248.22 5 37.53 3 -116.22 78.59	Nov 145.27 26.38 269.5 37.53 3 -116.22	Dec 145.27 28.12 289.5 37.53 3 -116.22 89.99 m	eating	(66) (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 (66)m= 145.27 145.	Aug Sep 145.27 145.27 145.27 145.27 145.27 17.8 17.8 17.8 17.8 17.8 17.8 17.8 17.	22.6 ble 5 248.22 5 37.53 3 -116.22 78.59	Nov 145.27 26.38 269.5 37.53 3 -116.22	Dec 145.27 28.12 289.5 37.53 3 -116.22 89.99	eating	(66) (67) (68) (69) (70)

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

Orientation	: Access Factor Table 6d	or	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East 0	9x 1	x	4.51	x	19.64	x	0.63	x	0.7	=	27.07	(76)
East 0	.9x 1	X	2.26	x	19.64	X	0.63	x	0.7	=	13.57	(76)
East 0	.9x 1	X	4.51	x	38.42	X	0.63	x	0.7	=	52.96	(76)
East 0	.9x 1	x	2.26	x	38.42	x	0.63	x	0.7	=	26.54	(76)
East 0	.9x 1	X	4.51	x	63.27	X	0.63	x	0.7	=	87.21	(76)
East 0	.9x 1	X	2.26	x	63.27	x	0.63	x	0.7	=	43.7	(76)
East 0	.9x 1	x	4.51	x	92.28	x	0.63	x	0.7	=	127.19	(76)
East 0	.9x 1	X	2.26	x	92.28	X	0.63	X	0.7	=	63.74	(76)
East 0	.9x 1	X	4.51	x	113.09	x	0.63	x	0.7	=	155.88	(76)
East 0	9x 1	X	2.26	X	113.09	X	0.63	X	0.7	=	78.11	(76)
East 0	.9x 1	X	4.51	X	115.77	x	0.63	x	0.7	=	159.57	(76)
East 0	.9x 1	X	2.26	x	115.77	X	0.63	X	0.7	=	79.96	(76)
East 0	.9x 1	X	4.51	x	110.22	x	0.63	X	0.7	=	151.92	(76)
East 0	.9x 1	X	2.26	X	110.22	x	0.63	x	0.7	=	76.13	(76)
East 0	.9x 1	X	4.51	x	94.68	x	0.63	x	0.7	=	130.49	(76)
East 0	.9x 1	X	2.26	x	94.68	x	0.63	X	0.7	=	65.39	(76)
East 0	.9x 1	X	4.51	X	73.59	x	0.63	x	0.7	=	101.43	(76)
East 0	.9x 1	X	2.26	X	73.59	x	0.63	x	0.7	=	50.83	(76)
East 0	.9x 1	X	4.51	X	45.59	x	0.63	x	0.7	=	62.84	(76)
East 0	.9x 1	X	2.26	X	45.59	x	0.63	x	0.7	=	31.49	(76)
East 0	.9x 1	X	4.51	X	24.49	x	0.63	X	0.7	=	33.75	(76)
East 0	.9x 1	X	2.26	X	24.49	X	0.63	X	0.7	=	16.91	(76)
East 0	.9x 1	X	4.51	X	16.15	X	0.63	X	0.7	=	22.26	(76)
	.9x 1	X	2.26	X	16.15	X	0.63	X	0.7	=	11.16	(76)
	.9x 0.77	X	4.72	X	19.64	X	0.63	X	0.7	=	84.99	(80)
	.9x 0.77	X	2.29	X	19.64	x	0.63	X	0.7	=	27.49	(80)
	.9x 0.77	X	4.72	X	38.42	X	0.63	X	0.7	=	166.26	(80)
	.9x 0.77	X	2.29	X	38.42	x	0.63	X	0.7	=	53.78	(80)
	.9x 0.77	X	4.72	X	63.27	X	0.63	X	0.7	=	273.81	(80)
	.9x 0.77	X	2.29	X	63.27	X	0.63	X	0.7	=	88.56	(80)
	.9x 0.77	X	4.72	X	92.28	X	0.63	X	0.7	=	399.34	(80)
	.9x 0.77	X	2.29	X	92.28	X	0.63	X	0.7	=	129.17	(80)
	.9x 0.77	X	4.72	X	113.09	X	0.63	X	0.7	=	489.41	(80)
	.9x 0.77	X	2.29	X	113.09	X	0.63	X	0.7	=	158.3	(80)
	.9x 0.77	X	4.72	X	115.77	X	0.63	X	0.7	=	500.99	(80)
	.9x 0.77	X	2.29	x	115.77	х	0.63	X	0.7	=	162.04	(80)
	.9x 0.77	X	4.72	X	110.22	X	0.63	X	0.7	=	476.97	(80)
	.9x 0.77	X	2.29	X	110.22	X	0.63	X	0.7	=	154.27	(80)
West 0	.9x 0.77	X	4.72	X	94.68	Х	0.63	X	0.7	=	409.71	(80)

	_					_											_
West	0.9x	0.77	Х	2.2	29	x	9	4.68	X		0.63	x	0.7		=	132.52	(80)
West	0.9x	0.77	Х	4.7	72	x	7:	3.59	X		0.63	x [	0.7		=	318.46	(80)
West	0.9x	0.77	X	2.2	29	x [	7:	3.59	X		0.63	x [	0.7		=	103	(80)
West	0.9x	0.77	Х	4.7	72	x	4:	5.59	x		0.63	х	0.7		=	197.29	(80)
West	0.9x	0.77	x	2.2	29	×	4:	5.59	x		0.63	x	0.7		=	63.81	(80)
West	0.9x	0.77	x	4.7	72	x [	2	4.49	х		0.63	x	0.7	司	=	105.98	(80)
West	0.9x	0.77	x	2.2	29	x [	2	4.49	x		0.63	x	0.7		=	34.28	(80)
West	0.9x	0.77	x	4.7	72	×	10	6.15	x		0.63	x	0.7		=	69.89	(80)
West	0.9x	0.77	x	2.2	29	× [	10	6.15	x		0.63	_ x [	0.7	司	=	22.61	(80)
	-								_								_
Solar	gains in	watts, ca	alculated	d for eac	h month	ı			(83)m	= Su	ım(74)m .	(82)m					
(83)m=	153.12	299.53	493.29	719.43	881.69	$\overline{}$	2.57	859.28	738.	11	573.72	355.42	190.92	125.9	92		(83)
Total g	gains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (8	3)m ,	watts					1			l	
(84)m=	645.29	789.4	965.75	1163.5	1295.82	128	88.09	1226.97	1113	.12	964.08	774.41	642.84	603.1	11		(84)
7 Me	an inter	nal temp	erature	(heating	season	)	,							•			
		during h		,		<i></i>	aroa f	rom Tah	olo 0	Th1	(°C)					21	(85)
-		•	٠.			_			ле э,	1111	( 0)					21	(00)
Utilisa		tor for g			I	Ť			۸.	[	0	0-4	Navi				
(2.5)	Jan	Feb	Mar	Apr	May	_	Jun 	Jul	Αι	<del>-  </del>	Sep	Oct	Nov	De	C		(00)
(86)m=	1	1	0.99	0.96	0.88	0	.71	0.55	0.62	2	0.88	0.99	1	1			(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollov	w step	os 3 to 7	in Ta	able	9c)						
(87)m=	19.59	19.76	20.06	20.45	20.77	20	0.94	20.99	20.9	98	20.84	20.39	19.92	19.5	7		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwe	elling	from Ta	ble 9	), Th	2 (°C)						
(88)m=	19.93	19.93	19.93	19.94	19.94	_	9.95	19.95	19.9	_	19.95	19.94	19.94	19.9	3		(88)
l Itilie	ation fac	tor for g	aine for	rost of d	welling	h2 r	m (so	o Tablo	02)							l	
(89)m=	1	1	0.99	0.95	0.83	_	.62	0.42	0.49	a T	0.81	0.98	1	1			(89)
				<u> </u>	l	<u> </u>							<u> </u>				()
		l temper		the rest	1	Ť	<del>`</del>		_	$\overline{}$	in Tabl					1	
(90)m=	18.04	18.29	18.72	19.29	19.72	19	9.91	19.95	19.9	94	19.81	19.22	18.52	18.0	1		(90)
											f	LA = Livir	ng area ÷ (4	4) =		0.29	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llinc	a) = fL	A × T1	+ (1 -	– fL/	A) × T2						
(92)m=	18.49	18.72	19.11	19.63	20.03	T	0.22	20.25	20.2	-	20.11	19.56	18.93	18.4	6		(92)
Apply	adiustr	nent to tl	he mear	interna	l temper	atur	re froi	m Table	4e. v	wher	re appro	priate	Ţ	ļ			
(93)m=	18.49	18.72	19.11	19.63	20.03	_	0.22	20.25	20.2	$\overline{}$	20.11	19.56	18.93	18.4	6		(93)
8. Sp	ace hea	ting requ	uiremen	t										<u> </u>			
•					re obtair	ned	at ste	ep 11 of	Table	e 9b	. so tha	t Ti.m=(	76)m an	d re-c	alc	culate	
		factor fo						, p			, 00	•, (	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	Jg	Sep	Oct	Nov	De	С		
Utilisa	ation fac	tor for g	ains, hm	n:	•	•	•						•	•			
(94)m=	1	1	0.99	0.95	0.84	0	.64	0.46	0.53	3	0.82	0.98	1	1			(94)
Usefu	ıl gains,	hmGm ,	W = (9	4)m x (8	4)m	•	•			•			•	•		'	
(95)m=	644.3	786.09	951.78	1099.59	1084.24	83	0.33	562.77	586.	07	792.71	755.95	640.67	602.4	45		(95)
Month	hly aver	age exte	rnal tem	perature	from T	able	8						-	•		•	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.4	4	14.1	10.6	7.1	4.2			(96)
Heat	loss rate	e for mea	an interr	nal tempe	erature,	Lm	, W =	:[(39)m :	x [(93	3)m–	- (96)m	]		-		•	
(97)m=	2272.46	2207.52	2010.75	1692.68	1310.88	87	5.76	569.47	598.	.9	940.8	1410.48	1870	2263.	.45		(97)
		•		•	•	•							•	•		•	

98)m=   1211.35   955.2	787.87	427.02	168.62	ı	0		<u> </u>	)m] x (4 486.97	885.12	1235.78		
98)m= 1211.35 955.2	787.87	427.02	168.62	0	0	0 Tota	0 I per vear		r) = Sum(9	<u> </u>	6157.94	(98)
Space heating requi	rement in	kWh/m²	2/vear			7010	ii poi youi	(ittiii) you	) – Cam(c	C)15,912 —	45.84	(99)
Pa. Energy requireme				vetome i	neludina	miero C	,⊓D/			L	40.04	
Space heating:	ilis – iliu	iividuai 11	calling s	ysterns i	ricidaling	i illicio-c	)					
Fraction of space he	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction of space he	at from n	nain syst	tem(s)			(202) = 1 -	- (201) =			Ī	1	(202)
Fraction of total hea	ting from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		Ī	1	(204)
Efficiency of main sp	ace heat	ting syste	em 1								93.4	(206)
Efficiency of second	ary/suppl	ementar	y heating	g system	າ, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requi	<del></del>	1	·	i		ı	1	ı	1			
1211.35 955.2	787.87	427.02	168.62	0	0	0	0	486.97	885.12	1235.78		
$(211)$ m = { $((98)$ m x (2)	<del></del>	<del>- ` </del>	<del></del>					504.00	0.47.00	4000 44		(211)
1296.95 1022.7	843.55	457.2	180.54	0	0	0 Tota	0 L(k\/\h/vea	521.38 ar) =Sum(1	947.66	1323.11	6593.08	(211
Space heating fuel ( = {[(98)m x (201)] } x		• /	month									
215)m= 0 0	0	0	0	0	0	0	0	0	0	0		
Z13)III= 0   0	0		0	0	0	_		_	0	_	0	(215
Water heating	1 -	0	1	0	0	_		_	,	_	0	(215
Water heating	ater (calc	0	1	0 155.49	0	_		_	,	_	0	(215
Water heating Dutput from water he	ater (calc	0 culated a	bove)			Tota	I (kWh/yea	L ar) =Sum(2	215) <sub>15,1012</sub>	<i>=</i>	80.3	(215
Water heating Dutput from water he 219.31 193.27 Efficiency of water he	ater (calc	0 culated a	bove)			Tota	I (kWh/yea	L ar) =Sum(2	215) <sub>15,1012</sub>	<i>=</i>		(216
Water heating Dutput from water he 219.31 193.27  Efficiency of water he 217)m= 88.69 88.53  Fuel for water heating	ater (calc 202.9 ater 88.13 g, kWh/m	0 culated a 181.78 87.13 onth	bove)	155.49	148.97	Tota	167.34	188.5	215) <sub>15,1012</sub>	214		(216
Vater heating  Output from water he  219.31 193.27  Efficiency of water he  217)m= 88.69 88.53  Fuel for water heating 219)m = (64)m x 10	ater (calc 202.9 ater 88.13 g, kWh/m	0 culated a 181.78 87.13 onth	bove)	155.49	148.97	Tota 166.06 80.3	1 (kWh/yea 167.34 80.3	188.5 87.33	215) <sub>15,1012</sub>	214	80.3	(216 (217
Water heating  Dutput from water he  219.31 193.27  Efficiency of water he  217)m= 88.69 88.53  Fuel for water heating  219)m = (64)m x 10  219)m= 247.28 218.32	ater (calc 202.9 ater 88.13 g, kWh/m	0 culated a 181.78 87.13 onth )m	bove) 176.54 84.94	155.49	148.97	Tota 166.06 80.3	1 (kWh/yea 167.34 80.3	188.5 87.33 215.84 19a) <sub>112</sub> =	215) <sub>15,1012</sub> 199.45 88.36	214 88.75	80.3 2589.35	(216 (217 (219
Water heating  Dutput from water he  219.31 193.27  Efficiency of water he  217)m= 88.69 88.53  Fuel for water heating 219)m = (64)m x 10 219)m= 247.28 218.32  Annual totals	ater (calc 202.9 ater 88.13 g, kWh/m 00 ÷ (217 230.23	0 culated a 181.78 87.13 onth )m 208.64	bove) 176.54 84.94 207.85	155.49	148.97	Tota 166.06 80.3	1 (kWh/yea 167.34 80.3	188.5 87.33 215.84 19a) <sub>112</sub> =	215) <sub>15,1012</sub> 199.45	214 88.75	80.3 2589.35 <b>kWh/yea</b>	(216 (217 (219
Water heating Dutput from water he  219.31 193.27  Efficiency of water he  217)m= 88.69 88.53  Fuel for water heating 219)m = (64)m x 10 219)m= 247.28 218.32  Annual totals  Space heating fuel us	ater (calc 202.9 ater 88.13 g, kWh/m 00 ÷ (217 230.23	0 culated a 181.78 87.13 onth )m 208.64	bove) 176.54 84.94 207.85	155.49	148.97	Tota 166.06 80.3	1 (kWh/yea 167.34 80.3	188.5 87.33 215.84 19a) <sub>112</sub> =	215) <sub>15,1012</sub> 199.45 88.36	214 88.75	2589.35 <b>kWh/yea</b> 6593.08	(216)
Vater heating Dutput from water he 219.31 193.27 Efficiency of water he 217)m= 88.69 88.53 Fuel for water heating 219)m = (64)m x 10 219)m= 247.28 218.32 Annual totals Epace heating fuel us Vater heating fuel us	ater (calconditions) ater  88.13 g, kWh/m 00 ÷ (217 230.23  seed, main ed	87.13 onth )m 208.64	bove) 176.54 84.94 207.85	80.3 193.63	148.97	Tota 166.06 80.3	1 (kWh/yea 167.34 80.3	188.5 87.33 215.84 19a) <sub>112</sub> =	215) <sub>15,1012</sub> 199.45 88.36	214 88.75	80.3 2589.35 <b>kWh/yea</b>	(216)
Water heating Dutput from water he  219.31 193.27  Efficiency of water he  217)m= 88.69 88.53  Fuel for water heating 219)m = (64)m x 10 219)m= 247.28 218.32  Annual totals  Space heating fuel us  Water heating fuel us  Electricity for pumps,	ater (calcomplete) 202.9 ater 88.13 g, kWh/m 00 ÷ (217 230.23  sed, main ed fans and	87.13 onth )m 208.64	bove) 176.54 84.94 207.85	80.3 193.63	148.97	Tota 166.06 80.3	1 (kWh/yea 167.34 80.3	188.5 87.33 215.84 19a) <sub>112</sub> =	215) <sub>15,1012</sub> 199.45 88.36	214 88.75	2589.35 <b>kWh/yea</b> 6593.08	(216 (217 (219
Vater heating Dutput from water he 219.31 193.27 Efficiency of water he 217)m= 88.69 88.53 Fuel for water heating 219)m = (64)m x 10 219)m= 247.28 218.32 Annual totals Space heating fuel us Vater heating fuel us Electricity for pumps, central heating pum	ater (calcomplete (calcomplete) 202.9  ater 88.13  g, kWh/m 200 ÷ (217) 230.23  seed, main ed fans and p:	eulated a 181.78 87.13 onth m 208.64 system electric	bove) 176.54 84.94 207.85	80.3 193.63	148.97	Tota 166.06 80.3	1 (kWh/yea 167.34 80.3	188.5 87.33 215.84 19a) <sub>112</sub> =	215) <sub>15,1012</sub> 199.45 88.36	214 88.75 241.12	2589.35 <b>kWh/yea</b> 6593.08	(216) (217) (219) (230)
Water heating Dutput from water he  219.31 193.27  Efficiency of water he  217)m= 88.69 88.53  Fuel for water heating 219)m= (64)m x 10  219)m= 247.28 218.32  Annual totals  Space heating fuel us  Electricity for pumps, central heating pum  boiler with a fan-ass	ater (calcomplete (calcomplete) 202.9  ater  88.13  g, kWh/m  00 ÷ (217)  230.23  seed, main ed fans and po: isted flue	eulated a 181.78 87.13 onth m 208.64 system electric	bove) 176.54 84.94 207.85	80.3 193.63	148.97	Tota  166.06  80.3  206.8  Tota	1 (kWh/yea 167.34 80.3 208.39 I = Sum(2	188.5 87.33 215.84 19a) <sub>112</sub> = <b>k</b>	215) <sub>15,1012</sub> 199.45 88.36 225.74 Wh/year	214 88.75	80.3 2589.35 <b>kWh/yea</b> 6593.08 2589.35	(216 (217) (219) r (230) (230)
Water heating Dutput from water he  219.31 193.27  Efficiency of water he  217)m= 88.69 88.53  Fuel for water heating (219)m= (64)m x 10 (219)m= 247.28 218.32  Annual totals  Space heating fuel us Water heating fuel us Electricity for pumps, central heating pum	ater (calcomplete (calcomplete) 202.9  ater  88.13  g, kWh/m  00 ÷ (217)  230.23  seed, main ed fans and po: isted flue	eulated a 181.78 87.13 onth m 208.64 system electric	bove) 176.54 84.94 207.85	80.3 193.63	148.97	Tota  166.06  80.3  206.8  Tota	1 (kWh/yea 167.34 80.3	188.5 87.33 215.84 19a) <sub>112</sub> = <b>k</b>	215) <sub>15,1012</sub> 199.45 88.36 225.74 Wh/year	214 88.75 241.12	2589.35 <b>kWh/yea</b> 6593.08	(216 (217 (219

Energy

kWh/year

**Emissions** 

kg CO2/year

**Emission factor** 

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	1424.11	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating (2	(219) x	0.216	=	559.3	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1983.4	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	250.78	(268)
Total CO2, kg/year	sum o	of (265)(271) =		2273.11	(272)

TER = 16.92 (273)

		User D	Details:				
Assessor Name:	Joseph Treanor		Stroma Nun	nber:	STRO	032062	
Software Name:	Stroma FSAP 2012		Software Ve	ersion:	Versio	n: 1.0.4.14	
		·	Address: P14				
Address :	, Gondar Gardens, Lo	ndon, NW6 1	⊣G				
Overall dwelling dime	ensions:	۸ro	a/m²\	Av. Height	(m)	Volumo(m3)	
Ground floor			a(m²) 57.38 (1a) x	2.55	(111) (2a) =	Volume(m³)	(3a)
First floor			58.34 (1b) x	3	(2b) =	175.02	」
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	(1n) 1	15.72 (4)				_
Dwelling volume				b)+(3c)+(3d)+(3e	e)+(3n) =	321.34	(5)
2. Ventilation rate:					L		<u>_</u>
	main sec heating hea	ondary Iting	other	total		m³ per hou	•
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			4	x 10 =	40	(7a)
Number of passive vents				0	x 10 =	0	(7b)
Number of flueless gas fi	res			0	x 40 =	0	(7c)
					Air ch	anges per ho	
Infiltration due to chimne	us fluos and fans - (6a)+	.(6h)+(7a)+(7h)+(	(7c) <del>-</del>		, ,		_
•	een carried out or is intended,			40 from (9) to (16)	÷ (5) =	0.12	(8)
Number of storeys in the	ne dwelling (ns)					0	(9)
Additional infiltration					[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber fra	me or 0.35 fo	r masonry cons	truction	Ī	0	(11)
if both types of wall are pa deducting areas of openia	resent, use the value correspon pas): if equal user 0.35	nding to the great	ter wall area (after				
	loor, 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	,	ŕ			0	(13)
Percentage of windows	s and doors draught strip	ped			Ī	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 ho	our per square r	netre of enve	lope area	5	(17)
If based on air permeabil	ity value, then (18) = [(17)	÷ 20]+(8), otherw	ise (18) = (16)		Ī	0.37	(18)
Air permeability value applie	s if a pressurisation test has be	een done or a de	gree air permeabilit	y is being used	-		_
Number of sides sheltere	ed					2	(19)
Shelter factor			(20) = 1 - [0.075  x]	(19)] =		0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18) x (20) =	•		0.32	(21)
Infiltration rate modified f	or monthly wind speed		,				
Jan Feb	Mar Apr May	Jun Jul	Aug Sep	Oct N	lov Dec		
Monthly average wind sp	eed from Table 7						

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37	]	
Calculate effect		•	rate for t	he appli	cable ca	se						0	(23a)
If exhaust air h			endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced with	heat reco	overy: effici	ency in %	allowing f	or in-use f	actor (fron	n Table 4h	ı) =	, , ,			0	(23c)
a) If balance	ed mecha	anical ve	ntilation	with hea	at recov	erv (MVI	HR) (24a	a)m = (22	2b)m + (	23b) × [	1 – (23c)		(200)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If balance	ed mecha	anical ve	ntilation	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	]	(24b)
c) If whole h	ouse ex	tract ven	tilation o	or positiv	e input	ventilatio	n from o	outside	•	•		•	
if (22b)n	n < 0.5 ×	(23b), t	hen (24d	c) = (23b)	); other	vise (24	c) = (22l	b) m + 0.	5 × (23b	) '		1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n		on or when (24d)			•				0.5]				
(24d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)
Effective air	change	rate - er	ter (24a	or (24b	o) or (24	c) or (24	d) in bo	x (25)			-	•	
(25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros area	_	Openin m	_	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
ELEMENT Windows Type	area	_	•	_		m²		2K .					
	area e 1	_	•	_	A ,r	m² x1	W/m2	2K · 0.04] =	(W/				kJ/K
Windows Type	area e 1 e 2	_	•	_	A ,r	m <sup>2</sup> x <sup>1</sup>	W/m2 /[1/( 1.4 )+	2K $0.04 = 0.04 = 0.04$	(W/ 5.91				kJ/K (27)
Windows Type	area e 1 e 2 e 3	_	•	_	A ,r 4.46	m <sup>2</sup> x1 <sub>0</sub> x1 <sub>0</sub> x1 <sub>0</sub> x1 <sub>0</sub>	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+	2K $0.04 = 0.$	5.91 2.56				kJ/K (27) (27)
Windows Type Windows Type Windows Type	area e 1 e 2 e 3 e 4	_	•	_	A ,r 4.46 1.93	x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$ \begin{array}{ll} 2K \\                                   $	5.91 2.56 5.83				kJ/K (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	area area area area area area area area	_	•	_	A ,r 4.46 1.93 4.4 4.59	x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$\begin{array}{l} 2K \\ -0.04] = \begin{bmatrix} \\ -0.04\end{bmatrix}$	(W/ 5.91 2.56 5.83 6.09				kJ/K (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	area area area area area area area area	_	•	_	A ,r 4.46 1.93 4.4 4.59	m <sup>2</sup>	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$\begin{array}{l} 2K \\ -0.04] = \begin{bmatrix} \\ -0.04\end{bmatrix}$	(W/ 5.91 2.56 5.83 6.09 2.64				kJ/K (27) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	area area area area area area area area	(m²)	· m		A ,r 4.46 1.93 4.4 4.59 1.99 5.43 2.08	x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$\begin{array}{l} 2K \\ -0.04] = \begin{bmatrix} \\ -0.04\end{bmatrix}$	(W/ 5.91 2.56 5.83 6.09 2.64 7.2 2.76				kJ/K (27) (27) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1	area a 1 a 2 a 3 a 4 a 5 a 6 a 7 a 118.	.9	28.9		A ,r  4.46  1.93  4.4  4.59  1.99  5.43  2.08  89.95	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K · 0.04] = [ ·	(W/ 5.91 2.56 5.83 6.09 2.64 7.2 2.76 16.19				kJ/K (27) (27) (27) (27) (27) (27) (27) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2	area a 1 a 2 a 3 a 4 a 5 a 6 a 7 a 118.	9 2	28.99		A ,r  4.46  1.93  4.4  4.59  1.99  5.43  2.08  89.96  4.02	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	2K - 0.04] = [ -	(W/ 5.91 2.56 5.83 6.09 2.64 7.2 2.76 16.19 0.72				kJ/K (27) (27) (27) (27) (27) (27) (27) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Type1	area area area area area area area area	.9 2 2	28.99 0		A ,r  4.46  1.93  4.4  4.59  1.99  5.43  2.08  89.95  4.02  6.82	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13	2K - 0.04] = [ -	(W/ 5.91 2.56 5.83 6.09 2.64 7.2 2.76 16.19 0.72 0.89				kJ/K (27) (27) (27) (27) (27) (27) (27) (29) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Type1 Roof Type2	area area area area area area area area	.9 2 2	28.99		A ,r  4.46  1.93  4.4  4.59  1.99  5.43  2.08  89.95  4.02  6.82	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	2K · 0.04] = [ ·	(W/ 5.91 2.56 5.83 6.09 2.64 7.2 2.76 16.19 0.72				kJ/K (27) (27) (27) (27) (27) (27) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of e	area area area area area area area area	.9 2 2	28.99 0		A ,r  4.46  1.93  4.4  4.59  1.99  5.43  2.08  89.95  4.02  6.82  58.34	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	2K - 0.04] = [ -	(W/ 5.91 2.56 5.83 6.09 2.64 7.2 2.76 16.19 0.72 0.89 7.58				kJ/K (27) (27) (27) (27) (27) (27) (29) (29) (30) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of e Party wall * for windows and	area a 1 2 2 3 3 4 4 4 5 5 6 6 6 7 118. 58.3 58.3 58.3 58.3 58.3 58.3 58.3 58	9 2 2 34 , m <sup>2</sup>	28.98 0 0 0	5	A ,r  4.46  1.93  4.4  4.59  1.99  5.43  2.08  89.95  4.02  6.82  58.34  188.0  72.21	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	2K · 0.04] = [ · = [	(W/ 5.91 2.56 5.83 6.09 2.64 7.2 2.76 16.19 0.72 0.89 7.58	k)	kJ/m²-	K C	kJ/K (27) (27) (27) (27) (27) (27) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type1 Roof Type1 Roof Type2 Total area of e Party wall * for windows and ** include the area	area area area area area area area area	.9 2 2 34 , m²	28.99 0 0 0	5	A ,r  4.46  1.93  4.4  4.59  1.99  5.43  2.08  89.95  4.02  6.82  58.34  188.0  72.21	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	2K  0.04] = [	(W/ 5.91 2.56 5.83 6.09 2.64 7.2 2.76 16.19 0.72 0.89 7.58	k)	kJ/m²-	K	kJ/K (27) (27) (27) (27) (27) (27) (29) (29) (30) (31) (32)
Windows Types Windows Types Windows Types Windows Types Windows Types Windows Types Windows Types Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of es Party wall ** for windows and ** include the area Fabric heat los	area area area area area area area area	9 2 2 34 , m <sup>2</sup> ows, use e sides of in	28.99 0 0 0	5	A ,r  4.46  1.93  4.4  4.59  1.99  5.43  2.08  89.95  4.02  6.82  58.34  188.0  72.21	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	2K  0.04] = [	(W/ 5.91 2.56 5.83 6.09 2.64 7.2 2.76 16.19 0.72 0.89 7.58	k)	kJ/m²-l	1 3.2 63.7	kJ/K (27) (27) (27) (27) (27) (27) (29) (29) (30) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type1 Roof Type1 Roof Type2 Total area of e Party wall * for windows and ** include the area	area a 1 a 2 a 3 a 4 a 5 a 6 a 7 a 118 a 6.82 a 58.3 b 14 b 58.3 b 18 c 1000 windows on both ss, W/K = Cm = S(	9 2 2 34 , m <sup>2</sup> ows, use e sides of in = S (A x (A x k)	28.99 0 0 0 ffective winternal walk	ndow U-va	A ,r  4.46  1.93  4.4  4.59  1.99  5.43  2.08  89.95  4.02  6.82  58.34  188.0  72.21  alue calculations	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0.13	$2K$ $0.04] = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 $	(W/ 5.91 2.56 5.83 6.09 2.64 7.2 2.76 16.19 0.72 0.89 7.58	K)	kJ/m²-l	K	kJ/K (27) (27) (27) (27) (27) (27) (29) (29) (30) (30) (31) (32)

an be used							,							(20)
Thermal b	bridges	s : S (L	x Y) cal	culated i	using Ap	pendix l	<b>\</b>						24.74	(36)
f details of t		0 0	are not kn	own (36) =	= 0.15 x (3	1)			,,					
Total fabr										(36) =			88.51	(37)
entilation/								ī		= 0.33 × (			1	
<u> </u>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 6	51.75	61.41	61.08	59.52	59.23	57.87	57.87	57.62	58.39	59.23	59.82	60.44		(38
Heat trans	sfer co	efficien	it, W/K	,					(39)m	= (37) + (3	38)m			
39)m= 15	50.26	149.92	149.59	148.03	147.74	146.38	146.38	146.12	146.9	147.74	148.33	148.94		
Heat loss	param	neter (H	ILP), W/	m²K						Average = = (39)m ÷		12 /12=	148.03	(39
40)m=	1.3	1.3	1.29	1.28	1.28	1.26	1.26	1.26	1.27	1.28	1.28	1.29		
Number o	of days	in mor	nth (Tabl	e 1a)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.28	(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. Water	r heatin	ng ener	gy requi	rement:								kWh/ye	ear:	
\aaumad		<b>N</b>	_											
	> 13.9,			[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	ΓFA -13.		85		(42
if TFA >	> 13.9, £ 13.9, verage	N = 1 · N = 1 hot wa	+ 1.76 x ter usag	je in litre usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9)	1.77		
if TFA s if TFA s Annual av Reduce the not more tha	> 13.9, £ 13.9, verage	N = 1 · N = 1 hot wa	+ 1.76 x ter usag	je in litre usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9)			
if TFA section if TFA for the section if TFA for the section if TFA for the section if TFA for the section in the section in the section if TFA for the section in the sect	> 13.9, £ 13.9, verage annual a at 125 lit	N = 1 N = 1 hot wa average fres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 10°	1.77		
if TFA sift	> 13.9, £ 13.9, verage e annual a at 125 lit Jan	N = 1 N = 1 hot wa average fres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 10°	1.77		
if TFA s if TFA s Annual av Reduce the not more tha	> 13.9, £ 13.9, verage e annual a pat 125 lit Jan usage in li	N = 1 · N = 1 hot was average tres per profession from the second	+ 1.76 x ater usag hot water person per Mar day for ea 103.81	ge in litre usage by a day (all w Apr ach month 99.74	es per da 5% if the day vater use, I May Vd,m = fa 95.67	ay Vd,av Iwelling is not and co Jun ctor from 1	erage = designed in did)  Jul Table 1c x  91.59	(25 x N) to achieve Aug (43) 95.67	+ 36 a water us Sep 99.74	Oct  103.81  Total = Sur	9) Nov 107.88 m(44) <sub>112</sub> =	1.77  Dec  111.95	1221.27	(43
if TFA series if	> 13.9, £ 13.9, verage annual a pat 125 lit Jan usage in lit 11.95	N = 1 · N = 1 hot was average tres per profession from the second	+ 1.76 x ater usag hot water person per Mar day for ea 103.81	ge in litre usage by a day (all w Apr ach month 99.74	es per da 5% if the day vater use, I May Vd,m = fa 95.67	ay Vd,av Iwelling is not and co Jun ctor from 1	erage = designed in did)  Jul Table 1c x  91.59	(25 x N) to achieve Aug (43) 95.67	+ 36 a water us Sep 99.74	Oct  103.81  Total = Sur	9) Nov 107.88 m(44) <sub>112</sub> =	1.77  Dec  111.95	1221.27	(43
if TFA series if	> 13.9, £ 13.9, verage annual a pat 125 lit Jan usage in lit 11.95	N = 1 · N = 1 hot was average tres per profittres per 107.88	+ 1.76 x  Inter usage hot water person per Mar day for ear 103.81	ge in litre usage by s day (all w Apr ach month 99.74	es per da $5\%$ if the a vater use, $I$ May $Vd,m = fa$ $95.67$ $Onthly = 4$	ay Vd,av Iwelling is not and co Jun ctor from 1 91.59	erage = designed in display   Jul	(25 x N) to achieve  Aug (43)  95.67	+ 36 a water us  Sep  99.74  0 kWh/mon  116.38	Oct  103.81  Fotal = Suith (see Ta	Nov  107.88  m(44) <sub>112</sub> = ables 1b, 1  148.06	1.77  Dec  111.95	1221.27	(43
if TFA series if	> 13.9, £ 13.9, verage e annual a lat 125 lit Jan sage in lit 11.95	N = 1 · N = 1 hot was average tres per profession from the lit	ter usaghot water person per Mar day for ea 103.81	ge in litre usage by a day (all w  Apr ach month 99.74  culated mo 130.63	es per da $5\%$ if the orater use, I  May $Vd,m = fa$ $95.67$ $onthly = 4$ .	ay Vd,av lwelling is not and co Jun ctor from 7 91.59 190 x Vd,r	erage = designed to ld)  Jul Table 1c x  91.59  m x nm x E  100.23	(25 x N) to achieve  Aug (43)  95.67  07m / 3600 115.01	+ 36 a water us  Sep  99.74  0 kWh/mon  116.38	Oct  103.81  Total = Sunth (see Tail 135.63	Nov  107.88  m(44) <sub>112</sub> = ables 1b, 1  148.06	1.77  Dec  111.95		(43
if TFA series if	> 13.9, £ 13.9, verage annual a at 125 lit listers of he feeds wat 24.9	N = 1 N = 1 hot wa average tres per p Feb litres per 107.88 ot water of ter heatir 21.78	ter usaghot water person per Mar day for ea 103.81	ge in litre usage by a day (all w  Apr ach month 99.74  culated mo 130.63	es per da $5\%$ if the orater use, I  May $Vd,m = fa$ $95.67$ $onthly = 4$ .	ay Vd,av lwelling is not and co Jun ctor from 7 91.59 190 x Vd,r	erage = designed to ld)  Jul Table 1c x  91.59  m x nm x E  100.23	(25 x N) to achieve  Aug (43)  95.67  07m / 3600 115.01	+ 36 a water us  Sep  99.74  0 kWh/mon  116.38	Oct  103.81  Total = Sunth (see Tail 135.63	Nov  107.88  m(44) <sub>112</sub> = ables 1b, 1  148.06	1.77  Dec  111.95		(43
if TFA series if	> 13.9, £ 13.9, verage annual a pat 125 litter 125 litter 11.95 litter 11.95 litter 11.95 litter 11.95 litter 124.9 litter	N = 1 · N = 1 hot was average tres per profession water at 145.2 ter heating 21.78 DSS:	ter usaghot water berson per Mar day for ea 103.81 used - calculus at point 22.48	Apr Apr Apr Apr Apr Apr Apr Apr	es per da 5% if the a rater use, I May Vd,m = fa 95.67 onthly = 4. 125.34 o hot water 18.8	ay Vd,av Iwelling is not and co Jun ctor from 1 91.59 190 x Vd,r 108.16	erage = designed in did)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25	+ 36 a water us  Sep  99.74  0 kWh/mor  116.38  0 to (61)  17.46	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44)12 = ables 1b, 1 148.06 m(45)112 =	1.77  Dec  111.95  = c, 1d)  160.78  = 24.12		(44)
if TFA sif TFA sif TFA sif TFA sif TFA sif TFA sif Annual average when the most more that water us sif Adom in the sif and sif	> 13.9, £ 13.9, verage annual a at 125 lit.  Jan sage in lit.  11.95 tent of he 66.02 eous wate 24.9 crage lovely of the contraction of the contraction of the contraction of the contraction.	N = 1 · N = 1 hot was average tres per professer per profe	ter usaghot water berson per Mar day for ea 103.81 used - calc 149.83 ag at point 22.48 includin	Apr Apr Apr Apr Apr Apr Apr Apr Apr Apr	es per da 5% if the of rater use, I  May  Vd,m = fact  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W	y Vd,av welling is not and co Jun ctor from 7 91.59 190 x Vd,r 108.16 r storage),	erage = designed to lid)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03	(25 x N) to achieve  Aug (43)  95.67  77m / 3600  115.01  boxes (46)  17.25  within sa	+ 36 a water us  Sep  99.74  0 kWh/mor  116.38  0 to (61)  17.46	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44)12 = ables 1b, 1 148.06 m(45)112 =	1.77  Dec  111.95		(43
if TFA series if	> 13.9, £ 13.9, verage annual a part 125 litter 125 litter 11.95 litter 11.95 litter 11.95 litter 15.00 litte	N = 1 · N = 1 hot was average tres per profession water and the second s	ter usaghot water berson per Mar day for ea 103.81 used - calculation and no ta	ge in litre usage by a day (all w  Apr ach month 99.74  130.63  of use (not 19.59  g any so nk in dw	es per da 5% if the of rater use, I  May  Vd,m = far  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W  velling, e	ay Vd,av Iwelling is not and co Jun ctor from 1 91.59 190 x Vd,r 108.16 r storage), 16.22 /WHRS	erage = designed in did)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03  storage  litres in	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47)	+ 36 a water us  Sep  99.74  0 kWh/mor  116.38  0 to (61)  17.46  ame vess	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44)112 = ables 1b, 1 148.06 m(45)112 =	1.77  Dec  111.95  = c, 1d)  160.78  = 24.12		(44)
if TFA series if TFA series if TFA series if TFA series if TFA series if TFA series if TFA series if ITFA serie	> 13.9, £ 13.9, verage annual a lat 125 lit lit literat of he laterat of	N = 1 · N = 1 hot was average fres per professer per profe	ter usaghot water berson per Mar day for ea 103.81 used - calculation and no ta	ge in litre usage by a day (all w  Apr ach month 99.74  130.63  of use (not 19.59  g any so nk in dw	es per da 5% if the of rater use, I  May  Vd,m = far  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W  velling, e	ay Vd,av Iwelling is not and co Jun ctor from 1 91.59 190 x Vd,r 108.16 r storage), 16.22	erage = designed in did)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03  storage  litres in	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47)	+ 36 a water us  Sep  99.74  0 kWh/mor  116.38  0 to (61)  17.46  ame vess	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44)112 = ables 1b, 1 148.06 m(45)112 =	1.77  Dec  111.95  = c, 1d)  160.78  = 24.12		(44)
if TFA sif TFA sif TFA sif TFA sif TFA sif TFA sif Annual average when the most more that water us sif Adom in the sif and sif	> 13.9, £ 13.9, verage annual a at 125 lit.  Jan sage in lit.  11.95 tent of he according to the according t	N = 1 · N = 1 hot was average tres per professer per profe	ter usaghot water berson per Mar day for ea 103.81 used - calculus at point 22.48 including the tot water the true of true of the true of true	Apr Apr Apr Apr Apr Apr Apr Apr Apr Apr	es per da 5% if the of water use, I  May Vd,m = fact 95.67  onthly = 4.  125.34  o hot water 18.8  olar or W welling, e	y Vd,av welling is not and co Jun ctor from 7 91.59 190 x Vd,r 108.16 r storage), 16.22 /WHRS nter 110	erage = designed in designed i	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47)	+ 36 a water us  Sep  99.74  0 kWh/mor  116.38  0 to (61)  17.46  ame vess	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44)12 = ables 1b, 1 148.06 m(45)12 = 22.21	1.77  Dec  111.95  = c, 1d)  160.78  = 24.12		(43 (44 (45 (46 (47
if TFA sif TFA sif TFA sif TFA sif TFA sif TFA sif Annual average when the motern water us sif and the motern water us sif and the sif and	> 13.9, £ 13.9, verage annual a lat 125 lit lit lit lit lit lit lit lit lit lit	N = 1 · N = 1 hot was average fres per professer per profe	ter usaghot water berson per Mar day for ear 103.81 used - calc 149.83 ag at point 22.48 including and no talc eclared less technical eclared eclared less technical eclared eclared less technical eclared e	Apr Apr Apr Apr Apr Apr Apr Apr Apr Apr	es per da 5% if the of water use, I  May Vd,m = fact 95.67  onthly = 4.  125.34  o hot water 18.8  olar or W velling, e	y Vd,av welling is not and co Jun ctor from 7 91.59 190 x Vd,r 108.16 r storage), 16.22 /WHRS nter 110	erage = designed in designed i	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47)	+ 36 a water us  Sep  99.74  0 kWh/mor  116.38  0 to (61)  17.46  ame vess	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44) <sub>112</sub> = ables 1b, 1 148.06 m(45) <sub>112</sub> = 22.21	1.77  Dec  111.95  c, 1d)  160.78  24.12		(43 (44 (45 (46 (47
if TFA sif TFA sif TFA sif TFA sif TFA sif TFA sif Annual average where the not more that the not more that the not more that the not more that the not more that the not more that the not more that the not more that the not more than the not more than the notation of th	> 13.9, £ 13.9, verage annual a lat 125 lit lit lit lit lit lit lit lit lit lit	N = 1 · N = 1 hot was average fres per profession water and 145.2 leter heating a stored loss: rer's dector froi	ter usaghot water berson per Mar day for ear 103.81  used - calc 149.83  og at point 22.48  including and no talc hot water eclared log mar Table	ge in litre usage by a day (all w  Apr ach month 99.74  130.63  of use (not 19.59  g any so nk in dw er (this in  coss facto 2b	es per da 5% if the of rater use, I  May  Vd,m = far  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W relling, e ncludes i	y Vd,av welling is not and co Jun ctor from 7 91.59 190 x Vd,r 108.16 r storage), 16.22 /WHRS nter 110	erage = designed in ld)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03  storage  litres in neous con/day):	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47)	+ 36 a water us  Sep  99.74  116.38  17.46  ame vess ers) ente	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44) <sub>112</sub> = ables 1b, 1 148.06 m(45) <sub>112</sub> = 22.21	1.77  Dec  111.95  c, 1d)  160.78  24.12  0		(43 (44 (45 (46 (47 (48 (49
if TFA series if	> 13.9, £ 13.9, verage e annual a lat 125 lit sage in la latent of he	N = 1 · N = 1 hot was average fres per properties p	ter usaghot water berson per Mar day for ea 103.81 used - calculus at point 22.48 including and no talculus at calculus at point water at calculus at point water at calculus at point water at calculus at point water	ge in litre usage by a day (all w  Apr ach month  99.74  130.63  of use (not) 19.59  g any so nk in dw er (this in  coss facto 2b , kWh/ye cylinder l	es per da 5% if the of water use, I  May Vd,m = far 95.67  onthly = 4.  125.34  o hot water  18.8  olar or W welling, e ncludes i  or is kno	ay Vd,av welling is not and co  Jun  ctor from 7  91.59  190 x Vd,r  108.16  storage),  16.22  /WHRS  nter 110  nstantar  wn (kWh	erage = designed in designed i	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47) ombi boil	+ 36 a water us  Sep  99.74  116.38  17.46  ame vess ers) ente	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44) <sub>112</sub> = ables 1b, 1 148.06 m(45) <sub>112</sub> = 22.21	1.77  Dec  111.95  c, 1d)  160.78  24.12  0		(43 (44 (45 (46 (47 (48 (49 (50
if TFA series if	> 13.9, £ 13.9, verage annual a lat 125 lit lit literat of he latent o	N = 1 · N = 1 · N = 1 · N = 1 · N = 1 · N = 1 · N = 1 · · N = 1 · · · · · · · · · · · · · · · · · ·	ter usage hot water person per day for ear 103.81  used - calca 149.83  ag at point 22.48  includinate hot water eclared lear to the storage eclared of factor free sections.	ge in litre usage by a day (all w  Apr ach month  99.74  130.63  of use (not 19.59  g any so nk in dw er (this in coss facto 2b , kWh/ye cylinder I com Tabl	es per da 5% if the of water use, I  May Vd,m = far 95.67  onthly = 4.  125.34  o hot water  18.8  olar or W welling, e ncludes i  or is kno	ay Vd,av welling is not and co  Jun  ctor from 7  91.59  190 x Vd,r  108.16  storage),  16.22  /WHRS  nter 110  nstantar  wn (kWh	erage = designed in designed i	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47) ombi boil	+ 36 a water us  Sep  99.74  116.38  17.46  ame vess ers) ente	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44) <sub>112</sub> = ables 1b, 1 148.06 m(45) <sub>112</sub> = 22.21	1.77  Dec  1111.95  c, 1d)  160.78  24.12  0		(42 (43 (44 (45 (46 (47 (48 (49 (50 (51
if TFA single if TFA single if TFA single if TFA single if TFA single if ITFA sin	> 13.9, £ 13.9, verage e annual a at 125 litter 125 lit	N = 1 - N = 1 hot was average fres per profession water of the state o	ter usaghot water berson per Mar day for ea 103.81 used - calculus and no talculus  in litre usage by a day (all w  Apr ach month  99.74  130.63  of use (not  19.59  g any so nk in dw er (this in  coss facto 2b , kWh/ye cylinder I com Tabl con 4.3	es per da 5% if the of water use, I  May Vd,m = far 95.67  onthly = 4.  125.34  o hot water  18.8  olar or W welling, e ncludes i  or is kno	ay Vd,av welling is not and co  Jun  ctor from 7  91.59  190 x Vd,r  108.16  storage),  16.22  /WHRS  nter 110  nstantar  wn (kWh	erage = designed in designed i	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47) ombi boil	+ 36 a water us  Sep  99.74  116.38  17.46  ame vess ers) ente	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44) <sub>112</sub> = ables 1b, 1 148.06 m(45) <sub>112</sub> = 22.21	1.77  Dec  1111.95  c, 1d)  160.78  24.12  0		(43 (44 (45 (46 (47 (48 (49 (50	

Energy lost from water	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (54) in (	55)									0		(55)
Water storage loss ca	lculated f	or each	month			((56)m = (	(55) × (41)r	n				
(56)m= 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedicate	ed solar stor	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= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss (a	nnual) fro	m Table	e 3							0		(58)
Primary circuit loss ca	lculated f	or each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by factor	rom Tabl	e H5 if t	here is s	olar wat	ter heati	ng and a	cylinde	thermo	stat)			
(59)m = 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 50.96 46.03	50.96	49.19	48.75	45.17	46.68	48.75	49.19	50.96	49.32	50.96		(61)
Total heat required fo	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 216.98 191.23	200.79	179.81	174.09	153.33	146.9	163.76	165.57	186.59	197.37	211.74		(62)
Solar DHW input calculated	l using Appe	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	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	ater		-	-	-	-	-		-	-		
(64)m= 216.98 191.23	200.79	179.81	174.09	153.33	146.9	163.76	165.57	186.59	197.37	211.74		
	•		•	•	•	Outp	out from wa	ater heate	r (annual)₁	12	2188.17	(64)
Heat gains from water	heating	k\/\/h/ma	anth 0.24	5 ′ [0 85	v (45)m	. (G1) <sub>m</sub>	1.00	. [/40\	. (F7)m	. (E0)m	1	
	noamig,		JIIIII 0.2	ა [ს.სა	X (45)III	+ (61)11	ıj + U.O X	(46)m	+ (57)111	+ (59)111	J	
(65)m= 67.94 59.79	62.56	55.73	53.86	47.26	44.99	50.43	50.99	57.84	61.56	66.2	]	(65)
	62.56	55.73	53.86	47.26	44.99	50.43	50.99	57.84	61.56	66.2		(65)
(65)m= 67.94 59.79	62.56 culation of	55.73 of (65)m	53.86 only if c	47.26	44.99	50.43	50.99	57.84	61.56	66.2		(65)
(65)m= 67.94 59.79 include (57)m in cal 5. Internal gains (se	62.56 culation of the Table 5	55.73 of (65)m and 5a	53.86 only if c	47.26	44.99	50.43	50.99	57.84	61.56	66.2		(65)
(65)m= 67.94 59.79 include (57)m in cal	62.56 culation of the Table 5	55.73 of (65)m and 5a	53.86 only if c	47.26	44.99	50.43	50.99	57.84	61.56	66.2		(65)
include (57)m in cal  5. Internal gains (see  Metabolic gains (Table	62.56 culation of the Table 5	55.73 of (65)m and 5a	53.86 only if c	47.26 ylinder i	44.99 s in the o	50.43 dwelling	50.99 or hot w	57.84 ater is fr	61.56 om com	66.2 munity h		(65)
include (57)m in cal  5. Internal gains (se  Metabolic gains (Table  Jan Feb  (66)m= 142.26 142.26	62.56 culation ce Table 5 e 5), Watt	55.73 of (65)m and 5a ts Apr 142.26	53.86 only if constant of the	Jun	44.99 s in the 0	50.43 dwelling Aug 142.26	50.99 or hot w Sep 142.26	57.84 ater is fr	61.56 om com	66.2 munity h		
include (57)m in cal  5. Internal gains (se  Metabolic gains (Table  Jan Feb	62.56 culation ce Table 5 e 5), Watt	55.73 of (65)m and 5a ts Apr 142.26	53.86 only if constant of the	Jun	44.99 s in the 0	50.43 dwelling Aug 142.26	50.99 or hot w Sep 142.26	57.84 ater is fr	61.56 om com	66.2 munity h		
include (57)m in cal 5. Internal gains (se  Metabolic gains (Table  Jan Feb  (66)m= 142.26 142.26  Lighting gains (calculation)  (67)m= 24.92 22.13	62.56 culation ce Table 5 e 5), Watt Mar 142.26 atted in Ap	55.73 of (65)m and 5a ats Apr 142.26 opendix 13.63	53.86 only if c : May 142.26 L, equati	47.26  ylinder is  Jun  142.26  ion L9 o  8.6	44.99 s in the o  Jul 142.26 r L9a), a  9.29	Aug 142.26 Iso see	50.99 or hot w Sep 142.26 Table 5 16.21	57.84 ater is fr Oct 142.26	61.56 om com Nov 142.26	66.2 munity h		(66)
include (57)m in cal  5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 142.26 142.26  Lighting gains (calcula (67)m= 24.92 22.13  Appliances gains (calcula fermion for the fer	62.56 culation of the Table 5 culation of the Table 5 culation of the Table 5 culated in Apple 18 culated	55.73 of (65)m and 5a ts Apr 142.26 ependix 13.63 Append	53.86  only if c  :  May 142.26  L, equati 10.19  dix L, eq	47.26  ylinder is  Jun  142.26  ion L9 o  8.6	Jul 142.26 r L9a), a 9.29	50.43 dwelling Aug 142.26 lso see 12.08 3a), also	50.99 or hot w Sep 142.26 Table 5 16.21 o see Tal	57.84  ater is fr  Oct  142.26  20.59  ole 5	61.56 om com Nov 142.26	66.2 munity h		(66)
include (57)m in cal  5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 142.26 142.26  Lighting gains (calculate)  (67)m= 24.92 22.13  Appliances gains (calculate)  (68)m= 279.53 282.43	62.56 culation of a Table 5 e 5), Watt Mar 142.26 ated in Ap 18 culated in 275.12	55.73 of (65)m and 5a as Apr 142.26 opendix 13.63 Appendix 259.56	53.86 only if c :  May 142.26 L, equati 10.19 dix L, eq 239.92	Jun 142.26 ion L9 o 8.6 uation L 221.46	Jul 142.26 r L9a), a 9.29 13 or L1 209.12	50.43 dwelling Aug 142.26 lso see 12.08 3a), also 206.22	50.99 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53	57.84  ater is fr  Oct 142.26  20.59  ole 5 229.09	61.56 om com Nov 142.26	66.2 munity h		(66) (67)
include (57)m in cal  5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 142.26 142.26  Lighting gains (calculate)  (67)m= 24.92 22.13  Appliances gains (calculate)  (68)m= 279.53 282.43  Cooking gains (calculate)	62.56 culation ce Table 5 e 5), Watt Mar 142.26 ated in Ap culated in 275.12 ated in Ap	55.73 of (65)m and 5a as Apr 142.26 opendix 13.63 Append 259.56 opendix	53.86 only if colors May 142.26 L, equati 10.19 dix L, equati 239.92 L, equat	Jun 142.26 ion L9 o 8.6 uation L 221.46 ion L15	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a	50.43 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 , also se	Sep 142.26 Table 5 16.21 See Table 213.53	57.84  ater is fr  Oct  142.26  20.59  ole 5  229.09  5	61.56 om com Nov 142.26 24.03	Dec 142.26 25.61		(66) (67) (68)
include (57)m in calculation include (57)m in calculation include (57)m in calculation include (57)m in calculation include (57)m in calculation include (57)m in calculation include (57)m include (56)m include (56)m include (57)m include (5	62.56 culation ce Table 5 e 5), Watt Mar 142.26 ated in Ap culated in 275.12 ated in Ap 37.23	55.73 of (65)m and 5a as Apr 142.26 opendix 13.63 Append 259.56 opendix 37.23	53.86 only if c :  May 142.26 L, equati 10.19 dix L, eq 239.92	Jun 142.26 ion L9 o 8.6 uation L 221.46	Jul 142.26 r L9a), a 9.29 13 or L1 209.12	50.43 dwelling Aug 142.26 lso see 12.08 3a), also 206.22	50.99 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53	57.84  ater is fr  Oct 142.26  20.59  ole 5 229.09	61.56 om com Nov 142.26	66.2 munity h		(66) (67)
include (57)m in calculation include (57)m in calculation include (57)m in calculation include (57)m in calculation include (57)m in calculation include (57)m in calculation include (57)m include (56)m include (56)m include (57)m include (57)m include (57)m include (56)m include (57)m include (5	62.56 culation of a Table 5 e 5), Watt Mar 142.26 ated in Ap 18 culated in 275.12 ated in Ap 37.23 c (Table 5	55.73 of (65)m and 5a ats Apr 142.26 opendix 13.63 Append 259.56 opendix 37.23 sa)	53.86 only if c ):  May 142.26 L, equati 10.19 dix L, eq 239.92 L, equat 37.23	Jun 142.26 ion L9 o 8.6 uation L 221.46 ion L15 37.23	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a; 37.23	50.43 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 ), also se 37.23	50.99 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23	57.84  ater is fr  Oct 142.26  20.59  ole 5 229.09  5 37.23	61.56 om com Nov 142.26 24.03	Dec 142.26 25.61 267.2		(66) (67) (68) (69)
include (57)m in cal  5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 142.26 142.26  Lighting gains (calculate)  (67)m= 24.92 22.13  Appliances gains (calculate)  (68)m= 279.53 282.43  Cooking gains (calculate)  (69)m= 37.23 37.23  Pumps and fans gains  (70)m= 3 3	62.56 culation ce Table 5 e 5), Watt Mar 142.26 ated in Ap culated in 275.12 ated in Ap 37.23 s (Table 5	55.73 of (65)m and 5a as Apr 142.26 opendix 13.63 Append 259.56 opendix 37.23 ia) 3	53.86 only if colors May 142.26 L, equati 10.19 dix L, equati 239.92 L, equati 37.23	Jun 142.26 ion L9 o 8.6 uation L 221.46 ion L15 37.23	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a	50.43 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 , also se	Sep 142.26 Table 5 16.21 See Table 213.53	57.84  ater is fr  Oct  142.26  20.59  ole 5  229.09  5	61.56 om com Nov 142.26 24.03	Dec 142.26 25.61		(66) (67) (68)
include (57)m in cal  5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 142.26 142.26  Lighting gains (calculate)  (67)m= 24.92 22.13  Appliances gains (calculate)  (68)m= 279.53 282.43  Cooking gains (calculate)  (69)m= 37.23 37.23  Pumps and fans gains  (70)m= 3 3  Losses e.g. evaporation	62.56 culation of a Table 5 e 5), Watt Mar 142.26 ated in Ap 275.12 ated in Ap 37.23 a (Table 5 3 on (negat	55.73 of (65)m and 5a ats Apr 142.26 opendix 13.63 Appendix 259.56 opendix 37.23 ive valu	53.86 only if c ):  May 142.26 L, equati 10.19 dix L, eq 239.92 L, equat 37.23	Jun 142.26 ion L9 o 8.6 uation L 221.46 ion L15 37.23	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a 37.23	50.43 dwelling Aug 142.26 lso see 12.08 3a), also 206.22 ), also se 37.23	50.99 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23	57.84 ater is fr  Oct 142.26  20.59 ble 5 229.09 5 37.23	61.56 om com  Nov 142.26  24.03  248.74  37.23	66.2 munity h  Dec 142.26  25.61  267.2		(66) (67) (68) (69)
include (57)m in cal  5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 142.26 142.26  Lighting gains (calculate)  (67)m= 24.92 22.13  Appliances gains (calculate)  (68)m= 279.53 282.43  Cooking gains (calculate)  (69)m= 37.23 37.23  Pumps and fans gains  (70)m= 3 3  Losses e.g. evaporation  (71)m= -113.81 -113.81	62.56  culation of a Table 5  e 5), Watt  Mar  142.26  ated in Ap  275.12  ated in Ap  37.23  ated in Ap  37.23  ated in Ap  37.23  ated in Ap  37.23  ated in Ap  37.23  ated in Ap  37.23  ated in Ap  37.23  ated in Ap  37.23	55.73 of (65)m and 5a ats Apr 142.26 opendix 13.63 Appendix 259.56 opendix 37.23 ive valu	53.86 only if colors May 142.26 L, equati 10.19 dix L, equati 239.92 L, equati 37.23	Jun 142.26 ion L9 o 8.6 uation L 221.46 ion L15 37.23	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a; 37.23	50.43 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 ), also se 37.23	50.99 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23	57.84  ater is fr  Oct 142.26  20.59  ole 5 229.09  5 37.23	61.56 om com Nov 142.26 24.03	Dec 142.26 25.61 267.2		(66) (67) (68) (69)
include (57)m in cal  5. Internal gains (see  Metabolic gains (Table  Jan Feb  (66)m= 142.26 142.26  Lighting gains (calculate)  (67)m= 24.92 22.13  Appliances gains (calculate)  (68)m= 279.53 282.43  Cooking gains (calculate)  (69)m= 37.23 37.23  Pumps and fans gains  (70)m= 3 3  Losses e.g. evaporation  (71)m= -113.81 -113.81  Water heating gains (**)	62.56 culation of the Table 5 e 5), Watt Mar 142.26 ated in Ap 275.12 ated in Ap 37.23 ated	55.73 of (65)m and 5a as Apr 142.26 opendix 13.63 Append 259.56 opendix 37.23 ive valu -113.81	53.86 only if colors May 142.26 L, equati 10.19 dix L, eqi 239.92 L, equati 37.23  as) (Tabi	Jun 142.26 ion L9 o 8.6 uation L 221.46 ion L15 37.23 3 lle 5)	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a 37.23	50.43 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 , also se 37.23	50.99 or hot w  Sep 142.26 Table 5 16.21 o see Table 213.53 ee Table 37.23  3	57.84 ater is fr  Oct 142.26  20.59 ole 5 229.09 5 37.23	61.56 om com  Nov  142.26  24.03  248.74  37.23	66.2 munity h  Dec 142.26 25.61 267.2 37.23		(66) (67) (68) (69) (70) (71)
include (57)m in call 59.79 include (57)m in call 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 142.26 142.26 Lighting gains (calcula (67)m= 24.92 22.13 Appliances gains (calcula (68)m= 279.53 282.43 Cooking gains (calcula (69)m= 37.23 37.23 Pumps and fans gains (70)m= 3 3 Losses e.g. evaporation (71)m= -113.81 -113.81 Water heating gains (72)m= 91.32 88.97	62.56  culation of a Table 5  e 5), Watt  Mar  142.26  ated in Ap  275.12  ated in Ap  37.23  a (Table 5  3  on (negat  -113.81  Table 5)  84.09	55.73 of (65)m and 5a ats Apr 142.26 opendix 13.63 Appendix 259.56 opendix 37.23 ive valu	53.86 only if c ):  May 142.26 L, equati 10.19 dix L, eq 239.92 L, equat 37.23	Jun 142.26 ion L9 o 8.6 uation L 221.46 ion L15 37.23  3 le 5) -113.81	44.99 s in the o  Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a 37.23  3  -113.81	50.43 dwelling Aug 142.26 lso see 12.08 3a), also 206.22 ), also se 37.23  -113.81	50.99 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23  3  -113.81	57.84 ater is fr  Oct 142.26  20.59 ble 5 229.09 5 37.23  3  -113.81	61.56 om com  Nov 142.26  24.03  248.74  37.23  3  -113.81	66.2 munity h  Dec 142.26  25.61  267.2  37.23  3  -113.81		(66) (67) (68) (69)
include (57)m in call 59.79 include (57)m in call 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 142.26 142.26 Lighting gains (calcula (67)m= 24.92 22.13 Appliances gains (calcula (68)m= 279.53 282.43 Cooking gains (calcula (69)m= 37.23 37.23 Pumps and fans gains (70)m= 3 3 Losses e.g. evaporation (71)m= -113.81 -113.81 Water heating gains (72)m= 91.32 88.97 Total internal gains :	62.56  culation of the Table 5  e 5), Watt  Mar  142.26  ated in Ap  275.12  ated in Ap  37.23	55.73 of (65)m and 5a ats Apr 142.26 opendix 13.63 Appendix 259.56 opendix 37.23 Ga) 3 ive valu -113.81	53.86 only if co :  May 142.26 L, equati 10.19 dix L, eqi 239.92 L, equati 37.23  a es) (Tab -113.81	Jun 142.26 ion L9 o 8.6 uation L 221.46 ion L15 37.23  3 le 5) -113.81	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a) 37.23 3 -113.81 60.48	50.43 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 ), also se 37.23  -113.81  67.78 1+ (68)m -	50.99 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23  3  -113.81  70.83 + (69)m + (	57.84 ater is fr  Oct 142.26  20.59 ble 5 229.09 5 37.23  3  -113.81  77.74  70)m + (7	61.56 om com  Nov 142.26  24.03  248.74  37.23  3  -113.81  85.5  1)m + (72)	66.2 munity h  Dec 142.26  25.61  267.2  37.23  3  -113.81		(66) (67) (68) (69) (70) (71)
include (57)m in call 59.79 include (57)m in call 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 142.26 142.26 Lighting gains (calcula (67)m= 24.92 22.13 Appliances gains (calcula (68)m= 279.53 282.43 Cooking gains (calcula (69)m= 37.23 37.23 Pumps and fans gains (70)m= 3 3 Losses e.g. evaporation (71)m= -113.81 -113.81 Water heating gains (72)m= 91.32 88.97	62.56  culation of a Table 5  e 5), Watt  Mar  142.26  ated in Ap  275.12  ated in Ap  37.23  a (Table 5  3  on (negat  -113.81  Table 5)  84.09	55.73 of (65)m and 5a as Apr 142.26 opendix 13.63 Append 259.56 opendix 37.23 ive valu -113.81	53.86 only if colors May 142.26 L, equati 10.19 dix L, eqi 239.92 L, equati 37.23  as) (Tabi	Jun 142.26 ion L9 o 8.6 uation L 221.46 ion L15 37.23  3 le 5) -113.81	44.99 s in the o  Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a 37.23  3  -113.81	50.43 dwelling Aug 142.26 lso see 12.08 3a), also 206.22 ), also se 37.23  -113.81	50.99 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23  3  -113.81	57.84 ater is fr  Oct 142.26  20.59 ble 5 229.09 5 37.23  3  -113.81	61.56 om com  Nov 142.26  24.03  248.74  37.23  3  -113.81	66.2 munity h  Dec 142.26  25.61  267.2  37.23  3  -113.81		(66) (67) (68) (69) (70) (71)

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

Orientatio	on:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	4.4	x	10.63	x	0.63	x	0.7	=	14.3	(74)
North	0.9x	0.77	x	4.59	x	10.63	x	0.63	x	0.7	=	14.92	(74)
North	0.9x	0.77	x	5.43	x	10.63	x	0.63	x	0.7	=	17.65	(74)
North	0.9x	0.77	x	4.4	x	20.32	x	0.63	x	0.7	=	27.33	(74)
North	0.9x	0.77	x	4.59	x	20.32	x	0.63	x	0.7	=	28.51	(74)
North	0.9x	0.77	x	5.43	x	20.32	x	0.63	x	0.7	=	33.72	(74)
North	0.9x	0.77	x	4.4	x	34.53	X	0.63	x	0.7	=	46.43	(74)
North	0.9x	0.77	X	4.59	X	34.53	X	0.63	X	0.7	=	48.44	(74)
North	0.9x	0.77	X	5.43	x	34.53	X	0.63	X	0.7	=	57.3	(74)
North	0.9x	0.77	X	4.4	X	55.46	X	0.63	X	0.7	=	74.58	(74)
North	0.9x	0.77	X	4.59	X	55.46	X	0.63	X	0.7	=	77.8	(74)
North	0.9x	0.77	X	5.43	x	55.46	X	0.63	X	0.7	=	92.04	(74)
North	0.9x	0.77	X	4.4	X	74.72	X	0.63	X	0.7	=	100.47	(74)
North	0.9x	0.77	X	4.59	X	74.72	X	0.63	X	0.7	=	104.81	(74)
North	0.9x	0.77	x	5.43	x	74.72	x	0.63	x	0.7	=	123.99	(74)
North	0.9x	0.77	x	4.4	x	79.99	X	0.63	x	0.7	=	107.56	(74)
North	0.9x	0.77	X	4.59	X	79.99	X	0.63	X	0.7	=	112.2	(74)
North	0.9x	0.77	x	5.43	x	79.99	x	0.63	x	0.7	=	132.73	(74)
North	0.9x	0.77	X	4.4	X	74.68	X	0.63	X	0.7	=	100.42	(74)
North	0.9x	0.77	X	4.59	X	74.68	X	0.63	X	0.7	=	104.75	(74)
North	0.9x	0.77	X	5.43	X	74.68	X	0.63	X	0.7	=	123.92	(74)
North	0.9x	0.77	X	4.4	X	59.25	X	0.63	X	0.7	=	79.67	(74)
North	0.9x	0.77	X	4.59	X	59.25	X	0.63	X	0.7	=	83.11	(74)
North	0.9x	0.77	X	5.43	X	59.25	X	0.63	X	0.7	=	98.32	(74)
North	0.9x	0.77	X	4.4	X	41.52	X	0.63	X	0.7	=	55.83	(74)
North	0.9x	0.77	X	4.59	X	41.52	X	0.63	X	0.7	=	58.24	(74)
North	0.9x	0.77	X	5.43	X	41.52	X	0.63	X	0.7	=	68.9	(74)
North	0.9x	0.77	X	4.4	X	24.19	X	0.63	X	0.7	=	32.53	(74)
North	0.9x	0.77	X	4.59	x	24.19	x	0.63	X	0.7	=	33.93	(74)
North	0.9x	0.77	X	5.43	X	24.19	X	0.63	X	0.7	=	40.14	(74)
North	0.9x	0.77	X	4.4	X	13.12	X	0.63	X	0.7	=	17.64	(74)
North	0.9x	0.77	X	4.59	X	13.12	X	0.63	X	0.7	=	18.4	(74)
North	0.9x	0.77	X	5.43	X	13.12	X	0.63	X	0.7	=	21.77	(74)
North	0.9x	0.77	X	4.4	X	8.86	X	0.63	X	0.7	=	11.92	(74)
North	0.9x	0.77	X	4.59	x	8.86	x	0.63	x	0.7	=	12.43	(74)
North	0.9x	0.77	X	5.43	x	8.86	x	0.63	x	0.7	=	14.71	(74)
East	0.9x	2	X	2.08	x	19.64	x	0.63	x	0.7	=	24.97	(76)
East	0.9x	2	x	2.08	x	38.42	x	0.63	x	0.7	=	48.85	(76)
East	0.9x	2	x	2.08	x	63.27	x	0.63	x	0.7	=	80.44	(76)

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East	0.9x	2	X	2.08	X	92.28	X	0.63	X	0.7	=	117.32	(76)
East	0.9x	2	X	2.08	X	113.09	X	0.63	X	0.7	=	143.78	(76)
East	0.9x	2	X	2.08	X	115.77	X	0.63	X	0.7	=	147.18	(76)
East	0.9x	2	X	2.08	X	110.22	X	0.63	X	0.7	=	140.13	(76)
East	0.9x	2	X	2.08	X	94.68	X	0.63	X	0.7	=	120.37	(76)
East	0.9x	2	X	2.08	X	73.59	X	0.63	X	0.7	=	93.56	(76)
East	0.9x	2	X	2.08	X	45.59	X	0.63	X	0.7	=	57.96	(76)
East	0.9x	2	X	2.08	X	24.49	X	0.63	X	0.7	=	31.13	(76)
East	0.9x	2	X	2.08	X	16.15	X	0.63	X	0.7	=	20.53	(76)
West	0.9x	0.77	X	4.46	X	19.64	X	0.63	X	0.7	=	26.77	(80)
West	0.9x	0.77	X	1.93	X	19.64	X	0.63	X	0.7	=	11.58	(80)
West	0.9x	0.77	X	1.99	X	19.64	X	0.63	x	0.7	=	23.89	(80)
West	0.9x	0.77	X	4.46	X	38.42	X	0.63	X	0.7	=	52.37	(80)
West	0.9x	0.77	X	1.93	X	38.42	X	0.63	X	0.7	=	22.66	(80)
West	0.9x	0.77	X	1.99	X	38.42	X	0.63	X	0.7	=	46.73	(80)
West	0.9x	0.77	X	4.46	X	63.27	x	0.63	x	0.7	=	86.24	(80)
West	0.9x	0.77	X	1.93	X	63.27	x	0.63	x	0.7	=	37.32	(80)
West	0.9x	0.77	X	1.99	X	63.27	x	0.63	x	0.7	=	76.96	(80)
West	0.9x	0.77	X	4.46	x	92.28	x	0.63	x	0.7	=	125.78	(80)
West	0.9x	0.77	X	1.93	x	92.28	x	0.63	X	0.7	=	54.43	(80)
West	0.9x	0.77	X	1.99	X	92.28	x	0.63	x	0.7	=	112.24	(80)
West	0.9x	0.77	X	4.46	x	113.09	х	0.63	x	0.7	=	154.15	(80)
West	0.9x	0.77	X	1.93	X	113.09	x	0.63	x	0.7	=	66.71	(80)
West	0.9x	0.77	X	1.99	x	113.09	x	0.63	X	0.7	=	137.56	(80)
West	0.9x	0.77	X	4.46	x	115.77	x	0.63	x	0.7	=	157.8	(80)
West	0.9x	0.77	X	1.93	x	115.77	x	0.63	X	0.7	=	68.29	(80)
West	0.9x	0.77	X	1.99	x	115.77	x	0.63	x	0.7	=	140.82	(80)
West	0.9x	0.77	X	4.46	x	110.22	х	0.63	x	0.7	=	150.23	(80)
West	0.9x	0.77	X	1.93	x	110.22	x	0.63	x	0.7	=	65.01	(80)
West	0.9x	0.77	x	1.99	x	110.22	x	0.63	x	0.7	=	134.06	(80)
West	0.9x	0.77	x	4.46	x	94.68	x	0.63	x	0.7	=	129.05	(80)
West	0.9x	0.77	×	1.93	x	94.68	x	0.63	x	0.7	] =	55.84	(80)
West	0.9x	0.77	X	1.99	x	94.68	x	0.63	x	0.7	] =	115.16	(80)
West	0.9x	0.77	x	4.46	x	73.59	x	0.63	x	0.7	=	100.3	(80)
West	0.9x	0.77	X	1.93	x	73.59	x	0.63	x	0.7	] =	43.41	(80)
West	0.9x	0.77	X	1.99	x	73.59	x	0.63	x	0.7	j =	89.51	(80)
West	0.9x	0.77	X	4.46	x	45.59	x	0.63	x	0.7	] =	62.14	(80)
West	0.9x	0.77	X	1.93	x	45.59	x	0.63	x	0.7	] =	26.89	(80)
West	0.9x	0.77	×	1.99	×	45.59	x	0.63	x	0.7	j =	55.45	(80)
West	0.9x	0.77	×	4.46	×	24.49	x	0.63	x	0.7	j =	33.38	(80)
West	0.9x	0.77	×	1.93	×	24.49	x	0.63	x	0.7	j =	14.44	(80)
	_		_				•		ı				_

	_													
West	0.9x	0.77	Х	1.9	99	x	24.49	x	0.63	x	0.7	=	29.79	(80)
West	0.9x	0.77	X	4.4	16	x	16.15	x	0.63	x	0.7	=	22.01	(80)
West	0.9x	0.77	Х	1.9	93	x	16.15	x	0.63	x	0.7	=	9.53	(80)
West	0.9x	0.77	X	1.9	9	x	16.15	x	0.63	х	0.7	=	19.65	(80)
	_													
Solar g	gains in	watts, ca	alculated	I for eac	h month			(83)m = \$	Sum(74)m .	(82)m				
(83)m=	134.07	260.16	433.14	654.2	831.46	866.5	818.53	681.51	509.74	309.04	166.55	110.79		(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m -	+ (83)	m , watts	•	•	•	•	•	ı	
(84)m=	598.52	722.37	879.03	1073.47	1222.64	1230.	94 1166.09	1036.27	878.98	705.14	593.49	561.25		(84)
7. Me	an inter	nal temp	erature	(heating	season	)	-							
							a from Tal	ble 9, Tl	ո1 (°C)				21	(85)
•		Ū	٠.			•	Table 9a)	,	,					`
· · · · · · · · · · · · · · · · · · ·	Jan	Feb	Mar	Apr	May	Jui	<del></del>	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.96	0.87	0.7	0.54	0.62	0.88	0.99	1	1		(86)
, ,	. ,						<u> </u>	ļ	ļ		<u> </u>	<u> </u>	l	
							steps 3 to 7	T	<del></del>		1 40 04	1 40 40	1	(07)
(87)m=	19.49	19.66	19.97	20.4	20.75	20.9	4 20.99	20.97	20.81	20.33	19.84	19.46	j	(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwelli	ng from Ta	able 9, 1	h2 (°C)				,	
(88)m=	19.84	19.84	19.85	19.86	19.86	19.8	7 19.87	19.87	19.86	19.86	19.86	19.85		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m	(see Table	9a)						
(89)m=	1	1	0.99	0.94	0.82	0.6	0.41	0.48	0.81	0.98	1	1		(89)
Mean	interna	l temner	ature in	the rest	of dwelli	na T2	(follow ste	ens 3 to	7 in Tah	le 9c)			I	
(90)m=	17.83	18.08	18.54	19.15	19.62	19.8	<u>`</u>	19.86	19.71	19.07	18.35	17.8		(90)
(==)											l ng area ÷ (	ļ	0.23	(91)
											,	,	0.20	
			<u> </u>		i		= fLA × T1	<del>- `</del>	<del>-                                    </del>	1	1 40 00	1 40 40	1	(00)
(92)m=	18.22	18.45	18.87	19.44	19.88	20.0		20.12	19.96	19.37	18.69	18.19		(92)
					· ·		from Table	T .	<del>-                                    </del>	r e	1 40.00	1 40 40	1	(93)
(93)m=	18.22	18.45	18.87	19.44	19.88	20.0	9 20.13	20.12	19.96	19.37	18.69	18.19		(93)
		ting requ				a al a t	atam 11 af	Table (	\h_	4 T: /	76)	ما سم مماد	lata	
		factor fo				eu ai	step 11 of	rable s	D, SO INA	ıt 11,111=(	76)III an	u re-caic	uiate	
	Jan	Feb	Mar	Apr	May	Jui	n Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		tor for g		•				1 3	1				ı	
(94)m=	1	0.99	0.98	0.94	0.82	0.62	0.44	0.51	0.81	0.97	1	1		(94)
Usefu	ıl gains,	hmGm ,	W = (94	4)m x (8	4)m			!	1				1	
(95)m=	597.11	718.25	863.56	1005.69		761.2	26 509.56	530.47	715.86	685.19	590.61	560.26		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8							I	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm , V	V =[(39)m	x [(93)n	n– (96)m	]			ı	
(97)m=	2091.45	2031.78	1851.02	1560.54	1208.95	803.1	7 516.07	543.54	861.24	1294.96	1719.71	2083.31		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/m	onth = $0.02$	24 x [(97	7)m – (95	<u>s)m]</u> x (4	1)m		'	
(98)m=	1111.79	882.69	734.67	399.5	155.73	0	0	0	0	453.67	812.96	1133.15		
								Tot	al per year	(kWh/yea	r) = Sum(9	18)15,912 =	5684.16	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /vear								49.12	(99)
-		J - 75			. ,									`` '

9a. Energy requirements	s – Individual ł	eating sv	/stems i	ncluding	micro-C	CHP)					
Space heating:		<u> </u>		J		,					_
Fraction of space heat			mentary	•						0	(201)
Fraction of space heat	•	, ,			(202) = 1					1	(202)
Fraction of total heating	g from main sy	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiency of main space	e heating syst	em 1								93.4	(206)
Efficiency of secondary	//supplementa	ry heating	g system	າ, %						0	(208)
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requiren	<u> </u>	<b>.</b>					452.67	040.06	1122.15	1	
	734.67 399.5	155.73	0	0	0	0	453.67	812.96	1133.15		
$(211)$ m = $\{[(98)$ m x $(204)\}$	<del>,                                    </del>	r	0		Ι ,		405.70	070.4	1040.00	1	(211)
1190.36 945.07	786.59 427.73	166.74	0	0	0 Tota	0 I (kWh/yea	485.73	870.4	1213.22	6005.00	(211)
Change heating fuel (age	aandami) k\\/b	/manth			7010	ii (ikvviii) yot	ar) =00m(2	- 1 115,101:	2	6085.82	(211)
Space heating fuel (sec = {[(98)m x (201)] } x 100	• ,	monun									
(215)m= 0 0	0 0	0	0	0	0	0	0	0	0		
					Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,101</sub>		0	(215)
Water heating											_
Output from water heate					1	<b>I</b>	1	1	•	1	
	200.79 179.81	174.09	153.33	146.9	163.76	165.57	186.59	197.37	211.74		7(040)
Efficiency of water heate	er 88.02 87	04.77	00.0	00.0	I 00 0	00.0	07.0	88.23	T 00.04	80.3	(216)
217)m= 88.58 88.42 Fuel for water heating, k		84.77	80.3	80.3	80.3	80.3	87.2	00.23	88.64		(217)
(219)m = (64)m x 100 -											
(219)m= 244.95   216.27   3	228.11 206.67	205.36	190.95	182.94	203.94	206.19	213.98	223.7	238.86		_
					Tota	I = Sum(2	19a) <sub>112</sub> =			2561.92	(219)
Annual totals		4					k'	Wh/yea	r	kWh/yea	<u>r</u>
Space heating fuel used	ı, maın system	1								6085.82	╛
Nater heating fuel used										2561.92	
Electricity for pumps, far	ns and electric	keep-ho	t								
central heating pump:									30		(230
boiler with a fan-assiste	ed flue								45		(230
Total electricity for the a	bove, kWh/yea	ar			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting	•									440.1	
12a. CO2 emissions –	Individual bas	ting evete	me incl	ıdina mi	cro CUE	)				440.1	
12a. 002 61113310113 –	marviduai nea	ing syste		ading mi	CIO-CI II						
				<b>ergy</b> /h/year			Emiss kg CO	i <b>on fac</b> 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main sys	stem 1)		(211	1) x			0.2	16	=	1314.54	(261)
Space heating (seconda	ary)		(215	5) x			0.5	19	=	0	(263)
Water heating			(219	9) x			0.2		=	553.37	(264)
Space and water heating	n		(261	1) + (262)	+ (263) + (	264) =				1867.91	(265)
opaco and water neating	9		(=3)	, (/	(/ · (	,				1007.91	(203)

Electricity for pumps, fans and electric keep-hot  $(231) \times 0.519 = 38.93 (267)$ Electricity for lighting  $(232) \times 0.519 = 228.41 (268)$ Total CO2, kg/year sum of (265)...(271) = 2135.25 (272)

TER =

(273)

18.45

			lloor F	) otoilo						
Assessor Name:	Joseph Treaper		User D	Strom	o Num	bori		STDC	0032062	
Software Name:	Joseph Treanor Stroma FSAP 20	)12		Softwa					on: 1.0.4.14	
			roperty	Address		CICIII				
Address :	, Gondar Gardens									
1. Overall dwelling dim	nensions:									
			Are	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	³)
Ground floor			7	78.35	(1a) x	2	2.55	(2a) =	199.79	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	le)+(1r	n) 7	78.35	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	199.79	(5)
2. Ventilation rate:										_
	main heating	secondar heating	′у 	other	_	total			m³ per hou	ır —
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	fans				Ī	3	X	10 =	30	(7a)
Number of passive ven	ts				Ē	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	X 4	40 =	0	(7c)
										(* 5)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans =	(6a)+(6b)+(7	<sup>7</sup> a)+(7b)+(	(7c) =	Γ	30		÷ (5) =	0.15	(8)
	been carried out or is inten	ded, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 for atout an timeles		. 0 05 4-				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timbe present, use the value corre				•	uction			0	(11)
	nings); if equal user 0.35	soponanig to	o uno grodi	ior man are	a (ano					
If suspended wooder	floor, enter 0.2 (unse	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
• ,	enter 0.05, else enter 0								0	(13)
J	ws and doors draught	stripped		0.05 10.0	(4.4)	001			0	(14)
Window infiltration				0.25 - [0.2			. (45)		0	(15)
Infiltration rate	a GEO overseed in a	ibia matra	o nor h	(8) + (10)	, , ,	, , ,	, ,	oroo	0	(16)
If based on air permeat	e, q50, expressed in cubility value, then $(18) = 1$		•	•	•	elle oi e	rivelope	alea	5	(17)
·	lies if a pressurisation test h					is being u	sed		0.4	(18)
Number of sides shelte			·		•	J			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpor	ating shelter factor			(21) = (18	x (20) =				0.34	(21)
Infiltration rate modified	for monthly wind spec	ed							•	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	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 <i>∸ 4</i>									
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
1.27	1.00	0.00	L 3.33	1 3.02		L	I ''' <sup>2</sup>	L '''	J	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
0.43	0.43	0.42	0.37	0.37	0.32	0.32	0.31	0.34	0.37	0.38	0.4	]		
Calculate effect		_	rate for t	he appli	cable ca	se	!	!	!					¬
If mechanica			andiv N. 70	2h) _ (22c	) Em. (	auation (N	VEVV otho	muiaa (22h	) - (220)			0		(23a)
If exhaust air h									) = (23a)			0		(23b)
If balanced with		•	•	_					<b>.</b>		4 (00.)	0		(23c)
a) If balance	1					<del>- ` `                                 </del>	<del>- ^ `</del>	<del>í `</del>	<del> </del>	<del></del>	<del>1 ` ´</del>	) ÷ 100] 1		(0.4=)
(24a)m= 0	0	0	0	0	. 0	0	0	0	0	0	0	]		(24a)
b) If balance	1				ı	<del>,                                    </del>	<del>- ´ ` -</del>	<del>í `</del>	<del>- ´ `</del>	<del>-                                    </del>	1 .	1		(O.4F.)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]		(24b)
c) If whole h if (22b)n	nouse ex n < 0.5 >				•				5 × (23b	p)	_	_		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]		(24c)
d) If natural if (22b)n	ventilation			•					0.5]					
(24d)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	]		(24d)
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)	•	•	•	-		
(25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	]		(25)
3. Heat losse	e and he	nat lose r	naramet	ar.								_		
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value		A X kJ/	
Windows Type		( )			9.61		/[1/( 1.4 )+	0.04] =	12.74	$\stackrel{\prime}{\Box}$				(27)
Windows Type					3.99	x1,	/[1/( 1.4 )+	0.04] =	5.29	=				(27)
Windows Type					2	_	- /[1/( 1.4 )+	l.	2.65	=				(27)
Windows Type					3.99	= ,	/[1/( 1.4 )+		5.29	=				(27)
Walls Type1	52.2	· ·	19.5			_		— ¦		╡ ,				7(29)
• •		_		<u>"</u>	32.65	=	0.18	_	5.88					╡``
Walls Type2	24.9		0	_	24.99	=	0.18		4.5	<del> </del>		<b>-</b>		(29)
Roof	35.6		0		35.68	_	0.13	=	4.64					(30)
Total area of e	eiements	, m²			112.9	<u>1</u>								(31)
Party wall					24.69		0	= [	0			L		(32)
* for windows and ** include the area						ated using	i formula 1	/[(1/U-valu	ie)+0.04] a	as given in	n paragrapi	1 3.2		
Fabric heat los				,			(26)(30)	) + (32) =				40.9	99	(33)
Heat capacity		•	,					((28)	(30) + (32	2) + (32a).	(32e) =	4890		(34)
Thermal mass		,	c = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		25		(35)
For design assess	sments wh	ere the de	tails of the	,			ecisely the	e indicative	values of	TMP in T	able 1f		-	」` ′
Thermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix I	<						14.8	37	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			55.8	35	<b>–</b>
Ventilation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (	(25)m x (5	)			_
				N 4 -	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1		
Jan	Feb	Mar	Apr	May	Juli	1	, .ug	l Ocb	1 000		1			
	Feb 38.92	Mar 38.69	Apr 37.58	37.37	36.41	36.41	36.23	36.78	37.37	37.79	38.23	1		(38)
(38)m= 39.17	38.92	38.69	<u> </u>		-	-	⊢ <u> </u>	36.78	-	37.79	+	]		(38)
	38.92	38.69	<u> </u>		-	-	⊢ <u> </u>	36.78	37.37	37.79	+	] ]		(38)

Heat loss para	meter (l	-II P) \///	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.21	1.21	1.21	1.19	1.19	1.18	1.18	1.18	1.18	1.19	1.2	1.2		
(13)									<u> </u>	: Sum(40) <sub>1</sub> .		1.19	(40)
Number of day	s in mo	nth (Tabl	le 1a)						worago	<b>Sum(10)</b>		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)
						Į							
4 Motor boot	ina ono	rav roqui	romonti								Is) M/b /v s	nor!	
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed 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 ( <sup>-</sup>	ΓFA -13		43		(42)
Annual average	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.93		(43)
not more that 125	ilires per	r oerson per			ioi and co								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	i litres pei	day for ea	ach month	Va,m = ta	ctor from	l able 1c x	(43)						
(44)m= 101.12	97.45	93.77	90.09	86.42	82.74	82.74	86.42	90.09	93.77	97.45	101.12		_
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	0Tm / 3600			ım(44) <sub>112</sub> = ables 1b, 1		1103.18	(44)
(45)m= 149.97	131.16	135.35	118	113.22	97.7	90.54	103.89	105.13	122.52	133.74	145.23		
								_	Total = Su	ım(45) <sub>112</sub> =	=	1446.44	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,	) to (61)	_				
(46)m= 22.49	19.67	20.3	17.7	16.98	14.66	13.58	15.58	15.77	18.38	20.06	21.78		(46)
Water storage													
Storage volume	` '		•			_		ame ves	sel		0		(47)
If community h	-			•			` '		(01)	( 4 <del>- 1</del> )			
Otherwise if no		not wate	er (tnis in	iciudes i	nstantar	neous co	illod idmi	ers) ente	er o in (	(47)			
Water storage a) If manufactor		aclared l	nee facti	or is kno	wn (k\//k	J/day).							(48)
Temperature fa				31 13 KHO	WII (ICVVI	i/day).					0		
•							(40) × (40)				0		(49)
Energy lost from b) If manufactor		_	-		or is not		(48) x (49)	) =			0		(50)
Hot water stora			-								0		(51)
If community h	-			`		,							, ,
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost from	m watei	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (	54) in (5	55)									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)ı	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	<u>I</u> H11)] ÷ (5	0), else (5	<u>I</u> 7)m = (56)	<u>l</u> m where (	I (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	- e 3							0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by				•	•	. ,	, ,		r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

	Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m												
				ì í	<u> </u>	<del>- ` ` `</del>	_		T	1	T	1	(04)
(61)m= 50.96	<u>_</u>	47.78	44.43	44.04	40.8	42.16	44.0		47.78	48.06	50.96		(61)
	<u> </u>		<u> </u>				<u> </u>		<del>`                                    </del>	<del>ì ´</del>	<del>`</del>	(59)m + (61)m	
(62)m= 200.9		183.13	162.43	157.26	138.5	132.7	147.9		170.3	181.8	196.19		(62)
Solar DHW inpu									ır contribu	tion to wate	er heating)		
(add addition		r	1	r		<del></del>	<del>.                                      </del>	<del></del>		1		1	(22)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from					ı					1		1	
(64)m= 200.9	2 176.01	183.13	162.43	157.26	138.5	132.7	147.9		170.3	181.8	196.19		٦,,,,
								Output from w				1996.74	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61	)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	[]	
(65)m= 62.6	54.82	56.95	50.34	48.66	42.69	40.64	45.5	5 46.06	52.68	56.48	61.03		(65)
include (57	7)m in cald	culation of	of (65)m	only if c	ylinder i	s in the	dwellir	ng or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):									
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts													
Jan		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec	]	
(66)m= 121.5	4 121.54	121.54	121.54	121.54	121.54	121.54	121.5	54 121.54	121.54	121.54	121.54	1	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5	•	•	•	•	
(67)m= 19.25	17.1	13.91	10.53	7.87	6.64	7.18	9.33	12.53	15.9	18.56	19.79	]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, ea	uation L	13 or L1	 3а), а	lso see Ta	ble 5	<u>.</u>	•		
(68)m= 215.9	<del></del>	212.55	200.53	185.35	171.09	161.56	159.3		176.99	192.17	206.43	1	(68)
Cooking gair	ns (calcula	ted in A	ppendix	L. eguat	ion L15	or L15a	). also	see Table	· 5		!	J	
(69)m= 35.15	<del>_`</del>	35.15	35.15	35.15	35.15	35.15	35.1		35.15	35.15	35.15	]	(69)
Pumps and f	ans gains	/Table !	L 5a)							1		J	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g.		<u> </u>	ļ	<u> </u>	ļ					1 -		J	` ,
(71)m= -97.23		-97.23	-97.23	-97.23	-97.23	-97.23	-97.2	97.23	-97.23	-97.23	-97.23	1	(71)
Water heatin		<u> </u>	07.20	07.20	07.20			07.20	1 07.20	07.20	1 07.20	J	( )
(72)m= 84.14	<del>~~</del>	76.54	69.92	65.4	59.29	54.63	61.2	3 63.98	70.81	78.45	82.03	1	(72)
` '	_	l	00.02	00.4				m + (69)m +	l	l	l	J	(12)
Total internation (73)m= 381.8	_ <del>-</del>	365.46	343.44	321.08	299.48	285.83	292.3		326.17	351.64	370.71	1	(73)
6. Solar gai		303.40	343.44	321.00	299.40	200.00	292.3	303.93	320.17	351.64	3/0./1		(10)
Solar gains are		using sola	r flux from	Table 6a	and assoc	iated equa	itions to	convert to the	ne applica	ble orienta	tion		
Orientation:		•	Area		Flu	•		g_	ю арріюа	FF F		Gains	
Onomation.	Table 6d		m <sup>2</sup>			ble 6a		Table 6b	Т	able 6c		(W)	
North 0.9	0.54	X	3.9	90	x -	10.63	1 <sub>x</sub> [	0.63	x [	0.7		9.09	(74)
North 0.9		×	3.9		-	20.32	] ^	0.63	^	0.7	= -	17.38	](74)
North 0.9		^ x	3.9			34.53	] ^	0.63	^ ^ L	0.7		29.53	](74)
North 0.9		_					┆		≓		=		$\int_{(74)}^{(74)}$
		×	3.9		<b>=</b>	55.46	]	0.63	×	0.7	╡ -	47.43	╡
North 0.9	0.54	X	3.9	99	X	74.72	X	0.63	x	0.7	=	63.89	(74)

North	0.9x	0.54	1 ,	0.00	۱ .,	70.00	1	0.00	۱	0.7	1 _	00.4	(74)
North	<u> </u>	0.54	] x ]	3.99	X I	79.99	X I	0.63	X	0.7	] = ]	68.4	╡゛
North	0.9x	0.54	] X ] .,	3.99	l x	74.68	X I	0.63	X	0.7	] = ]	63.86	$= \frac{1}{74}$
North	0.9x	0.54	] X ] .,	3.99	l X l	59.25	l X l	0.63	X	0.7	] = ]	50.67	$= \frac{1}{74}$
North	0.9x	0.54	] X ]	3.99	X 	41.52	X 1	0.63	X	0.7	] = ]	35.5	$= \frac{(74)}{(74)}$
North	0.9x	0.54	] X ]	3.99	X	24.19	X 1	0.63	X	0.7	] = 1	20.69	(74)
North	0.9x	0.54	X 1	3.99	X 	13.12	X 1	0.63	X	0.7	] = 1	11.22	$= \frac{1}{(74)}$
East	0.9x	0.54	] X	3.99	X	8.86	X	0.63	X	0.7	] = 1	7.58	= (74) = (70)
East	0.9x	1	] X	9.61	X	19.64	X	0.63	X	0.7	] = 1	57.68	(76)
East	0.9x	. 1	] X ]	3.99	X 	19.64	X 1	0.63	X	0.7	] = 1	23.95	$= \frac{1}{2} (76)$
East	0.9x	1	] X	2	X	19.64	X	0.63	X	0.7	] = 1	12	(76)
	0.9x	1	X	9.61	X I	38.42	X	0.63	X	0.7	] = 1	112.84	(76)
East	0.9x	1	X	3.99	X I	38.42	X I	0.63	X	0.7	] = 1	46.85	(76)
East	0.9x	1	X	2	X	38.42	X	0.63	X	0.7	] = 1	23.48	(76)
East	0.9x	1	X	9.61	X	63.27	X	0.63	X	0.7	] = 1	185.83	(76)
East	0.9x	1	X	3.99	X	63.27	X	0.63	X	0.7	] = 1	77.15	(76)
East	0.9x	1	X	2	X	63.27	X	0.63	X	0.7	] =	38.67	(76)
East	0.9x	1	X	9.61	X	92.28	X	0.63	X	0.7	] =	271.02	(76)
East	0.9x	1	X	3.99	X	92.28	X	0.63	X	0.7	=	112.53	(76)
East	0.9x	1	X	2	Х	92.28	X	0.63	X	0.7	=	56.4	(76)
East	0.9x	1	X	9.61	Х	113.09	X	0.63	X	0.7	=	332.15	(76)
East	0.9x	1	X	3.99	Х	113.09	X	0.63	X	0.7	=	137.9	(76)
East	0.9x	1	X	2	X	113.09	X	0.63	X	0.7	=	69.13	(76)
East	0.9x	1	X	9.61	X	115.77	X	0.63	X	0.7	=	340.01	(76)
East	0.9x	1	X	3.99	X	115.77	X	0.63	X	0.7	=	141.17	(76)
East	0.9x	1	X	2	X	115.77	X	0.63	X	0.7	=	70.76	(76)
East	0.9x	1	X	9.61	X	110.22	X	0.63	X	0.7	=	323.7	(76)
East	0.9x	1	X	3.99	X	110.22	X	0.63	X	0.7	=	134.4	(76)
East	0.9x	1	X	2	X	110.22	X	0.63	X	0.7	=	67.37	(76)
East	0.9x	1	X	9.61	X	94.68	X	0.63	X	0.7	=	278.06	(76)
East	0.9x	1	X	3.99	X	94.68	X	0.63	X	0.7	=	115.45	(76)
East	0.9x	1	X	2	X	94.68	X	0.63	X	0.7	=	57.87	(76)
East	0.9x	1	X	9.61	X	73.59	X	0.63	X	0.7	=	216.13	(76)
East	0.9x	1	X	3.99	X	73.59	X	0.63	X	0.7	=	89.73	(76)
East	0.9x	1	X	2	X	73.59	X	0.63	X	0.7	=	44.98	(76)
East	0.9x	1	X	9.61	X	45.59	X	0.63	X	0.7	=	133.89	(76)
East	0.9x	1	X	3.99	X	45.59	X	0.63	X	0.7	=	55.59	(76)
East	0.9x	1	x	2	x	45.59	X	0.63	x	0.7	] =	27.87	(76)
East	0.9x	1	x	9.61	x	24.49	X	0.63	x	0.7	] =	71.92	(76)
East	0.9x	1	X	3.99	x	24.49	x	0.63	x	0.7	=	29.86	(76)
East	0.9x	1	x	2	x	24.49	x	0.63	x	0.7	=	14.97	(76)
East	0.9x	1	x	9.61	X	16.15	X	0.63	X	0.7	] =	47.44	(76)

East	0.9x	1	х	3.9	99	x	16.15	x	0.63	x	0.7	=	19.69	(76)
East	0.9x	1	x	2	2	x	16.15	x	0.63	_ x [	0.7	=	9.87	(76)
	_					_		_						_
Solar g	gains in	watts, ca	alculated	for eac	h month			(83)m = 9	Sum(74)m	(82)m				
(83)m=	102.73	200.55	331.19	487.38	603.07	620.	34 589.33	502.04	386.34	238.04	127.97	84.58		(83)
Total g	ains – i	nternal a	and solar	(84)m =	= (73)m	+ (83)	m , watts			•	•		I	
(84)m=	484.55	579.89	696.65	830.82	924.15	919.	83 875.16	794.38	690.28	564.2	479.61	455.29		(84)
7. Me	an inter	nal temp	perature	(heating	season	)								
							ea from Ta	ble 9, Th	n1 (°C)				21	(85)
-		_	•			-	Table 9a)	,	,			ļ		
	Jan	Feb	Mar	Apr	May	Ju	<u> </u>	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93	0.8	0.6		0.52	0.8	0.97	1	1		(86)
` ′			<u> </u>		ļ	<u> </u>		ļ	<u>ļ</u>		<u> </u>			` '
ı					,		steps 3 to	1	<del>-                                    </del>		,	1	Ī	(07)
(87)m=	19.69	19.87	20.18	20.57	20.85	20.9	7 20.99	20.99	20.89	20.5	20.02	19.66		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwell	ing from Ta	able 9, T	h2 (°C)					
(88)m=	19.91	19.91	19.91	19.93	19.93	19.9	4 19.94	19.94	19.93	19.93	19.92	19.92		(88)
Utilisa	ation fac	tor for a	ains for i	est of d	welling	h2 m	(see Table	. 9a)	•	•	•	-	1	
(89)m=	1	0.99	0.97	0.91	0.74	0.52	<u>`                                      </u>	0.41	0.72	0.95	0.99	1		(89)
			<u> </u>						<u> </u>				l	, ,
1		· ·			i		? (follow ste	ri e	1	<del>' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' </del>	T		l	(00)
(90)m=	18.17	18.44	18.89	19.44	19.79	19.9	2 19.94	19.94	19.85	19.35	18.66	18.14		(90)
										TLA = LIVIN	ng area ÷ (4	4) =	0.39	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling)	= fLA × T1	+ (1 – fl	_A) × T2					
(92)m=	18.77	19	19.39	19.88	20.2	20.3	3 20.35	20.35	20.26	19.8	19.19	18.73		(92)
Apply	adjustn	nent to t	he mean	interna	l temper	ature	from Table	4e, wh	ere appr	opriate			ı	
(93)m=	18.77	19	19.39	19.88	20.2	20.3	3 20.35	20.35	20.26	19.8	19.19	18.73		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	i to the ı	mean int	ternal ter	nperatu	re obtair	ned at	step 11 of	Table 9	b, so tha	at Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	able 9a			1			ı	1	I	
	Jan	Feb	Mar	Apr	May	Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
1	ation fac		ains, hm					1		1	1		l	
(94)m=	1	0.99	0.97	0.9	0.76	0.56	0.39	0.45	0.74	0.95	0.99	1		(94)
			, W = (94		<del></del>							ı	I	
(95)m=	482.48	574.01	675.93	751.52	703.28	513.		359.2	513.16	536.98	475.38	453.83		(95)
	<u> </u>	age exte	rnal tem	perature	from T					т	T	1	l	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6		16.4	14.1	10.6	7.1	4.2		(96)
Heat I							V = [(39)m]	<del> </del>	<del>1 ` ´ </del>	<del>i                                     </del>		1	Ī	
(97)m=	1374.51	1336.3	1219.1	1026.2	792.81	528.		363.39	570.56	857.44	1132.3	1367.19		(97)
Space	e heatin	<del></del>		r each n	nonth, k	Wh/m	onth = $0.02$	24 x [(97	<u>')m – (95</u>	5)m] x (4	1)m	1	Ī	
(98)m=	663.67	512.26	404.12	197.77	66.61	0	0	0	0	238.43	472.98	679.54		_
								Tota	al per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	3235.38	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								41.29	(99)
9a. En	erav rec	uiremer	nts – Indi	vidual h	eating s	vstem	s including	micro-C	CHP)					
	e heatir	•			g	,		,						
-		•	at from se	econdar	y/supple	ment	ary system						0	(201)
	ı.	_												

Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) <b>×</b> [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.4	(206)
Efficiency of secondary/supplementary heating s	ystem,	%						0	(208)
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)    663.67   512.26   404.12   197.77   66.61	0	0	0	0	238.43	472.98	679.54	1	
	<u> </u>	U	U	U	230.43	472.90	679.54		(211)
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $	0	0	0	0	255.27	506.41	727.56	]	(211)
			Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<u> </u>	3464	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)								1	
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		<b>7</b>
Materia			rota	i (kvvn/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<b>.</b>	0	(215)
Water heating Output from water heater (calculated above)									
'	138.5	132.7	147.93	149.56	170.3	181.8	196.19		
Efficiency of water heater								80.3	(216)
` '	80.3	80.3	80.3	80.3	85.9	87.35	87.92		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	72.48	165.25	184.22	186.25	198.26	208.13	223.14	]	
			Tota	I = Sum(2	19a) –				7(040)
			Tota	i – Odiii(2	10u) <sub>112</sub> =			2357.18	(219)
Annual totals			Tota	1 = 0am(2		Wh/year		kWh/yea	
Space heating fuel used, main system 1			Tota	1 – Odiii(2		Wh/year			
			rota	i – Gam(z		Wh/year		kWh/yea	
Space heating fuel used, main system 1			Tota	i – Sam(2		Wh/year		kWh/year	
Space heating fuel used, main system 1 Water heating fuel used			Tota	i – Sam(2		Wh/year	30	kWh/year	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot			Tota	- Sump		Wh/year		kWh/year	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:							30	kWh/year	(230c)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue					k¹		30	3464 2357.18	(230c) (230e)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year	s includ	ding mid	sum	of (230a).	k¹		30	kWh/year 3464 2357.18	(230c) (230e) (231)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting			sum	of (230a).	<b>k</b> 1		30 45	kWh/year 3464 2357.18 75 340.01	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	Ene		sum	of (230a).	<b>k</b> 1	ion fac	30 45	kWh/year 3464 2357.18	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	Ene	r <b>gy</b> n/year	sum	of (230a).	(230g) =	ion fac 2/kWh	30 45	kWh/year 3464 2357.18 75 340.01	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems	<b>Ene</b> kWh	e <b>rgy</b> n/year ×	sum	of (230a).	(230g) =  Emiss kg CO	ion fac 2/kWh	30 45 <b>tor</b>	kWh/year 3464 2357.18 75 340.01 Emissions kg CO2/ye	(230c) (230e) (231) (232)
Space heating fuel used, main system 1  Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)	<b>Ene</b> kWh	e <b>rgy</b> n/year x	sum	of (230a).	Emiss kg CO:	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b>	kWh/year 3464 2357.18 75 340.01 Emissions kg CO2/ye 748.22 0	(230c) (230e) (231) (232) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	Ene kWh (211) (215) (219)	e <b>rgy</b> n/year x x	sum	of (230a).	(230g) =  Emiss kg CO:	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b> = =	kWh/year 3464 2357.18 75 340.01 Emissions kg CO2/ye 748.22 0 509.15	(230c) (230e) (231) (232) (232) (261) (263) (264)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating Space and water heating	Ene kWh (211) (215) (219) (261)	x x x x + (262) -	sum	of (230a).	Emiss kg CO: 0.2	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b> = =	kWh/year 3464 2357.18 75 340.01 Emissions kg CO2/ye 748.22 0 509.15 1257.38	(230c) (230e) (231) (232) (232) (261) (263) (264) (265)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	Ene kWh (211) (215) (219)	x x x + (262) -	sum	of (230a).	Emiss kg CO:	ion fac 2/kWh 16 19	30 45 <b>tor</b> = =	kWh/year 3464 2357.18 75 340.01 Emissions kg CO2/ye 748.22 0 509.15	(230c) (230e) (231) (232) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1472.77 (272)

TER = 18.8 (273)

			I leer P	)otoile: -						
			User D					0.75.5	2000000	
Assessor Name: Software Name:	Joseph Treanor Stroma FSAP 20	112		Strom: Softwa					0032062 on: 1.0.4.14	
Software Name:	Stiolila FSAF 20			Address		Sion:		VEISIG	JII. 1.U.4.14	
Address :	, Gondar Gardens		i i		ГЮ					
1. Overall dwelling dime	·	, London,	14440 11							
<u> </u>			Area	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor					(1a) x		.55	(2a) =	139.28	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	le)+(1r	n) 5	4.62	(4)			_		
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	139.28	(5)
2. Ventilation rate:										
<u> </u>		secondar	у	other		total			m³ per hou	ır
Number of chimneys	heating +	<b>heating</b>	+ [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	<b></b>	0	] = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	2	x ·	10 =	20	(7a)
Number of passive vents	S						x	10 =	0	(7b)
Number of flueless gas t					F	0	x	40 =	0	(7c)
ramber of nacious gas i						0				(70)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(	7c) =	Γ	20		÷ (5) =	0.14	(8)
If a pressurisation test has	been carried out or is inten	ded, procee	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (					•	ruction			0	(11)
if both types of wall are p deducting areas of open	oresent, use the value corre ings): if equal user 0.35	esponding to	the great	er wall are	a (after					
If suspended wooden	• / .	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0	,	`	,					0	(13)
Percentage of window	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	12) + (13)	+ (15) =		0	(16)
Air permeability value	, q50, expressed in cu	ubic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	ility value, then (18) = [	(17) ÷ 20]+(8	B), otherwi	ise (18) = (	16)				0.39	(18)
Air permeability value appli	es if a pressurisation test h	as been dor	ne or a deg	gree air pe	meability	is being u	sed			
Number of sides shelter	ed								2	(19)
Shelter factor				(20) = 1 -		[9)] =			0.85	(20)
Infiltration rate incorpora	-			(21) = (18)	x (20) =				0.33	(21)
Infiltration rate modified	<del></del>	ed	i				•		7	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7	_							-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (2	22)m ÷ 4									
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
•			<u> </u>			Ļ	L		J	

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.38	0.39		
Calculate effe	ctive air	change i			cable ca	se							
If mechanica	al ventila	ition:									[	0	(23
If exhaust air h		0	. ,	, ,	,	. `	,, .	,	) = (23a)			0	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(23
a) If balance	ed mech	anical ve	ntilation	with he	at recov	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		(24
b) If balance	1			without		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				•	•				<b>5</b> (00)	`			
<u> </u>		<u> </u>		<u> </u>	ŕ	wise (24	<del></del>		<del>`</del>	<del>i                                      </del>			(2)
24c)m= 0	0	0		0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r						ventilatio 24d)m = 1			0.51				
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	ter (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
					<u> </u>	<u> </u>	<u> </u>						`
<ol><li>Heat losse</li></ol>		•											
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-ł		A X k kJ/K
Vindows Type		(111)	•••		3.03	<del></del>	/[1/( 1.4 )+		4.02		10/111	`	(27
Vindows Type					1.52	ऱ .		l l	2.02				(27
Vindows Type					3.03	=	/[1/( 1.4 )+	· .	4.02				(27
Valls Type1			40.0			<b>=</b>   ``		` ¦		=		<b>-</b>	`
Walls Type1	50.0		13.64	<u>+</u>	36.45	=	0.18	=	6.56	_		╡	(29
• •	25.3		0	_	25.36	=	0.18	=	4.56	<u> </u>		╡╞	(29
Roof	44.		0		44.8	×	0.13	=	5.82				(30
Total area of e	elements	, m²			120.2	5							(31
Party wall					24.73		0	=	0				(32
for windows and it include the area						lated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	n paragraph	3.2	
abric heat los							(26)(30)	+ (32) =			I	35.03	(33
leat capacity		•	,					((28)	.(30) + (3	2) + (32a)	(32e) =	5224.6	<b>==</b>
hermal mass		,	P = Cm ÷	- TFA) ir	n kJ/m²K	,		Indica	tive Value	: Medium	· · ·	250	(35
or design assess	•	•		,			ecisely the	indicative	values of	f TMP in T	able 1f		( )
an be used inste	ad of a de	tailed calc	ulation.										
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	K						15.42	(30
details of therma		are not kn	own (36) =	= 0.15 x (3	11)			(22)	(00)		ı		
otal fabric he		-1- 1-1- 1							(36) =	(05) (5	, I	50.45	(3
entilation hea	r				1	11	۸		i	(25)m x (5	· 		
i lan	Feb	Mar	Apr	25.95	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(3
Jan	1 07			/ n Uh	25.3	25.3	25.18	25.55	25.95	26.24	26.53		(30
38)m= 27.16	27	26.84	26.09	20.00		<u> </u>	<u> </u>		<u> </u>	ļ.			`
	<u> </u>		76.55	76.41	75.75	75.75	75.63	(39)m 76.01	= (37) + ( 76.41	38)m 76.69	76.98		`

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.42	1.42	1.42	1.4	1.4	1.39	1.39	1.38	1.39	1.4	1.4	1.41		
( )										Sum(40) <sub>1.</sub>	12 /12=	1.4	(40)
Number of day	s in mo	nth (Tabl	e 1a)							, ,	L		
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	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu											83		(42)
if TFA > 13.9 if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)	)2)] + 0.0	0013 x (	ΓFA -13.	.9)			
Annual averag	•	ater usac	e in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		77	.57		(43)
Reduce the annua	ıl average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.07		( - /
not more that 125	litres per	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	r day for ea	ch month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 85.33	82.23	79.12	76.02	72.92	69.82	69.82	72.92	76.02	79.12	82.23	85.33		
						_				m(44) <sub>112</sub> =	L	930.87	(44)
Energy content of	hot water	used - cal	culated mo	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= 126.54	110.67	114.21	99.57	95.54	82.44	76.39	87.66	88.71	103.38	112.85	122.55		_
<i>(f. in a tandan a a</i>			-f (n.		( )		havea (40		Total = Su	m(45) <sub>112</sub> =	· [	1220.52	(45)
If instantaneous w							boxes (46)	) 10 (61)					
(46)m= 18.98	16.6	17.13	14.94	14.33	12.37	11.46	13.15	13.31	15.51	16.93	18.38		(46)
Water storage Storage volum		) includin	a anv c	olar or M	WHDC	etorage	within co	ama vac	വ				(47)
_	` '		•			_		airie ves	3 <b>C</b> I		0		(47)
If community h Otherwise if no	•			•			` '	are) ante	ar '∩' in <i>(</i>	<b>7</b> 17)			
Water storage		not wate	. (0113 11	iciaacs i	iistaiitai	icous co	ilibi boli	Ci3) Citi	JI O III (	(77)			
a) If manufact		eclared lo	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa					`	,					0		(49)
Energy lost fro				ear			(48) x (49)	) =			0		(50)
b) If manufact		_	-		or is not		(10) 11 (10)	,			0		(50)
Hot water stora			-								0		(51)
If community h	•		on 4.3										
Volume factor											0		(52)
Temperature fa	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 (5	55)									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder 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	хН	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tabl	e H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi los				$\overline{}$			Ť		· ` `	<u> </u>	-		1			1	
(61)m= 4	3.48	37.85	40.32	2	37.49	37.16	3	34.43	35.58	37.	16	37.49	40.32	40.55	43.48		(61)
Total hea	t requ	uired for	water	he	ating ca	alculated	d fo	r eac	h month	(62)	m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 17	70.02	148.52	154.5	3	137.06	132.7	1	16.87	111.97	124	.82	126.2	143.7	153.4	166.03		(62)
Solar DHW	input o	calculated	using A	ppe	endix G or	Appendix	кН	(negati	ve quantity	/) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)		
(add addi	itiona	l lines if	FGHR	S	and/or V	VWHRS	ap	plies	, see Ap	pend	lix C	<del>)</del>				,	
(63)m=	0	0	0		0	0		0	0	0	)	0	0	0	0		(63)
Output fro	om w	ater hea	ter														
(64)m= 17	70.02	148.52	154.5	3	137.06	132.7	1	16.87	111.97	124	.82	126.2	143.7	153.4	166.03		_
											Outp	ut from wa	ater heate	er (annual) <sub>1</sub>	112	1685.83	(64)
Heat gain	ns froi	m water	heatin	g,	kWh/mo	onth 0.2	5 ′	[0.85	× (45)m	+ (6	1)m	] + 0.8 x	([(46)m	+ (57)m	+ (59)m	]	
(65)m= 5	2.95	46.26	48.05	5	42.48	41.06	3	86.02	34.3	38.	44	38.87	44.46	47.66	51.62		(65)
include	e (57)ı	m in calc	ulatio	n o	f (65)m	only if o	ylir	nder i	s in the o	llewb	ing	or hot w	ater is f	rom com	munity h	neating	
5. Interr	nal ga	ains (see	Table	5	and 5a)	):											
Metabolio	c gain	s (Table	5). W	att	S												
	Jan	Feb	Ma	$\neg$	Apr	May		Jun	Jul	А	ug	Sep	Oct	Nov	Dec		
(66)m= 9	1.31	91.31	91.31	T	91.31	91.31	9	1.31	91.31	91.	31	91.31	91.31	91.31	91.31		(66)
Lighting g	gains	(calculat	ted in	Ap <sub>l</sub>	pendix l	_, equat	tion	L9 o	r L9a), a	lso s	ee -	Table 5				1	
· · ·	4.19	12.61	10.25	÷	7.76	5.8	_	4.9	5.29	6.8	_	9.23	11.72	13.68	14.59	]	(67)
Appliance	es ga	ins (calc	ulated	in	Append	dix L, eq	uat	tion L	13 or L1	3a), i	also	see Tal	ble 5			1	
·· —	59.21	160.86	156.6	_	147.83	136.64	_	26.13	119.1	117		121.62	130.48	141.67	152.18	]	(68)
Cooking 9	gains	(calcula	ted in	— Др	pendix	L. egua	tior	ո L15	or L15a)	L ). als	0 SE	e Table	5	1	<u> </u>	ı	
	32.13	32.13	32.13	÷	32.13	32.13	_	32.13	32.13	32.	_	32.13	32.13	32.13	32.13	1	(69)
L_ Pumps aı	nd far	ns dains	(Table		a)				<u> </u>	<u> </u>				<u> </u>		J	
(70)m=	3	3	3	<u> </u>	3	3	Π	3	3	3	;	3	3	3	3	]	(70)
Losses e		anoratio	n (nec	L tati			الد ماد			<u> </u>		_		1		I	, ,
	.g. ev 73.05	-73.05	-73.0	_	-73.05	-73.05	_	73.05	-73.05	-73	05	-73.05	-73.05	-73.05	-73.05	1	(71)
Water he				_	7 0.00	70.00			70.00			10.00	7 0.00	1 70.00	10.00	I	( )
_	71.16	68.84	64.59	÷	59	55.18		50.03	46.1	51.	66	53.98	59.75	66.2	69.38	1	(72)
` '					39	33.10	`			<u> </u>			<u> </u>	71)m + (72)	I	I	(12)
(73)m= 29	<b>ernai</b> 97.96	295.7	284.9	<u>. T</u>	267.98	251.02	1 2	34.45	223.89	229	_	238.23	255.35	274.94	289.54	1	(73)
6. Solar			264.9	3 <u> </u>	207.96	251.02		34.45	223.69	229	.39	230.23	255.35	274.94	269.54		(73)
			usina sa	olar	flux from	Table 6a	and	assoc	iated equa	tions	to co	nvert to th	e applica	ble orienta	tion		
Orientation			Ū	Jiai	Area	rabic oa	ana	Flu	•	1110110	.0 00	g_	с арріюа	FF		Gains	
Onomane		able 6d	aotoi		m <sup>2</sup>				ble 6a		Т	able 6b	7	able 6c		(W)	
East	0.9x	3		X	3.0	3	x		9.64	x		0.63	x	0.7		54.56	(76)
	0.9x	1		X	1.5		x		19.64	] ^ ] <sub>X</sub>		0.63	^	0.7		9.12	](76)
	0.9x	3	$\dashv$	^ X			X			] ^   x			_  ^ L				](76) ](76)
	0.9x C		_		3.0				38.42	] ]		0.63	╡╞	0.7	=	106.73	╡
	늗	1	_	X	1.5		X		38.42	X I		0.63		0.7	_ =	17.85	<b></b> (76)
⊏aSl	0.9x	3		X	3.0	3	X	6	3.27	X		0.63	X	0.7	=	175.77	(76)

	_												_					
East	0.9x	1		X	1.52		X	6	3.27	X		0.63	X	0.7	=		29.39	(76)
East	0.9x	3		X	3.03		X	9	2.28	X		0.63	X	0.7	=		256.36	(76)
East	0.9x	1		X	1.52		X	9	2.28	X		0.63	X	0.7	=		42.87	(76)
East	0.9x	3		x	3.03		X	1	13.09	X		0.63	X	0.7	=		314.17	(76)
East	0.9x	1		x	1.52		X	1	13.09	X		0.63	X	0.7	=		52.54	(76)
East	0.9x	3		x	3.03		X	1	15.77	X		0.63	X	0.7	=		321.61	(76)
East	0.9x	1		x	1.52		X	1	15.77	X		0.63	X	0.7	=		53.78	(76)
East	0.9x	3		x	3.03		X	1	10.22	x		0.63	X	0.7	=		306.19	(76)
East	0.9x	1		x	1.52		X	1	10.22	X		0.63	X	0.7	=		51.2	(76)
East	0.9x	3		x	3.03		X	S	4.68	X		0.63	X	0.7	=		263.01	(76)
East	0.9x	1		x	1.52		X	9	4.68	x		0.63	x	0.7	=		43.98	(76)
East	0.9x	3		x	3.03		X	7	3.59	X		0.63	X	0.7	=		204.43	(76)
East	0.9x	1		x	1.52		X	7	3.59	x		0.63	x	0.7	=		34.18	(76)
East	0.9x	3		x	3.03		X	4	5.59	x		0.63	x	0.7	=		126.65	(76)
East	0.9x	1		x	1.52		X	4	5.59	X		0.63	X	0.7	=		21.18	(76)
East	0.9x	3		x	3.03		X	2	4.49	x		0.63	x	0.7	=		68.03	(76)
East	0.9x	1		x	1.52		X	2	4.49	x		0.63	X	0.7	=		11.38	(76)
East	0.9x	3		x	3.03		X	1	6.15	X		0.63	X	0.7	=		44.87	(76)
East	0.9x	1		x	1.52		X	1	6.15	x		0.63	x	0.7	=		7.5	(76)
South	0.9x	0.77		x	3.03		X	4	6.75	x		0.63	x	0.7	=		43.29	(78)
South	0.9x	0.77		x	3.03		X	7	6.57	X		0.63	X	0.7	=		70.9	(78)
South	0.9x	0.77		x	3.03		X	9	7.53	x		0.63	x	0.7	=		90.32	(78)
South	0.9x	0.77		x	3.03		X	1	10.23	x		0.63	x	0.7	=		102.08	(78)
South	0.9x	0.77		x	3.03		X	1	14.87	x		0.63	x	0.7	=		106.37	(78)
South	0.9x	0.77		x	3.03		X	1	10.55	x		0.63	X	0.7	=		102.37	(78)
South	0.9x	0.77		x	3.03		X	1	08.01	X		0.63	X	0.7	=		100.02	(78)
South	0.9x	0.77		x	3.03		X	1	04.89	X		0.63	X	0.7	=		97.13	(78)
South	0.9x	0.77		x	3.03		X	1	01.89	X		0.63	X	0.7	=		94.35	(78)
South	0.9x	0.77		x	3.03		X	8	2.59	X		0.63	X	0.7	=		76.47	(78)
South	0.9x	0.77		x	3.03		X	5	5.42	X		0.63	X	0.7	=		51.32	(78)
South	0.9x	0.77		x	3.03		X		40.4	x		0.63	X	0.7	=		37.41	(78)
7-				$\overline{}$	for each		$\overline{}$			$\overline{}$	_	um(74)m .				_		
` '	106.98	195.48	295.4			473.08		77.76	457.41	404	.12	332.96	224.3	130.72	89.78			(83)
Ī				_	(84)m = (		<del>-</del>							- 1		٦		(0.4)
(84)m=	404.93	491.18	580.4	41	669.29	724.1		12.21	681.29	633	5.51	571.19	479.6	405.66	379.32			(84)
					heating s													
•		•		• •	eriods in t		_			ole 9	, Th	1 (°C)					21	(85)
Utilisat				-	ving area		Ť			_					ı	_		
	Jan	Feb	Ma	-	Apr	May	+	Jun	Jul	<del>                                     </del>	ug	Sep	Oct	+	Dec	4		(0.0)
(86)m=	1	0.99	0.97	/	0.92	8.0		0.63	0.48	0.5	53	0.78	0.95	0.99	1			(86)
			1	-	ving area		$\overline{}$		i –							_		
(87)m=	19.54	19.75	20.0	9	20.49	20.79	2	20.94	20.99	20.	98	20.87	20.44	19.91	19.5			(87)

Comparison   Com	<b>T</b>			and a day to		.1 .112	( T.	LL O T	LO (0 <b>0</b> )					
Utilisation factor for gains for rest of dwelling, h2/m (see Table 9a)   (89)								i	· · ·	10.76	10.76	10.76		(88)
Column   C	` '	ļ		ļ		<u>!</u>			19.77	19.76	19.76	19.76		(00)
Maximinational temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (30)m= 17.04		<del></del>	1			<del>```</del>	1	<del>-                                    </del>	0.00	0.00	0.00			(00)
Solid   Soli	(89)m= 0.99	0.98	0.96	0.89	0.74	0.53	0.35	0.4	0.68	0.93	0.99	1		(89)
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2   (2)2/m   (8)2/m   (		<del></del>				<del>` ` `</del>	1	<u> </u>	ì	e 9c)				
Mani internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2   (92)	(90)m= 17.84	18.15	18.63	19.19	19.57	19.74	19.77	19.77	<u> </u>	!	!	<u> </u>		<b>_</b> ` ′
(92)   18.82   19.08   19.47   19.94   20.28   20.44   20.47   20.47   20.38   19.9   19.27   18.78   (92)									f	fLA = Livin	g area ÷ (4	4) =	0.58	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (33)ms 18,82 19,08 19,47 19,94 20,28 20,44 20,47 20,47 20,46 19,9 19,27 18,78 (83)  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  Uain Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (34)m= 0.98 0.98 0.96 0.96 0.89 0.77 0.58 0.42 0.47 0.73 0.93 0.98 0.98 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m  Useful dains, hmGm, W = (94)m x (84)m  (35)ms 40.16 482.27 555.35 597.39 556.89 419.2 289.12 300.77 418.03 446.93 399.19 376.91 (95)  Monthly average external temperature from Table 8  (36)ms 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 ((39)m - (96)m) Total per year (kWh/year) = Sum((38)) 12.1 (97)  Space heating requirement for each month, kWh/month = 0.024 x ((37)m - (95)m) x (41)m  (36)ms 539.68 413.79 332.8 178.36 73.22 0 0 0 0 0 0 9 (96.11 384.41 554.42)  Total per year (kWh/year) = Sum((38)) x is.x = 2672.79 (98)  Space heating requirement in kWh/m²/year  3a Energy requirements - Individual heating systems including micro-CHP)  Space heating requirement (calculated above)  [Efficiency of secondary/supplementary beating systems including micro-CHP)  Space heating requirement (calculated above)  [539.68 413.79 332.8 178.36 73.22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
18.82   19.08   19.47   19.94   20.28   20.44   20.47   20.47   20.36   19.9   19.27   18.78   (93)	(92)m= 18.82	19.08	19.47	19.94	20.28	20.44	20.47	20.47	20.36	19.9	19.27	18.78		(92)
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	Apply adjust	ment to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
Set Ti to the mean intermal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.96 0.89 0.77 0.59 0.42 0.47 0.73 0.93 0.98 0.99 0.98 0.99 0.98 0.96 0.89 0.77 0.59 0.42 0.47 0.73 0.93 0.98 0.99 0.98 0.99 0.98 0.96 0.89 0.77 0.59 0.42 0.47 0.73 0.93 0.98 0.99 0.99	(93)m= 18.82	19.08	19.47	19.94	20.28	20.44	20.47	20.47	20.36	19.9	19.27	18.78		(93)
the utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	8. Space he	ating requ	uirement											
Utilisation factor for gains, hms   Line				•		ned at st	ep 11 of	Table 9l	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Utilisation factor for gains, hm:  (34)me		1				Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(94)m=				<u> </u>				7 10.9						
(95)me		<del></del>			0.77	0.59	0.42	0.47	0.73	0.93	0.98	0.99		(94)
Monthly average external temperature from Table 8 (96)m= 4.3	Useful gains	, hmGm	, W = (9 <sup>2</sup>	4)m x (84	4)m									
Ge me	(95)m= 401.6	482.27	555.35	597.39	556.89	419.2	289.12	300.77	418.03	446.93	399.19	376.91		(95)
Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m ) (97)m = (1126.98) (1098.03) (1002.66) (845.11) (655.3) (442.22) (293.49) (307.8) (476.08) (710.51) (933.1) (1122.1) (97) Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m (98)m = (539.68) (413.79) (332.8) (176.36) (73.22) (0) (0) (0) (196.11) (384.41) (554.42) (98) Space heating requirement in kWh/m²/year	Monthly ave	rage exte	ernal tem	perature	from Ta	able 8	•	•	•			•		
(97)me   1126.98   1098.03   1002.66   845.11   655.3   442.22   293.49   307.8   476.08   710.51   933.1   1122.1   (97)   Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m    (98)me   539.68   413.79   332.8   178.36   73.22   0   0   0   0   196.11   384.41   554.42    Total per year (kWh/year) = Sum(98)s. vz = 2672.79   (98)   Space heating requirement in kWh/m²/year   48.93   (99)    9a. Energy requirements - Individual heating systems including micro-CHP)  Space heating: Fraction of space heat from secondary/supplementary system   0   (201)   Fraction of space heating from main system(s)   (202) = 1 - (201) =   1   (202)   Fraction of total heating from main system 1   (204) = (202) x [1 - (203)] =   1   (204)   Efficiency of secondary/supplementary heating system, %   0   (208)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   kWh/year    Space heating requirement (calculated above)   539.68   413.79   332.8   178.36   73.22   0   0   0   0   196.11   384.41   554.42    (211)m = {([(98)m x (204)] } x 100 ÷ (206)   (211)    Space heating fuel (secondary), kWh/month   = {([98)m x (201)] } x 100 ÷ (208)   (211)    Space heating fuel (secondary), kWh/month   = {([98)m x (201)] } x 100 ÷ (208)   (215)m =   0   0   0   0   0   0   0   0   0	(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)
Space heating requirement for each month, kWh/month = 0.024 x [[97]m - (95)m] x (41)m  (98)m=	Heat loss ra	te for me	an intern	al tempe	erature,	Lm , W :	=[(39)m :	x [(93)m	– (96)m	]				
Space heating requirement in kWh/m²/year   Space heating requirement in kWh/m²/year   Space heating requirements – Individual heating systems including micro-CHP	(97)m= 1126.98	1098.03	1002.66	845.11	655.3	442.22	293.49	307.8	476.08	710.51	933.1	1122.1		(97)
Space heating requirement in kWh/m²/year   Sum(98)_Ls_2.12   2672.79   (98)		<del> </del>		r each n		Wh/mon	th = 0.02	24 x [(97	)m – (95	<u> </u>	1)m	1		
Space heating requirement in kWh/m²/year   48.93   (99)	(98)m= 539.68	413.79	332.8	178.36	73.22	0	0	0	0	196.11	384.41	554.42		_
Space heating:   Fraction of space heat from secondary/supplementary system   (202) = 1 - (201) =   (202)								Tota	l per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	2672.79	(98)
Space heating:           Fraction of space heat from secondary/supplementary system         0 (201)           Fraction of space heat from main system(s)         (202) = 1 - (201) = 1 (202)           Fraction of total heating from main system 1         (204) = (202) × [1 - (203)] = 1 (204)           Efficiency of main space heating system 1         93.4 (206)           Efficiency of secondary/supplementary heating system, %         0 (208)           Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         kWh/year           Space heating requirement (calculated above)         539.68 413.79 332.8 178.36 73.22 0 0 0 0 0 196.11 384.41 554.42           (211)m = {[(98)m x (204)] } x 100 ÷ (206)         (211)           577.82 443.03 356.31 190.96 78.39 0 0 0 0 0 209.97 411.58 593.6         Total (kWh/year) = Sum(211), 4.101, = 2861.66 (211)           Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)           2(15)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Space heati	ng require	ement in	kWh/m²	<sup>2</sup> /year								48.93	(99)
Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above)  539.68 413.79 332.8 178.36 73.22 0 0 0 0 196.11 384.41 554.42  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  Total (kWh/year) = Sum(211) <sub>151012</sub> 2861.66 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m 0 0 0 0 0 0 0 0 0 0 0 0 0	- 0,	•	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above)  539.68 413.79 332.8 178.36 73.22 0 0 0 0 196.11 384.41 554.42  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  Total (kWh/year) = Sum(211) <sub>13.1017</sub> 2861.66 (211)  Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)  (215)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	•	•			/l-							i	_	7,000
Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  539.68 413.79 332.8 178.36 73.22 0 0 0 0 196.11 384.41 554.42  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 2861.66 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0		•				ementary	•		(224)				0	╡`
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  539.68 413.79 332.8 178.36 73.22 0 0 0 0 196.11 384.41 554.42  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  577.82 443.03 356.31 190.96 78.39 0 0 0 0 209.97 411.58 593.6  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 2861.66 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction of s	pace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  539.68 413.79 332.8 178.36 73.22 0 0 0 0 196.11 384.41 554.42  (211)m = {[(98)m x (204)]} x 100 ÷ (206)  577.82 443.03 356.31 190.96 78.39 0 0 0 0 209.97 411.58 593.6  Total (kWh/year) = Sum(211) <sub>1.5.1012</sub> 2861.66 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction of to	otal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   kWh/year	Efficiency of	main spa	ace heat	ing syste	em 1								93.4	(206)
Space heating requirement (calculated above)  539.68   413.79   332.8   178.36   73.22   0   0   0   0   196.11   384.41   554.42    (211)m = {[(98)m x (204)] } x 100 ÷ (206)  577.82   443.03   356.31   190.96   78.39   0   0   0   0   209.97   411.58   593.6    Total (kWh/year) = Sum(211) <sub>15,1012</sub> = 2861.66   (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  (215)m= 0   0   0   0   0   0   0   0   0   0	Efficiency of	seconda	ry/suppl	ementar	y heatin	g systen	n, %						0	(208)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
$ (211) \text{m} = \{ [(98) \text{m x } (204)] \} \text{ x } 100 \div (206) \\ \hline 577.82  443.03  356.31  190.96  78.39  0  0  0  0  209.97  411.58  593.6 \\ \hline \hline \text{Total } (\text{kWh/year}) = \text{Sum}(211)_{15,1012} = \qquad 2861.66  (211) \\ \text{Space heating fuel (secondary), kWh/month} \\ = \{ [(98) \text{m x } (201)] \} \text{ x } 100 \div (208) \\ \hline \text{(215)m} =  0  0  0  0  0  0  0  0  0 $	Space heati	ng require	ement (c	alculate	d above	)	-							
577.82 443.03 356.31 190.96 78.39 0 0 0 0 209.97 411.58 593.6  Total (kWh/year) = Sum(211) <sub>15,1012</sub> 2861.66 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0	539.68	413.79	332.8	178.36	73.22	0	0	0	0	196.11	384.41	554.42		
	(211)m = {[(9	8)m x (20	04)] } x 1	00 ÷ (20	06)									(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0	577.82	443.03	356.31	190.96	78.39	0	0	0	0	209.97	411.58	593.6		
$= \{ [(98)m \times (201)] \} \times 100 \div (208)$ $(215)m =                                   $		-		-		-		Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	_	2861.66	(211)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	Space heati	ng fuel (s	econdar	y), kWh/	month							'		_
		01)] } x 1	00 ÷ (20	8)		,	, ,	r		·	1			
Total (kWh/year) = Sum(215) <sub>15,1012</sub> = 0 (215)														
	(215)m= 0	0	0	0	0	0	0							٦.

170.02 148.52 154.53 137.06 132.7 1	16.87 111.97	124.82	126.2	143.7	153.4	166.03		
Efficiency of water heater	10.07	124.02	120.2	140.7	100.4	100.00	80.3	] <sub>(2</sub>
	80.3 80.3	80.3	80.3	85.83	87.27	87.85	00.5	_ 2)
Fuel for water heating, kWh/month								•
219)m = (64)m x 100 ÷ (217)m					ī			
219)m= 193.75   169.75   177.75   159.9   158.68   1	45.54 139.44		157.16	167.42	175.78	188.99		,
		l otal =	= Sum(2 <sup>2</sup>	19a) <sub>112</sub> =		l	1989.61	(2
Annual totals Space heating fuel used, main system 1				k\	Wh/year	[	2861.66	1
						]		] 1
Vater heating fuel used							1989.61	]
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(2
boiler with a fan-assisted flue						45		(2
otal electricity for the above, kWh/year		sum o	of (230a).	(230g) =			75	(2
Electricity for lighting							250.66	(2
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP				ı		
				Emico	ion fac	4	<b></b>	
	Energy				ion iac	tor	<b>Emissions</b>	
	<b>Energy</b> kWh/year			kg CO		tor	kg CO2/yea	r
Space heating (main system 1)	•				2/kWh	tor = [		r ](2
Space heating (main system 1) Space heating (secondary)	kWh/year			kg CO	2/kWh		kg CO2/yea	,
	kWh/year			kg CO2	2/kWh	= [	kg CO2/yea	(2
Space heating (secondary) Vater heating	kWh/year (211) x (215) x	+ (263) + (26	64) =	0.2°	2/kWh	= [	kg CO2/yea	(2
Space heating (secondary)  Vater heating  Space and water heating	kWh/year (211) x (215) x (219) x	+ (263) + (26	64) =	0.2°	2/kWh 16 19	= [	kg CO2/yea 618.12 0 429.76	](2 ](2 ](2 ](2
Space heating (secondary)	kWh/year (211) x (215) x (219) x (261) + (262)	+ (263) + (26	64) =	0.2°	2/kWh 16 19 16	= [ = [ = [	kg CO2/yea 618.12 0 429.76 1047.88	](2 ](2 ](2

TER =

(273)

22.28

#### Appendix G: SAP DER worksheets for proposed solution

			Lloor F	Details:						
A Nove	la a sub Tue		USEI L		- 11			OTDO	.000000	
Assessor Name:	Joseph Tre			Strom					032062	
Software Name:	Stroma FS	AP 2012	5 ,	Softwa		rsion:		versic	n: 1.0.4.14	
			Property		: A1					
Address :		ardens, Londo	n, NW6 11	HG						
1. Overall dwelling dime	ensions:		_							
D				a(m²)	l		eight(m)	_	Volume(m <sup>3</sup>	<u> </u>
Basement				85.6	(1a) x	2	2.55	(2a) =	218.28	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(	(1d)+(1e)+	(1n)	85.6	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	218.28	(5)
2. Ventilation rate:										
	main heating	second heatin		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [	0	=	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	<b>=</b>   +	0		0	x	20 =	0	(6b)
Number of intermittent fa	ans					0	x	10 =	0	(7a)
Number of passive vents	<b>S</b>				F	0	x	10 =	0	(7b)
Number of flueless gas f					L	0	x	40 =	0	(7c)
Number of flueless gas i	1163				L	0	^		0	(70)
								Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fa	ans = (6a)+(6b)	+(7a)+(7b)+	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has l	peen carried out or	is intended, prod	eed to (17),	otherwise (	L continue fr	rom (9) to		` '		
Number of storeys in t	he dwelling (ns	s)							0	(9)
Additional infiltration							[(9]	)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber frame	or 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are p deducting areas of openi			g to the grea	ter wall are	ea (after			'		_
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dr	aught stripped	k						0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic me	tres per ho	our per s	quare m	etre of e	envelope	e area	3	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	]+(8), otherw	rise (18) =	(16)				0.15	(18)
Air permeability value applie	es if a pressurisation	on test has been o	done or a de	gree air pe	rmeability	is being u	ised			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified	for monthly win	d speed						•	1	
Jan Feb	Mar Apr	May Jur	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Tabl	e 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									
vviiiu i acitii (22a)iii = (2	T	1.00 0.05	0.05	T 0.02			1	1	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.16	0.16	0.16	0.14	0.14	d wind s	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe		-	rate for t	he appli	cable ca	se	<u> </u>			<u> </u>			
If mechanica												0.5	(23
If exhaust air h		0 11		, ,	,	. `	,, .	,	) = (23a)			0.5	(23
If balanced with		•	•	_								68.85	(23
a) If balance						<del>- `                                     </del>	<del>-                                    </del>	ŕ	<del> </del>	<del>-                                    </del>	ì	÷ 100]	
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(24
b) If balance							r ``	<del>í `</del>	<del> </del>		1	1	(0.4
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•					F (22h	.\			
$\frac{11 (220)f}{24c)m=0}$	0.5 x	(23b), t	nen (240	(230) = (230)	o); otherv	wise (24)	C) = (220)	0) m + 0.	5 × (230	0	0	]	(24
	<u> </u>						<u> </u>		U		0		(24
d) If natural if (22b)r					rwise (2				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	) or (24k	o) or (24	c) or (24	d) in box	· (25)				1	
(25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25
0 11		-11											
3. Heat losse		·			N				A 37 11				\
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>(</b> )	k-value kJ/m²-l		X k /K
Nindows Type		` ,			9.47		/[1/( 1.2 )+		10.84	$\stackrel{\prime}{\Box}$			(27
Windows Type	2				2.39	x <sub>1</sub> ,	/[1/( 1.2 )+	0.04] =	2.74	Ħ			(27
Nindows Type					2.39	=	/[1/( 1.2 )+	L	2.74	=			(27
Floor					85.6	x	0.13		11.128	<b>=</b>			) (28
Nalls Type1	76.1	4	14.2		61.89	=	0.18	╡┇	11.14	╡ ¦			(29
Walls Type2	13.8		0			=				<del>- </del>			(29
Total area of e					13.89	_	0.23		3.14				
Party wall	ioinents	, 111			175.6	=							(31
* for windows and	l roof wind	0W6 U60 0	effoctivo wi	ndow I I ve	16.77		o formula 1	/[/1/    volu	0	l	naragranh		(32
** include the area						ateu usiriy	i ioiiiiuia i	/[( 1/ <b>O-</b> valu	1 <del>0</del> )+0.04j a	is giveri ii	i paragrapi.	1 3.2	
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				41.72	(33
Heat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	14717.45	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35
or design asses	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
or accigir acces						,							_
can be used inste	ae · S (I	,			•	<						12.5	(36
can be used inste	•	are not kn	own (36) =	= 0.15 x (3	11)			(33) +	(36) =			54.22	(37
can be used inste Thermal bridge f details of therma	al bridging	are not kir						(33)	(00)			34.22	(5)
can be used inste Thermal bridg f details of therma Total fabric he	al bridging at loss		l monthly	<i>,</i>				(38)m	$= 0.33 \times 0$	25)m x (5	)		
can be used inste Thermal bridge f details of therma Total fabric he Ventilation hea	al bridging at loss at loss ca	alculated			,lun	Jul.	Aug		= 0.33 × (		1	]	
can be used inste Thermal bridg f details of therma Total fabric he Ventilation hea	at loss ca	alculated Mar	Apr	May	Jun 19.94	Jul 19.94	Aug 19.71	Sep	Oct	Nov	Dec		(38
Fan be used instermal bridger f details of thermal Fotal fabric head of the fabric head o	at loss carried Feb	Mar 22.47			Jun 19.94	Jul 19.94	Aug 19.71	Sep 20.4	Oct 21.09	Nov 21.55	1		(38)
can be used inste Thermal bridge f details of therma Total fabric he Ventilation hea	at loss carried Feb	Mar 22.47	Apr	May			⊢ <u> </u>	Sep 20.4	Oct	Nov 21.55	Dec		(38)

	ss para	meter (F	HLP), W/	m²K		ı	ı	ı	(40)m	= (39)m ÷	· (4)			
0)m=	0.9	0.9	0.9	0.88	0.88	0.87	0.87	0.86	0.87	0.88	0.89	0.89		
ımhei	r of day	e in moi	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	0.88	(4
Г	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
I)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
_														
. Wat	ter heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
eume	של טכנוו	pancy, I	N									56		(4
if TF	۹ > 13.9	0, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13		30		(-
	A £ 13.9	•	ater usag	ne in litre	s ner ds	y Vd av	erane –	(25 v N)	± 36		05	01		(4
duce ti	he annua	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.01		(-
t more	that 125	litres per <sub>l</sub>	person per	day (all w	ater use, l	hot and co	ld)		,	,	,			
<u> </u>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
г		•	day for ea			1	1	· <i>'</i>	1		1			
)m=	104.52	100.71	96.91	93.11	89.31	85.51	85.51	89.31	93.11	96.91	100.71	104.52	4440.47	<b>—</b> ,
ergy co	ontent of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	n x nm x E	Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1140.17	(4
)m= [	154.99	135.56	139.88	121.95	117.02	100.98	93.57	107.37	108.66	126.63	138.22	150.1		
' L			<u> </u>			<u> </u>	<u> </u>	<u> </u>		<u>I</u> Total = Su	<u>I</u> m(45) <sub>112</sub> =	<u> </u>	1494.94	(4
nstanta	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)			-		
· .	23.25	20.33	20.98	18.29	17.55	15.15	14.04	16.11	16.3	18.99	20.73	22.52		(4
	storage		مالم بام ما		. lo o \ \	WALLDO		م ماطلانی						
-		, ,	includin				_		allie ves	SEI		0		(4
	•	_	ind no ta hot wate		-			' '	ers) ente	er '0' in (	47)			
	storage			(					,		, ,			
If ma	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(•
mper	rature fa	actor fro	m Table	2b								0		(4
			storage	-				(48) x (49)	) =		1	10		(!
			eclared of factor fr	-										(1
		•	ee secti		C Z (KVV	11/11116/06	iy <i>)</i>				0.	02		(
	-	from Ta									1.	03		(
mper	rature fa	actor fro	m Table	2b							0	.6		(
ergy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(
nter (	50) or (	54) in (5	55)								1.	03		(
ater s	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
)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		(!
ylinder	r contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [( <del>50)</del> – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хH	
)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		(!
marv	circuit	loss (ar	nual) fro	m Table	3							0		(!
-		•	culated t			59)m = (	(58) ÷ 36	65 × (41)	m					
(modi	ified by	factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
)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		(

				(0.4)	(00)	0= (44)							
Combi loss o	1			,	, ,	<u> </u>		Ι .		Ι.	Ι.	1	(04)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(61)
	<del>-</del>						<del>`</del>		<u> </u>	<del>`                                    </del>	<del>`</del>	· (59)m + (61)m	
(62)m= 210.2		195.16	175.45	172.29	154.47	148.85	162.65	162.15	181.9	191.72	205.38	]	(62)
Solar DHW inpu									r contribut	ion to wate	er heating)		
(add addition						·	<del></del>	<del>.                                      </del>	1		•	1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from		ter										,	
(64)m= 210.2	7 185.49	195.16	175.45	172.29	154.47	148.85	162.65	162.15	181.9	191.72	205.38		7
							Out	put from wa	ater heate	r (annual) <sub>1</sub>	112	2145.78	(64)
Heat gains fi	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	<u>.</u> ]	
(65)m= 95.76	85.01	90.73	83.34	83.13	76.37	75.33	79.92	78.92	86.33	88.75	94.13	]	(65)
include (57	7)m in cald	culation c	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):									
Metabolic ga	ins (Table	5). Watt	S										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m= 128.0	3 128.03	128.03	128.03	128.03	128.03	128.03	128.03	128.03	128.03	128.03	128.03	1	(66)
Lighting gair	s (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5				1	
(67)m= 21.3	<u> </u>	15.38	11.65	8.71	7.35	7.94	10.32	13.86	17.59	20.53	21.89	1	(67)
Appliances of	iains (calc	ulated in	Append	dix L. ea	uation L	13 or L1		see Ta	ble 5	!	!	1	
(68)m= 230.7	<u> </u>	227.11	214.26	198.05	182.81	172.63	170.23	176.26	189.11	205.33	220.57	]	(68)
Cooking gair			nendix	L equat	ion I 15	or I 15a\	L also s	L ee Tahle	5	<u> </u>	<u> </u>	1	
(69)m= 35.8	<del>_`</del>	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	1	(69)
Pumps and f								1 3333		-		J	` '
(70)m= 0	0 0		0	0	0	0	0	0	0	0	0	1	(70)
		ا					Ů	<u> </u>				J	(1.0)
Losses e.g.	<del></del>	<del>`                                    </del>		-102.42		-102.42	102.42	100.40	102.42	100.40	100.40	1	(71)
(71)m= -102.4		<u> </u>	-102.42	-102.42	-102.42	-102.42	-102.42	-102.42	-102.42	-102.42	-102.42	J	(7-1)
Water heatin	<del>``</del>	<del> </del>	445.70	444.70	400.07	1 404 05	407.40	1 400 00	440.00	1 400 07	1 400 50	1	(70)
(72)m= 128.7		121.95	115.76	111.73	106.07	101.25	107.42	109.62	116.03	123.27	126.52	]	(72)
Total intern	<del>_</del>						<del>-                                    </del>	+ (69)m + (		· · · · · ·	i	1	( <b>-</b> 0)
(73)m= 442.1		425.85	403.07	379.89	357.63	343.23	349.39	361.15	384.14	410.54	430.38	]	(73)
6. Solar gai			(I) (	T-1-1- 0-		ta ta al a acce	··						
Solar gains are		•					tions to co		e applicat		tion.	Oning	
Orientation:	Table 6d		Area m²		Flu Tal	ix ble 6a	٦	g_ able 6b	Т	FF able 6c		Gains (W)	
Foot							. —						1,
East 0.93		X	9.4		_	9.64	X	0.5	_	0.7	=	45.11	(76)
East 0.9		X	2.3			9.64	X	0.5	X	0.7	_  =	11.39	[(76)
East 0.9		X	2.3	39	X 1	9.64	X	0.5	x	0.7	=	11.39	(76)
East 0.9		X	9.4	7	x 3	88.42	x	0.5	x	0.7	=	88.25	(76)
East 0.9	1	X	2.3	39	<b>X</b> 3	88.42	x	0.5	x	0.7	=	22.27	(76)

East	۰.۰.۲	-				1		10.10	1		0 =	<b>-</b>		_	22	(70)
East	0.9x	1	=	Χ	2.39	」 × ¬	<b>—</b>	88.42	] X ]		0.5	X	0.7	_ =	22.27	(76)
	0.9x	1		X	9.47	」× □		33.27	] X ]		0.5	×	0.7	= =	145.34	(76)
East East	0.9x	1		X	2.39	ͺ ×		33.27	J X 1		0.5	_ ×	0.7	╡ -	36.68	(76)
	0.9x	1		X	2.39	_ ×		33.27	J X 1		0.5	×	0.7	= =	36.68	(76)
East	0.9x	1		X	9.47	」 × ¬		92.28	] X		0.5	×	0.7	_ =	211.96	(76)
East	0.9x	1		X	2.39	」 ×		)2.28	] X		0.5	×	0.7	=	53.49	(76)
East	0.9x	1		X	2.39	」 ×	9	2.28	X		0.5	X	0.7	_ =	53.49	(76)
East	0.9x	1		X	9.47	×	1	13.09	X		0.5	X	0.7	=	259.77	(76)
East	0.9x	1		X	2.39	」 ×	1	13.09	X		0.5	X	0.7	_ =	65.56	(76)
East	0.9x	1		X	2.39	」 ×	1	13.09	X		0.5	X	0.7	_ =	65.56	(76)
East	0.9x	1		X	9.47	X	1	15.77	X		0.5	X	0.7	=	265.92	(76)
East	0.9x	1		X	2.39	×	1	15.77	X		0.5	X	0.7	=	67.11	(76)
East	0.9x	1		X	2.39	×	1	15.77	X		0.5	X	0.7	=	67.11	(76)
East	0.9x	1		X	9.47	X	1	10.22	X		0.5	X	0.7	=	253.17	(76)
East	0.9x	1		X	2.39	x	1	10.22	X		0.5	X	0.7	=	63.89	(76)
East	0.9x	1		X	2.39	X	1	10.22	X		0.5	x	0.7	=	63.89	(76)
East	0.9x	1		X	9.47	x	9	94.68	X		0.5	x	0.7	=	217.47	(76)
East	0.9x	1		X	2.39	x	9	94.68	X		0.5	x	0.7	=	54.88	(76)
East	0.9x	1		X	2.39	x	9	94.68	X		0.5	x	0.7	=	54.88	(76)
East	0.9x	1		X	9.47	X	7	3.59	X		0.5	×	0.7		169.03	(76)
East	0.9x	1		X	2.39	×	7	73.59	X		0.5	x	0.7	=	42.66	(76)
East	0.9x	1		X	2.39	Ī×	7	'3.59	X		0.5	×	0.7		42.66	(76)
East	0.9x	1		X	9.47	Īx		15.59	X		0.5	x	0.7		104.72	(76)
East	0.9x	1		X	2.39	Īx		15.59	X		0.5	×	0.7		26.43	(76)
East	0.9x	1		X	2.39	i x		15.59	X		0.5	i x	0.7	<b>=</b> =	26.43	(76)
East	0.9x	1		X	9.47	i x	2	24.49	X		0.5	×	0.7	=	56.25	(76)
East	0.9x	1		X	2.39	i x	2	24.49	] x		0.5	×	0.7		14.2	(76)
East	0.9x	1		X	2.39	i x		24.49	] x		0.5	×	0.7		14.2	(76)
East	0.9x	1		X	9.47	i x		6.15	X		0.5	×	0.7		37.1	(76)
East	0.9x	1		X	2.39	٦ ×		6.15	] ]		0.5	→     ×	0.7	= =	9.36	(76)
East	0.9x	1		X	2.39	i x	_	6.15	] ]		0.5	ا ×	0.7	= =	9.36	(76)
	L	•			2.00			0.10	]		0.0		0.1		0.00	(1.5)
Solar o	nains in	watts ca	alcula	ted	for each mor	nth			(83)m	า = Sเ	um(74)m	(82)m				
(83)m=	67.88	132.79	218.6	$\overline{}$	318.95 390.8	-	400.14	380.95	327	$\overline{}$	254.35	157.5	7 84.64	55.82		(83)
Total g	gains – ii	nternal a	and so	olar	(84)m = $(73)$	m +	(83)m	, watts		1	!			!	_	
(84)m=	510.04	572.77	644.5	55	722.02 770.7	78	757.78	724.18	676	6.62	615.49	541.7	495.18	486.21		(84)
7 Me	ean inter	nal temr	peratu	re (	heating seas	on)								•		
					eriods in the l		area	from Tal	ble 9	. Th	1 (°C)				21	(85)
-		_		•	ving area, h1	_				,	. ( -)					` ′
O tillot	Jan	Feb	Ma	-	Apr Ma	Ť	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.95	0.91	-	0.84 0.72	<del>-  </del>	0.56	0.43	0.4		0.69	0.87	0.95	0.97	-	(86)
			<u> </u>		I			<u> </u>			!			1	_	
(87)m=	19.18	19.41	19.8	-	ving area T1	<del>`</del> т	ow ste 20.89	20.96	/ IN I		20.79	20.29	19.66	19.14	7	(87)
(07)111=	13.10	10.41	19.0		20.20   20.0	<u> </u>	_0.03	1 20.30	1 20.	.55	20.13	20.28	1 10.00	1 10.14	J	(01)

Temperature	durina h	neating p	eriods ir	n rest of	dwelling	ı from Ta	able 9. T	h2 (°C)					
(88)m= 20.17	20.17	20.17	20.18	20.18	20.2	20.2	20.2	20.19	20.18	20.18	20.18		(88)
Utilisation fac	ctor for g	ains for	rest of d	welling, l	h2,m (se	ee Table	9a)	ı	ı	ı			
(89)m= 0.96	0.94	0.9	0.81	0.68	0.51	0.36	0.4	0.63	0.85	0.94	0.96		(89)
Mean interna	al tempei	rature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	le 9c)	-			
(90)m= 17.71	18.04	18.6	19.29	19.8	20.09	20.17	20.16	19.97	19.31	18.41	17.66		(90)
				•			•	1	fLA = Livin	g area ÷ (4	4) =	0.36	(91)
Mean interna	al tempei	rature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m= 18.24	18.54	19.03	19.65	20.11	20.38	20.46	20.45	20.27	19.66	18.86	18.2		(92)
Apply adjustr	ment to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 18.24	18.54	19.03	19.65	20.11	20.38	20.46	20.45	20.27	19.66	18.86	18.2		(93)
8. Space hea									. —				
Set Ti to the the utilisation			•		ed at st	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		
Utilisation fac	ctor for g	ains, hm	<u> </u>	<u> </u>		!		<u>'</u>	<u> </u>	<u> </u>	<u> </u>		
(94)m= 0.94	0.92	0.88	0.8	0.68	0.52	0.38	0.42	0.64	0.84	0.92	0.95		(94)
Useful gains,	, hmGm	, W = (9	4)m x (8	4)m									
(95)m= 481.19		566.96	576.59	522.62	394.29	276.58	286.05	393.24	452.69	455.86	461.69		(95)
Monthly aver	T	T T	i –			ı	ı	ı	I	I			(20)
(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 rat (97)m= 1075.59	e for me	961.34	812.35	633.69	LM , VV =	=[(39)m 286.19	x [(93)m 299.36	- (96)m 460.29	682.53	891.13	1067.02		(97)
Space heating	l .	l .	l			l		l			1007.02		(01)
(98)m= 442.24	349.93	293.42	169.75	82.64	0	0	0	0	171	313.39	450.37		
` /	ļ						I Tota	l Il per year	l (kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2272.74	(98)
Space heating	ng requir	ement in	kWh/m²	²/year							·	26.55	」 「(99)
9b. Energy re	auiremei	nts – Coi	mmunitv	heating	scheme	)							
This part is us	•						ting prov	rided by	a comm	unity sch	neme.		
Fraction of spa	ace heat	from se	condary	/supplen	nentary l	heating (	(Table 1	1) '0' if n	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community s		-							up to four	other heat	sources; tl	ne latter	
includes boilers, I Fraction of he		-			rom powe	r stations.	See Appei	ndix C.			ſ	0.5	(303a)
Fraction of co											[	0.5	(303b)
	•					_			(2)	00) (000	_\		<b>-</b>
Fraction of tot	•			•						02) x (303	l I	0.5	(304a)
Fraction of tot	•			•						02) x (303	b) =	0.5	(304b)
Factor for con	trol and	charging	method	l (Table 4	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribution lo	ss factor	(Table 1	2c) for o	commun	ity heati	ng syste	m					1.05	(306)
Space heatin	-											kWh/year	_
Annual space	heating	requiren	nent									2272.74	

Space heat from Community heat pump		(98) x (304a) x	(305) x (306) =	1193.19	(307a)
Space heat from heat source 2		(98) x (304b) x	(305) x (306) =	1193.19	(307b)
Efficiency of secondary/supplementary heating	g system in % (from Tabl	e 4a or Appen	ndix E)	0	(308
Space heating requirement from secondary/su	upplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating					
Annual water heating requirement				2145.78	
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x	(305) x (306) =	1126.53	(310a)
Water heat from heat source 2		(64) x (303b) x	(305) x (306) =	1126.53	(310b)
Electricity used for heat distribution	0.0	1 × [(307a)(307	'e) + (310a)(310e)] =	46.39	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling syste	m, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling mechanical ventilation - balanced, extract or p	•	)		279.62	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =	279.62	(331)
Energy for lighting (calculated in Appendix L)				376.14	(332)
Electricity generated by PVs (Appendix M) (ne	egative quantity)			-522.83	(333)
Electricity generated by wind turbine (Append	x M) (negative quantity)			0	(334)
12b. CO2 Emissions – Community heating sci	neme				
		ergy Vh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water h Efficiency of heat source 1 (%)	eating (not CHP)  If there is CHP using two fue	Is repeat (363) to	(366) for the second fue	425	(367a)
Efficiency of heat source 2 (%)	If there is CHP using two fue	Is repeat (363) to	(366) for the second fue	91	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x	0.52	283.28	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x	100 ÷ (367b) x	0.22	550.62	(368)
Electrical energy for heat distribution	[(313) x		0.52	24.08	(372)
Total CO2 associated with community system	S (363)(	366) + (368)(372	2) =	857.97	(373)
CO2 associated with space heating (secondar	ry) (309) x		0 =	0	(374)
CO2 associated with water from immersion he	eater or instantaneous he	eater (312) x	0.52	0	(375)
Total CO2 associated with space and water he	eating (373) + (	374) + (375) =		857.97	(376)
CO2 associated with electricity for pumps and	fans within dwelling (33	1)) x	0.52	145.12	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	195.22	(379)
Energy saving/generation technologies (333) tem 1	to (334) as applicable		0.52 × 0.01 =	-271.35	(380)

Total CO2, kg/year sum of (376)...(382) = Dwelling CO2 Emission Rate  $(383) \div (4) =$  El rating (section 14)

926.96	(383)
10.83	(384)
90.49	(385)

			5							
			User D	etails:						
Assessor Name:	Joseph Treand				a Num				032062	
Software Name:	Stroma FSAP	2012		Softw	are Ve	rsion:		Versio	n: 1.0.4.14	
				Address	: A2					
Address :	, Gondar Garde	ns, London,	VW6 11	HG						
Overall dwelling dimens	nsions:		_	4 0						
Basement				a(m²) 37.17	(1a) x	Av. Hei	ght(m) 55	(2a) =	Volume(m³)	(3a)
Ground floor				'9.45	(1b) x		3		238.35	](3b)
Total floor area TFA = (1a	)\_(1b)\_(1c)\_(1d).	⊥(1o)⊥ (1n			<u>.</u>		<u> </u>	(20) -	230.33	(3b)
	i)+(1b)+(1c)+(1u)·	+(1 <del>6</del> )+(111	)	66.62	(4)	\	·	(5.)		_
Dwelling volume					(3a)+(3b	)+(3c)+(3d	)+(3e)+	(3n) =	460.63	(5)
2. Ventilation rate:		_								
	main heating	secondary heating	/	other		total			m³ per hour	•
Number of chimneys		+ 0	] + [	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0	0	] + [	0	_ = [	0	X	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 fir	es					0	x	40 =	0	(7c)
								A ir ab	anges nor ha	_
Infiltration due to chimne	ro fluor and fano	(6a) ı (6b) ı (7	a) ı ( <b>7</b> b) ı (	<b>7</b> c) –	Г		_	ı	anges per ho	_
Infiltration due to chimney  If a pressurisation test has be	•				continue fr	0 rom (9) to (		÷ (5) =	0	(8)
Number of storeys in th		toriada, process	(11),	301101 WIGO	oonanao n	0// (0) 10 (	. 0)		0	(9)
Additional infiltration	3 ( )						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or tim	ber frame or	0.35 fo	r mason	ry consti	ruction			0	(11)
if both types of wall are pro deducting areas of openin			the great	er wall are	ea (after			'		_
If suspended wooden fl			1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else ente	r 0	`	,.					0	(13)
Percentage of windows	and doors draug	ht stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13) +	- (15) =		0	(16)
Air permeability value,	q50, expressed in	cubic metre	s per ho	our per s	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabili	ty value, then (18)	$= [(17) \div 20] + (8)$	), otherw	ise (18) =	(16)				0.15	(18)
Air permeability value applies	s if a pressurisation tes	st has been don	e or a de	gree air pe	ermeability	is being us	sed			_
Number of sides sheltered	d			(00)	10.07F · · (4	10)]			2	(19)
Shelter factor					[0.075 x (′	19)] =			0.85	<u> </u> (20)
Infiltration rate incorporati				(21) = (18	s) x (20) =				0.13	(21)
Infiltration rate modified for	<del></del>			1	1				1	
Jan Feb	Mar Apr M	1ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		

4.9

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

5.1

Wind Factor (22a	)m = (22	)m ÷	4										
	<del>````</del>	.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
A divista di infilmati				-14	-l		(04 =)	(00-)				l	
Adjusted infiltration	`	.16	0.14	0.14	0.12	0.12	0.12	(22a)m 0.13	0.14	0.14	0.15		
Calculate effective			-			l .	0.12	0.10	0.14	0.14	0.10		
If mechanical v	entilation	า:										0.5	(23a)
If exhaust air heat p	pump using	g Appe	endix N, (2	3b) = (23a	) × Fmv (e	equation (I	N5)) , othe	rwise (23b	o) = (23a)			0.5	(23b)
If balanced with he	at recovery	y: effici	ency in %	allowing for	or in-use f	actor (fron	n Table 4h	) =				68.85	(23c)
a) If balanced n		_				<del>- ` ` </del>	<del>-                                    </del>	ŕ	<del>r ´       `</del>	<del>-                                    </del>	<del>``</del>	÷ 100]	4
` '		.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(24a)
b) If balanced n						<del></del>	<del>- ^ ` ` </del>	<del>í `</del>	<del>-                                    </del>	<del>-                                    </del>	I	ı	(0.41.)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole hous if (22b)m <				-	•				5 v (22h	.\			
(24c)m= 0	0.5 x (2.	0	0	) = (23b 0	0	0	$\frac{1}{1} = (221)$	0	0	0	0		(24c)
d) If natural ver													(= 15)
if (22b)m =									0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air cha	ange rate	e - en	ter (24a	or (24b	o) or (24	c) or (24	ld) in bo	x (25)	•			•	
(25)m= 0.32 0	0.32 0	.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25)
3. Heat losses a	nd heat l	loss p	paramete	er:									
3. Heat losses a <b>ELEMENT</b>	nd heat I Gross area (m²		oaramete Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-ł		A X k kJ/K
ELEMENT	Gross		Openin	gs		m²		!K		<)			
ELEMENT	Gross		Openin	gs	A ,r	m² x1	W/m2	2K 0.04] =	(W/I	<) 			kJ/K
ELEMENT Windows Type 1	Gross		Openin	gs	A ,r	m <sup>2</sup> x1 x1	W/m2  /[1/( 1.2 )+	2K 0.04] = 0.04] =	(W/I 5.63	<) 			kJ/K (27)
ELEMENT Windows Type 1 Windows Type 2	Gross		Openin	gs	A ,r 4.92	m² x1 x1 x1	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+	2K 0.04] = 0.04] = 0.04] =	5.63 5.63	<) 			kJ/K (27) (27)
ELEMENT Windows Type 1 Windows Type 2 Windows Type 3	Gross		Openin	gs	A ,r 4.92 4.92 2.39	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] = 0.04] =	5.63 5.63 2.74	<)			kJ/K (27) (27) (27)
ELEMENT Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Gross		Openin	gs	A ,r 4.92 4.92 2.39 7.32	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 5.63 5.63 2.74 8.38	<) 			kJ/K (27) (27) (27) (27)
ELEMENT  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5	Gross		Openin	gs	A ,r 4.92 4.92 2.39 7.32 4.76	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 5.63 5.63 2.74 8.38 5.45	<)			kJ/K (27) (27) (27) (27) (27)
ELEMENT Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	Gross		Openin	gs	A ,r 4.92 4.92 2.39 7.32 4.76 2.39	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04]	(W/I 5.63 5.63 2.74 8.38 5.45 2.74	<)			kJ/K (27) (27) (27) (27) (27) (27)
ELEMENT Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	Gross		Openin	gs	A ,r 4.92 4.92 2.39 7.32 4.76 2.39 4.76	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04]	(W/I 5.63 5.63 2.74 8.38 5.45 2.74 5.45				kJ/K (27) (27) (27) (27) (27) (27) (27)
ELEMENT  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Windows Type 6  Windows Type 7  Windows Type 8	Gross		Openin	gs	A ,r 4.92 4.92 2.39 7.32 4.76 2.39 4.76	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04]	(W/I 5.63 5.63 2.74 8.38 5.45 2.74 5.45 2.74				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
ELEMENT  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Windows Type 6  Windows Type 7  Windows Type 8  Floor Type 1	Gross		Openin	gs <sup>2</sup>	A ,r 4.92 4.92 2.39 7.32 4.76 2.39 4.76 2.39 87.17	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+	(Control of the control (W/I 5.63 5.63 2.74 8.38 5.45 2.74 5.45 2.74 11.332				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)	
ELEMENT  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Windows Type 6  Windows Type 7  Windows Type 8  Floor Type 1  Floor Type 2	Gross area (m²		Openin m	gs <sup>2</sup>	A ,r  4.92  2.39  7.32  4.76  2.39  4.76  2.39  87.17  6.96  71.83	m <sup>2</sup>	W/m2 //[1/( 1.2 )+ //[1/( 1.2 )+ //[1/( 1.2 )+ //[1/( 1.2 )+ //[1/( 1.2 )+ //[1/( 1.2 )+ //[1/( 1.2 )+ //[1/( 1.2 )+ //[1/( 1.2 )+ //[1/( 1.3	(Control of the control (W/I 5.63 5.63 2.74 8.38 5.45 2.74 5.45 2.74 11.332 0.9048 12.93				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)	
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Floor Type 1 Floor Type 2 Walls Type1	Gross area (m² 86.29 81.09		14.46 24.17	gs <sup>2</sup>	A ,r  4.92  2.39  7.32  4.76  2.39  4.76  2.39  87.17  6.96  71.83	m <sup>2</sup>	W/m2 //[1/( 1.2 )+ //[1/( 1.2	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] =	(W/I 5.63 5.63 2.74 8.38 5.45 2.74 5.45 2.74 11.332 0.9048 12.93 10.25				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Floor Type 1 Floor Type 2 Walls Type1 Walls Type2	Gross area (m²		Openin m	gs <sup>2</sup>	A ,r  4.92  2.39  7.32  4.76  2.39  4.76  2.39  87.17  6.96  71.83	m <sup>2</sup>	W/m2 //[1/( 1.2 )+ //[1/( 1.2	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = =	(W/I 5.63 5.63 2.74 8.38 5.45 2.74 5.45 2.74 11.332 0.9048 12.93				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 7 Windows Type 8 Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3	86.29 81.09 43.85		14.4¢  24.17	gs <sup>2</sup>	A ,r  4.92  2.39  7.32  4.76  2.39  87.17  6.96  71.83  56.92	m <sup>2</sup>	W/m2 //[1/( 1.2 )+ //[1/( 1.2	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/I 5.63 5.63 2.74 8.38 5.45 2.74 5.45 2.74 11.332 0.9048 12.93 10.25 9.97				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 7 Windows Type 8 Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Walls Type3 Roof Type1	86.29 81.09 43.85 15.5 6.22	²)	14.46 24.11 0	gs <sup>2</sup>	A ,r  4.92  2.39  7.32  4.76  2.39  87.17  6.96  71.83  56.92  43.85	m <sup>2</sup>	W/m2 //[1/( 1.2 )+ //[1/( 1.2	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = =	(W/I 5.63 5.63 2.74 8.38 5.45 2.74 5.45 2.74 11.332 0.9048 12.93 10.25 9.97 2.01				kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (28) (29) (29) (29) (30) (30)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 7 Windows Type 8 Floor Type 1 Floor Type 1 Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2	86.29 81.09 43.85 15.5 6.22	²)	14.46 24.11 0	gs <sup>2</sup>	A ,r  4.92  2.39  7.32  4.76  2.39  4.76  2.39  87.17  6.96  71.83  56.92  43.85  6.22	m <sup>2</sup>	W/m2 //[1/( 1.2 )+ //[1/( 1.2	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = =	(W/I 5.63 5.63 2.74 8.38 5.45 2.74 5.45 2.74 11.332 0.9048 12.93 10.25 9.97 2.01				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)

		l roof winde as on both	-				ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				92.43	(33)
Heat ca	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	21850.18	(34)
Therma	al mass	parame	eter (TMF	P = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
		sments wh			constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated (	using Ap	pendix I	<						25.28	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			117.71	(37)
Ventila	tion hea	at loss ca	alculated	monthly	У				(38)m	= 0.33 × (	25)m x (5)		i	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	48.39	47.9	47.42	44.99	44.51	42.09	42.09	41.6	43.06	44.51	45.48	46.45		(38)
Heat tra	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m=	166.1	165.61	165.13	162.71	162.22	159.8	159.8	159.32	160.77	162.22	163.19	164.16		
·											Sum(39) <sub>1</sub> .	12 /12=	162.59	(39)
r	ss para	meter (H	· ·	ı —						= (39)m ÷			1	
(40)m=	1	0.99	0.99	0.98	0.97	0.96	0.96	0.96	0.96	0.97	0.98	0.99		<b>—</b>
Numbe	r of day	/s in moi	nth (Tah	le 1a)					/	Average =	Sum(40) <sub>1</sub> .	12 /12=	0.98	(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)
(41)		1 20	J 01		01				00	01		01		( ,
4 307												1.3.5 () (		
4. Wa	ter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
		ting enei		irement:							2.	kWh/ye	ear:	(42)
Assum if TF	ed occu A > 13.9		N		(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (1	ΓFA -13.			ear:	(42)
Assumif TF	ed occu A > 13.9 A £ 13.9 averag	upancy, l 9, N = 1 9, N = 1 ge hot wa	N + 1.76 x ater usaç	[1 - exp	es per da	ay Vd,av	erage =	(25 x N)	+ 36		9)		ear:	(42)
Assum if TF if TF Annual Reduce	ed occu A > 13.9 A £ 13.9 averag	upancy, l 9, N = 1 9, N = 1 ge hot wa al average	N + 1.76 x ater usag hot water	[1 - exp ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		9)	96	ear:	. ,
Assum if TF if TF Annual Reduce	ed occu A > 13.9 A £ 13.9 averag the annua	upancy, l 9, N = 1 9, N = 1 ge hot wa al average litres per l	N + 1.76 x ater usag hot water person per	[1 - exp ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is thot and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	9) 104	96	ear:	. ,
Assum if TF, if TF, Annual Reduce a	ed occu A > 13.9 A £ 13.9 averag the annua that 125	upancy, I 9, N = 1 9, N = 1 ge hot wa al average i litres per l	N + 1.76 x ater usag hot water person per Mar	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36		9)	96	ear:	. ,
Assum if TF, if TF, Annual Reduce a not more	ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage in	upancy, I 9, N = 1 9, N = 1 ge hot wa al average i litres per l Feb	N + 1.76 x ater usag hot water person per Mar r day for ea	[1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa	ay Vd,av Iwelling is that and co Jun ctor from	erage = designed in the latest section of th	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	se target o	9) 104 Nov	96 4.45 Dec	ear:	. ,
Assum if TF, if TF, Annual Reduce a	ed occu A > 13.9 A £ 13.9 averag the annua that 125	upancy, I 9, N = 1 9, N = 1 ge hot wa al average i litres per l	N + 1.76 x ater usag hot water person per Mar	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us  Sep  102.36	Oct	9) 104 Nov	96 4.45 Dec		(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=	ed occu A > 13.9 A £ 13.9 averag the annual that 125 Jan er usage ii	upancy, I 9, N = 1 9, N = 1 ge hot wa al average i litres per l Feb	N + 1.76 x ater usag hot water person per Mar r day for ea 106.54	[1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 98.19	ay Vd,av Iwelling is not and co Jun ctor from	erage = designed and designed a	(25 x N) to achieve Aug (43) 98.19	+ 36 a water us  Sep  102.36	Oct  106.54  Total = Su	9) Nov 110.72 m(44) <sub>112</sub> =	96 4.45 Dec	ear: 1253.44	. ,
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=	ed occu A > 13.9 A £ 13.9 averag the annual that 125 Jan er usage ii	upancy, I 9, N = 1 9, N = 1 ge hot wa al average i litres per I Feb in litres per	N + 1.76 x ater usag hot water person per Mar r day for ea 106.54	[1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the day vater use, I May Vd,m = fac 98.19	ay Vd,av Iwelling is not and co Jun ctor from	erage = designed and designed a	(25 x N) to achieve Aug (43) 98.19	+ 36 a water us  Sep  102.36	Oct  106.54  Total = Su	9) Nov 110.72 m(44) <sub>112</sub> =	96 4.45 Dec		(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan er usage in	upancy, I 9, N = 1 9, N = 1 ge hot wa al average Ilitres per I Feb n litres per 110.72	N + 1.76 x ater usag hot water person per Mar r day for ea  106.54  used - cal	[1 - exp ge in litre usage by day (all w Apr ach month 102.36	es per da 5% if the or vater use, $I$ May $Vd, m = fa$ 98.19 $I$ $I$ $I$ $I$ $I$ $I$ $I$ $I$	ay Vd,av Iwelling is not and co Jun ctor from 94.01	erage = designed and designed a	(25 x N) to achieve  Aug (43)  98.19	+ 36 a water us  Sep  102.36  0 kWh/mon  119.45	Oct  106.54  Total = Su  139.21	Nov  110.72  m(44) <sub>112</sub> = ables 1b, 1  151.96	96 4.45  Dec 114.9  c, 1d) 165.01		(43)
Assum if TF, if TF, Annual Reduce a not more  Hot wate  (44)m=  Energy c  (45)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 114.9 content of	upancy, I 9, N = 1 9, N = 1 ge hot wa al average Ilitres per I Feb n litres per 110.72	N + 1.76 x ater usag hot water person per Mar r day for ea  106.54  used - cale	[1 - exp ge in litre usage by a day (all w Apr ach month 102.36  culated me	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 94.01 190 x Vd,r	erage = designed and ld)  Jul Table 1c x  94.01  m x nm x E  102.87	(25 x N) to achieve  Aug (43)  98.19  97m / 3600  118.04	+ 36 a water us  Sep  102.36 b kWh/mon  119.45	Oct  106.54  Total = Su  139.21	Nov  110.72  m(44) <sub>112</sub> = ables 1b, 1	96 4.45  Dec 114.9  c, 1d) 165.01	1253.44	(43)
Assum if TF, if TF, Annual Reduce a not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m=	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 114.9 content of 170.39 aneous w	upancy, I 9, N = 1 9, N = 1 ge hot wa al average is litres per p Feb n litres per 110.72 f hot water 149.02	N + 1.76 x ater usag hot water person per Mar r day for ea  106.54  used - cale	[1 - exp ge in litre usage by a day (all w Apr ach month 102.36  culated me	es per da 5% if the da 5% if th	ay Vd,av lwelling is not and co Jun ctor from 7 94.01 190 x Vd,r	erage = designed and ld)  Jul Table 1c x  94.01  m x nm x E  102.87	(25 x N) to achieve  Aug (43)  98.19  97m / 3600  118.04	+ 36 a water us  Sep  102.36 b kWh/mon  119.45	Oct  106.54  Total = Su  139.21	Nov  110.72  m(44) <sub>112</sub> = ables 1b, 1  151.96	96 4.45  Dec 114.9  c, 1d) 165.01	1253.44	(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m=  Water s	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan ar usage in 114.9 content of 170.39 aneous w 25.56 storage	upancy, I 9, N = 1 9, N = 1 ge hot wa al average is litres per p Feb in litres per 110.72 f hot water 149.02 vater heatin 22.35	N + 1.76 x ater usag hot water person per Mar r day for ea 106.54 used - calc 153.78 arg at point 23.07	[1 - exp ge in litre usage by day (all w Apr ach month 102.36  134.07  of use (no	es per da 5% if the a yater use, I May Vd,m = fa 98.19 onthly = 4. 128.64 o hot water 19.3	ay Vd,av lwelling is not and co Jun ctor from 1 94.01 190 x Vd,r 111.01 r storage),	erage = designed in designed i	(25 x N) to achieve  Aug (43)  98.19  07m / 3600  118.04  boxes (46)  17.71	+ 36 a water us  Sep  102.36  0 kWh/mon  119.45  0 to (61)  17.92	Oct  106.54  Total = Su  139.21  Total = Su  20.88	9) Nov 110.72 m(44) <sub>112</sub> = ables 1b, 1 151.96 m(45) <sub>112</sub> = 22.79	96  1.45  Dec  114.9  c, 1d)  165.01  24.75	1253.44	(43) (44) (45) (46)
Assum if TF, if TF, Annual Reduce a not more  Hot water  (44)m=  Energy of  (45)m=  If instant  (46)m=  Water s  Storage	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 114.9 content of 170.39 aneous w 25.56 storage e volume	upancy, I 9, N = 1 9, N = 1 ge hot wa al average is litres per p 110.72 f hot water 149.02 vater heatil 22.35 loss: ne (litres)	N + 1.76 x ater usage hot water person per Mar day for each 106.54 used - calconding at point 23.07	ge in litre usage by a day (all we have ach month 102.36 134.07 1 of use (not ach any set) any set any	es per da 5% if the orater use, I May Vd,m = far 98.19 onthly = 4. 128.64 o hot water 19.3 olar or W	ay Vd,av Iwelling is not and co Jun ctor from 7 94.01 190 x Vd,r 111.01 r storage),	erage = designed and ld)  Jul Table 1c x  94.01  m x nm x E  102.87  enter 0 in  15.43  storage	(25 x N) to achieve  Aug (43)  98.19  07m / 3600  118.04  boxes (46)  17.71  within sa	+ 36 a water us  Sep  102.36  0 kWh/mon  119.45  0 to (61)  17.92	Oct  106.54  Total = Su  139.21  Total = Su  20.88	9) Nov 110.72 m(44) <sub>112</sub> = ables 1b, 1 151.96 m(45) <sub>112</sub> = 22.79	96  1.45  Dec  114.9  c, 1d)  165.01	1253.44	(43)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m=  Water s  Storage If comm	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 114.9 content of 170.39 aneous w 25.56 storage e volume	upancy, I 9, N = 1 9, N = 1 ge hot wa al average is litres per p 110.72 149.02 vater heatin 22.35 ne (litres)	N + 1.76 x ater usage hot water person per Mar r day for ear 106.54 used - calc 153.78 ang at point 23.07 including and no talc 1.76 x	ge in litre usage by day (all w Apr ach month 102.36  134.07  of use (not 20.11  ag any so	es per da 5% if the a vater use, I May $Vd,m = fa$ 98.19 $to the total part of the $	ay Vd,av lwelling is not and co  Jun ctor from 1  94.01  190 x Vd,r  111.01  storage), 16.65  /WHRS nter 110	erage = designed in designed i	(25 x N) to achieve  Aug (43)  98.19  07m / 3600  118.04  boxes (46)  17.71  within sa (47)	+ 36 a water us  Sep  102.36  0 kWh/mon  119.45  17.92  ame vess	Oct  106.54  Total = Su  139.21  Total = Su  20.88  sel	9) Nov 110.72 m(44) <sub>112</sub> = ables 1b, 1 151.96 m(45) <sub>112</sub> = 22.79	96  1.45  Dec  114.9  c, 1d)  165.01  24.75	1253.44	(43) (44) (45) (46)
Assum if TF if TF Annual Reduce not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m= Water s  Storage If commotherw	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 114.9 content of 170.39 aneous w 25.56 storage e volume	upancy, I 9, N = 1 9, N = 1 ge hot wa al average is litres per p 110.72  I hot water 149.02  vater heatin 22.35  loss: ne (litres) neating a p stored	N + 1.76 x ater usage hot water person per Mar r day for ear 106.54 used - calc 153.78 ang at point 23.07 including and no talc 1.76 x	ge in litre usage by day (all w Apr ach month 102.36  134.07  of use (not 20.11  ag any so	es per da 5% if the a vater use, I May $Vd,m = fa$ 98.19 $to the total part of the $	ay Vd,av lwelling is not and co  Jun ctor from 1  94.01  190 x Vd,r  111.01  storage), 16.65  /WHRS nter 110	erage = designed in designed i	(25 x N) to achieve  Aug (43)  98.19  07m / 3600  118.04  boxes (46)  17.71  within sa (47)	+ 36 a water us  Sep  102.36  0 kWh/mon  119.45  17.92  ame vess	Oct  106.54  Total = Su  139.21  Total = Su  20.88  sel	9) Nov 110.72 m(44) <sub>112</sub> = ables 1b, 1 151.96 m(45) <sub>112</sub> = 22.79	96  1.45  Dec  114.9  c, 1d)  165.01  24.75	1253.44	(43) (44) (45) (46)
Assum if TF, if TF, Annual Reduce not more  Hot wate  (44)m=  Energy c  (45)m=  If instant  (46)m=  Water s  Storage If commotherw Water s	ed occu A > 13.9 A £ 13.9 average the annual that 125 Jan 114.9 content of 170.39 aneous w 25.56 storage e volum nunity h	upancy, I 9, N = 1 9, N = 1 ge hot wa al average is litres per p 110.72  I hot water 149.02  vater heatin 22.35  loss: ne (litres) neating a p stored	N + 1.76 x ater usage hot water person per Mar r day for ear 106.54  used - calconding at point 23.07  including and no talconding at water to talconding at point and no talconding and no talc	ge in litre usage by day (all w Apr ach month 102.36  134.07  of use (not 20.11  ag any so ank in dw er (this in	es per da 5% if the o rater use, I  May  Vd,m = far  98.19  onthly = 4.  128.64  o hot water  19.3  olar or W velling, e acludes i	ay Vd,av lwelling is not and co  Jun ctor from 94.01  190 x Vd,r  111.01  storage), 16.65  /WHRS nter 110 nstantar	erage = designed in designed i	(25 x N) to achieve  Aug (43)  98.19  07m / 3600  118.04  boxes (46)  17.71  within sa (47)	+ 36 a water us  Sep  102.36  0 kWh/mon  119.45  17.92  ame vess	Oct  106.54  Total = Su  139.21  Total = Su  20.88  sel	9) Nov 110.72 m(44) <sub>112</sub> = ables 1b, 1 151.96 m(45) <sub>112</sub> = 22.79	96  1.45  Dec  114.9  c, 1d)  165.01  24.75	1253.44	(43) (44) (45) (46)

Energy lost from water storage, kWh/year	(48) x (49) = 110	(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	0.02	(51)
Volume factor from Table 2a	1.03	(52)
Temperature factor from Table 2b	0.6	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) = 1.03	(54)
Enter (50) or (54) in (55)	1.03	(55)
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	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	32.01 30.98 32.01 30.98 32.01	(57)
		(58)
Primary circuit loss (annual) from Table 3  Primary circuit loss calculated for each month (59)m = (58) ÷ 3		(30)
(modified by factor from Table H5 if there is solar water hea		
(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 × (4	<del>і і і і і і                            </del>	(04)
(61)m= 0 0 0 0 0 0 0	0 0 0 0 0	(61)
Total heat required for water heating calculated for each mon		
(62)m= 225.67 198.95 209.06 187.56 183.92 164.5 158.14	173.32 172.94 194.48 205.45 220.29	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	ity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)	
(63)m= 0 0 0 0 0 0	0 0 0 0	(63)
Output from water heater		
(64)m= 225.67 198.95 209.06 187.56 183.92 164.5 158.14	173.32 172.94 194.48 205.45 220.29	
	Output from water heater (annual) <sub>112</sub> 2294.2	29 (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= 100.88 89.49 95.35 87.37 87 79.71 78.42	83.47 82.51 90.51 93.32 99.09	(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):	The state of the s	
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec	
(66)m= 147.9 147.9 147.9 147.9 147.9 147.9 147.9	147.9 147.9 147.9 147.9 147.9	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5	
(67)m= 30.14 26.77 21.77 16.48 12.32 10.4 11.24	14.61 19.61 24.9 29.06 30.98	(67)
Appliances gains (calculated in Appendix L, equation L13 or L	13a), also see Table 5	
(68)m= 338.09 341.59 332.75 313.93 290.18 267.85 252.93	249.42 258.26 277.08 300.84 323.17	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15	a), also see Table 5	
(69)m= 37.79 37.79 37.79 37.79 37.79 37.79 37.79	37.79 37.79 37.79 37.79 37.79	(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)		
(71)m= -118.32	-118.32 -118.32 -118.32 -118.32 -118.32	(71)
, , , , , , , , , , , , , , , , , , , ,	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	· /

\/\/ater	heating	gains (T	ahle 5)											
(72)m=	135.59	133.17	128.16	121.35	116.93	Τ 1	10.7 105.41	112	.19 114.6	121.6	5 129.61	133.18		(72)
` '		gains =			<u> </u>				3)m + (69)m + (	70)m +	(71)m + (72)			
(73)m=		568.91	550.06	519.14	486.8	4	56.32 436.95	443	.59 459.84	491	526.88	554.7		(73)
6. So	lar gains	S:						<u> </u>						
Solar	gains are o	calculated	using sola	r flux from	Table 6a	and	associated equa	itions	to convert to th	e applic	able orientat	ion.		
Orient		Access F		Area			Flux		g_		FF		Gains	
	7	Table 6d		m²			Table 6a		Table 6b		Table 6c		(W)	
East	0.9x	1	X	4.7	76	X	19.64	x	0.5	X	0.7	=	22.68	(76)
East	0.9x	1	X	2.3	39	X	19.64	X	0.5	X	0.7	=	11.39	(76)
East	0.9x	1	Х	4.7	76	X	19.64	x	0.5	X	0.7	=	22.68	(76)
East	0.9x	1	X	2.3	39	X	19.64	x	0.5	x	0.7	=	11.39	(76)
East	0.9x	1	X	4.7	76	X	38.42	X	0.5	X	0.7	=	44.36	(76)
East	0.9x	1	X	2.3	39	X	38.42	x	0.5	x	0.7	=	22.27	(76)
East	0.9x	1	X	4.7	76	X	38.42	X	0.5	×	0.7	=	44.36	(76)
East	0.9x	1	X	2.3	39	X	38.42	X	0.5	×	0.7	=	22.27	(76)
East	0.9x	1	X	4.7	76	X	63.27	X	0.5	X	0.7	=	73.05	(76)
East	0.9x	1	X	2.3	39	X	63.27	X	0.5	X	0.7	=	36.68	(76)
East	0.9x	1	X	4.7	76	X	63.27	X	0.5	X	0.7	=	73.05	(76)
East	0.9x	1	X	2.3	39	X	63.27	x	0.5	X	0.7	=	36.68	(76)
East	0.9x	1	X	4.7	76	X	92.28	x	0.5	X	0.7	=	106.54	(76)
East	0.9x	1	X	2.3	39	X	92.28	x	0.5	X	0.7	=	53.49	(76)
East	0.9x	1	X	4.7	76	X	92.28	x	0.5	x	0.7	=	106.54	(76)
East	0.9x	1	X	2.3	39	X	92.28	X	0.5	X	0.7	=	53.49	(76)
East	0.9x	1	X	4.7	76	X	113.09	x	0.5	X	0.7	=	130.57	(76)
East	0.9x	1	X	2.3	39	X	113.09	x	0.5	X	0.7	=	65.56	(76)
East	0.9x	1	X	4.7	76	X	113.09	x	0.5	X	0.7	=	130.57	(76)
East	0.9x	1	X	2.3	39	X	113.09	x	0.5	X	0.7	=	65.56	(76)
East	0.9x	1	X	4.7	76	x	115.77	x	0.5	x	0.7	=	133.66	(76)
East	0.9x	1	X	2.3	39	X	115.77	x	0.5	X	0.7	=	67.11	(76)
East	0.9x	1	X	4.7	76	x	115.77	x	0.5	X	0.7	=	133.66	(76)
East	0.9x	1	X	2.3	39	X	115.77	x	0.5	x	0.7	=	67.11	(76)
East	0.9x	1	X	4.7	76	X	110.22	x	0.5	x	0.7	=	127.25	(76)
East	0.9x	1	X	2.3	39	x	110.22	x	0.5	x	0.7	=	63.89	(76)
East	0.9x	1	X	4.7	76	x	110.22	x	0.5	x	0.7	=	127.25	(76)
East	0.9x	1	X	2.3	39	x	110.22	x	0.5	x	0.7	=	63.89	(76)
East	0.9x	1	X	4.7	76	x	94.68	x	0.5	X	0.7	=	109.31	(76)
_								1		_				$\neg$

X

X

2.39

4.76

2.39

X

X

94.68

94.68

94.68

X

X

0.5

0.5

0.5

X

X

0.7

0.7

0.7

East

East

East

0.9x

0.9x

0.9x

1

(76)

(76)

(76)

54.88

109.31

54.88

	_				_								_
East	0.9x	1	X	4.76	X	73.59	X	0.5	X	0.7	=	84.96	(76)
East	0.9x	1	X	2.39	X	73.59	X	0.5	X	0.7	=	42.66	(76)
East	0.9x	1	X	4.76	X	73.59	х	0.5	X	0.7	=	84.96	(76)
East	0.9x	1	X	2.39	X	73.59	х	0.5	X	0.7	=	42.66	(76)
East	0.9x	1	X	4.76	X	45.59	x	0.5	X	0.7	=	52.63	(76)
East	0.9x	1	X	2.39	X	45.59	X	0.5	X	0.7	=	26.43	(76)
East	0.9x	1	X	4.76	X	45.59	x	0.5	X	0.7	=	52.63	(76)
East	0.9x	1	X	2.39	X	45.59	x	0.5	X	0.7	=	26.43	(76)
East	0.9x	1	X	4.76	X	24.49	X	0.5	x	0.7	=	28.27	(76)
East	0.9x	1	X	2.39	X	24.49	X	0.5	X	0.7	=	14.2	(76)
East	0.9x	1	X	4.76	X	24.49	X	0.5	X	0.7	=	28.27	(76)
East	0.9x	1	X	2.39	X	24.49	X	0.5	x	0.7	=	14.2	(76)
East	0.9x	1	X	4.76	X	16.15	x	0.5	X	0.7	=	18.65	(76)
East	0.9x	1	X	2.39	X	16.15	X	0.5	X	0.7	=	9.36	(76)
East	0.9x	1	X	4.76	X	16.15	X	0.5	x	0.7	=	18.65	(76)
East	0.9x	1	X	2.39	X	16.15	x	0.5	X	0.7	=	9.36	(76)
South	0.9x	0.77	X	7.32	X	46.75	x	0.5	X	0.7	=	83.01	(78)
South	0.9x	0.77	X	7.32	X	76.57	X	0.5	x	0.7	=	135.94	(78)
South	0.9x	0.77	X	7.32	X	97.53	X	0.5	x	0.7	=	173.17	(78)
South	0.9x	0.77	X	7.32	X	110.23	x	0.5	X	0.7	=	195.72	(78)
South	0.9x	0.77	X	7.32	X	114.87	X	0.5	X	0.7	=	203.95	(78)
South	0.9x	0.77	X	7.32	X	110.55	x	0.5	X	0.7	=	196.27	(78)
South	0.9x	0.77	X	7.32	X	108.01	X	0.5	X	0.7	=	191.77	(78)
South	0.9x	0.77	X	7.32	X	104.89	x	0.5	X	0.7	=	186.24	(78)
South	0.9x	0.77	X	7.32	X	101.89	x	0.5	X	0.7	=	180.89	(78)
South	0.9x	0.77	X	7.32	X	82.59	X	0.5	X	0.7	=	146.63	(78)
South	0.9x	0.77	X	7.32	X	55.42	X	0.5	x	0.7	=	98.39	(78)
South	0.9x	0.77	X	7.32	X	40.4	x	0.5	X	0.7	=	71.73	(78)
West	0.9x	0.77	X	4.92	X	19.64	X	0.5	X	0.7	=	23.44	(80)
West	0.9x	0.77	X	4.92	X	19.64	x	0.5	x	0.7	=	23.44	(80)
West	0.9x	0.77	X	2.39	X	19.64	X	0.5	X	0.7	=	34.16	(80)
West	0.9x	0.77	X	4.92	X	38.42	X	0.5	X	0.7	=	45.85	(80)
West	0.9x	0.77	X	4.92	X	38.42	x	0.5	X	0.7	=	45.85	(80)
West	0.9x	0.77	X	2.39	X	38.42	X	0.5	X	0.7	=	66.82	(80)
West	0.9x	0.77	X	4.92	X	63.27	X	0.5	X	0.7	=	75.51	(80)
West	0.9x	0.77	x	4.92	x	63.27	x	0.5	x	0.7	] =	75.51	(80)
West	0.9x	0.77	X	2.39	x	63.27	x	0.5	x	0.7	=	110.04	(80)
West	0.9x	0.77	X	4.92	x	92.28	x	0.5	x	0.7	=	110.12	(80)
West	0.9x	0.77	x	4.92	x	92.28	x	0.5	x	0.7	] =	110.12	(80)
West	0.9x	0.77	X	2.39	x	92.28	x	0.5	x	0.7	] =	160.48	(80)
West	0.9x	0.77	X	4.92	x	113.09	x	0.5	X	0.7	<b>=</b>	134.96	(80)

\ <b>\</b> /+	г		_						1 1			- I				<b>–</b> 1
West	0.9x	0.77	X	4.9	2	X	1	13.09	X		0.5	_  ×	0.7	_  =	134.96	(80)
West	0.9x	0.77	X	2.3	9	X	1	13.09	X		0.5	_ x	0.7	=	196.68	(80)
West	0.9x	0.77	X	4.9	2	X	1	15.77	X		0.5	X	0.7	=	138.15	(80)
West	0.9x	0.77	X	4.9	2	X	1	15.77	X		0.5	X	0.7	=	138.15	(80)
West	0.9x	0.77	X	2.3	9	X	1	15.77	X		0.5	X	0.7	=	201.33	(80)
West	0.9x	0.77	X	4.9	2	X	1	10.22	X		0.5	x	0.7	=	131.53	(80)
West	0.9x	0.77	X	4.9	2	X	1	10.22	X		0.5	x	0.7	=	131.53	(80)
West	0.9x	0.77	Х	2.3	9	X	1	10.22	X		0.5	X	0.7	=	191.68	(80)
West	0.9x	0.77	Х	4.9	2	X	9	4.68	X		0.5	X	0.7	=	112.98	(80)
West	0.9x	0.77	X	4.9	2	X	9	4.68	X		0.5	x	0.7	=	112.98	(80)
West	0.9x	0.77	X	2.3	9	X	9	4.68	X		0.5	X	0.7	=	164.65	(80)
West	0.9x	0.77	X	4.9	2	X	7	3.59	X		0.5	X	0.7	=	87.82	(80)
West	0.9x	0.77	X	4.9	2	X	7	3.59	X		0.5	x [	0.7	=	87.82	(80)
West	0.9x	0.77	X	2.3	9	X	7	3.59	X		0.5	X	0.7	=	127.98	(80)
West	0.9x	0.77	X	4.9	2	X	4	5.59	X		0.5	X	0.7	=	54.4	(80)
West	0.9x	0.77	X	4.9	2	X	4	5.59	X		0.5	x [	0.7	=	54.4	(80)
West	0.9x	0.77	X	2.3	9	X	4	5.59	X		0.5	X	0.7	=	79.28	(80)
West	0.9x	0.77	X	4.9	2	X	2	4.49	X		0.5	X	0.7	=	29.22	(80)
West	0.9x	0.77	X	4.9	2	X	2	4.49	X		0.5	x	0.7	=	29.22	(80)
West	0.9x	0.77	X	2.3	9	X	2	4.49	X		0.5	X	0.7	=	42.59	(80)
West	0.9x	0.77	X	4.9	2	X	1	6.15	X		0.5	×	0.7	=	19.27	(80)
West	0.9x	0.77	X	4.9	2	X	1	6.15	X		0.5	×	0.7	=	19.27	(80)
West	0.9x	0.77	X	2.3	9	x	1	6.15	x		0.5	X	0.7	=	28.09	(80)
•	ains in	watts, calc			n mont	$\overline{}$			(83)m	n = Sur	m(74)m	.(82)m			7	
(83)m=	232.16		553.68	896.51	1062.8		075.46	1028.8	905	.23	739.75	492.84	284.37	194.38	]	(83)
_		nternal and		<del>`                                    </del>		<del>`</del>			L			000.04	T 044 05	740.00	1	(0.4)
(84)m=	803.34	996.63 1	203.74	1415.65	1549.6	15	531.78	1465.74	1348	3.82	1199.59	983.84	811.25	749.08		(84)
		nal tempe	,													
•		during hea	٠.			•			ole 9,	, Th1	(°C)				21	(85)
Utilisa		tor for gain				T			Ι.				T	_	1	
(2.2)	Jan	Feb	Mar	Apr	May	+	Jun	Jul	_	ug -	Sep	Oct	Nov	Dec	1	(00)
(86)m=	0.98	0.96	0.93	0.85	0.73		0.58	0.45	0.	5	0.72	0.9	0.97	0.98		(86)
Mean		l temperat	ure in li		ea T1 (	follo	w ste	ps 3 to 7	in T	able	9c)				,	
(87)m=	18.75	19.06	19.55	20.13	20.58	2	20.85	20.95	20.	93	20.71	20.09	19.31	18.7		(87)
Temp	erature	during hea	ating pe	eriods in	rest o	f dw	elling	from Ta	able 9	9, Th2	2 (°C)		_		_	
(88)m=	20.09	20.09	20.09	20.1	20.11	2	20.12	20.12	20.	12	20.11	20.11	20.1	20.1		(88)
Utilisa	ation fac	tor for gain	ns for re	est of d	welling	, h2	,m (se	e Table	9a)							
(89)m=	0.98	0.96	0.91	0.83	0.69		0.52	0.37	0.4	12	0.66	0.88	0.96	0.98	]	(89)
Mean	interna	l temperat	ure in t	he rest	of dwe	Ilina	T2 (f	ollow ste	eps 3	to 7	in Table	e 9c)	•		-	
(90)m=	17.04	<del> </del>	18.19	19.02	19.62	Ť	19.98	20.08	20.	$\overline{}$	19.82	18.98	17.86	16.97	1	(90)
		ı L									fl	_A = Liv	ing area ÷ (4	1) =	0.29	(91)

Mean intern	al temper	aturo (fo	r the wh	ale dwel	lina) – fl	Λ <b>ν</b> Τ1	⊥ (1 _ fl	۸) ی T2					
(92)m= 17.54	<del></del>	18.59	19.34	19.9	20.23	20.34	20.32	20.08	19.3	18.29	17.48		(92)
Apply adjus										.0.20			(- /
(93)m= 17.54	1	18.59	19.34	19.9	20.23	20.34	20.32	20.08	19.3	18.29	17.48		(93)
8. Space he	eating requ	uirement											
Set Ti to the the utilisation			•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Jan	1	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa			<u> </u>				_ 3						
(94)m= 0.96	0.94	0.89	0.81	0.68	0.53	0.39	0.44	0.66	0.86	0.94	0.97		(94)
Useful gains	s, hmGm	W = (94	4)m x (84	4)m									
(95)m= 774.00	935.04	1073.34	1142.16	1061.09	811.02	570.85	587.95	789.03	845.45	766.1	726.03		(95)
Monthly ave	<del></del>		i –										(2.2)
(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 ra	ate for mea		1699.23	ı	_m , VV =	=[(39)m : 597.07	x [(93)m- 624.71	- (96)m 961.61	1411.69	1925 44	2180.13		(97)
(97)m= 2199.3 Space heat	_ l		l								2160.13		(31)
(98)m= 1060.4		686.71	401.09	200.72	0	0.02	0	0	421.28	762.73	1081.85		
` '							Tota	l per year			8) <sub>15,912</sub> =	5439.42	(98)
Space heat	ing require	ement in	kWh/m²	/year							Ī	32.65	(99)
9b. Energy re	eguiremer	nts – Cor	nmunity	heating	scheme								
This part is u				Ĭ			ing prov	ided by	a comm	unity sch	neme.		
Fraction of sp										·		0	(301)
Fraction of sp	oace heat	from co	mmunity	system	1 – (301	I) =						1	(302)
The community									up to four o	other heat	sources; th	e latter	
includes boilers, Fraction of h		-			om powei	stations.	See Appei	ndix C.			Γ	0.5	(303a)
Fraction of co	ommunity	heat fro	m heat s	ource 2							Ī	0.5	(303b)
Fraction of to	tal space	heat fro	m Comn	nunity he	at pump	)			(30	02) x (303	a) =	0.5	(304a)
Fraction of to	tal space	heat fro	m comm	unity he	at sourc	e 2			(3	02) x (303	b) =	0.5	(304b)
Factor for co	ntrol and	charging	method	(Table 4	lc(3)) fo	r commu	unity hea	ting sys	tem		Ī	1	(305)
Distribution le	oss factor	(Table 1	2c) for (	communi	ty heatir	ng syste	m				Ī	1.05	(306)
Space heati	na												
	9										L	kWh/year	
Annual space	•	requirem	nent								[	kWh/year 5439.42	
Annual space Space heat f	e heating	-		p				(98) x (30	04a) x (305	5) x (306) =	- [		(307a)
•	e heating rom Comi	nunity h	eat pum	p					04a) x (305 04b) x (305		L	5439.42	
Space heat f	e heating rom Comi	munity h	eat pum		system	in % (frc	om Table	(98) x (30	04b) x (305	5) x (306) :	L	5439.42 2855.7	] (307a)
Space heat f	e heating rom Comi rom heat secondary	munity hesource 2 //supple	eat pum	heating	•	,		(98) x (30 e 4a or A	04b) x (305	5) x (306) = E)	L	5439.42 2855.7 2855.7	(307a) (307b)
Space heat f Space heat f Efficiency of Space heatin Water heatin	e heating rom Comi rom heat secondary ng require	munity hosource 2 y/supplement from	eat pum	heating	•	,		(98) x (30 e 4a or A	04b) x (305 ppendix	5) x (306) = E)	L	5439.42 2855.7 2855.7 0	(307a) (307b) (308
Space heat f Space heat f Efficiency of Space heatin Water heatin Annual water	e heating rom Comi rom heat secondary ng required ng	munity hosource 2  //supple ment from	eat pum mentary m secon ent	heating	•	,		(98) x (30 e 4a or A	04b) x (305 ppendix	5) x (306) = E)	L	5439.42 2855.7 2855.7	(307a) (307b) (308
Space heat f Space heat f Efficiency of Space heatin Water heatin	e heating rom Comi rom heat secondary ng require ng r heating r communi	munity he source 2 //supple ment from equirem	eat pum mentary m secon ent ne:	heating dary/sup	•	,		(98) x (30 e 4a or A (98) x (30	04b) x (305 ppendix	5) x (306) = E) ÷ (308) =	= [ [ [	5439.42 2855.7 2855.7 0	(307a) (307b) (308

	(2.1)	(000)			
Water heat from heat source 2		$(305) \times (306) =$			(310b)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] :	= 8		(313)
Cooling System Energy Efficiency Ratio					(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		590	0.07	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	590	0.07	(331)
Energy for lighting (calculated in Appendix L)			532	2.29	(332)
Electricity generated by PVs (Appendix M) (negative quanti	ty)		-101	16.84	(333)
Electricity generated by wind turbine (Appendix M) (negative	re quantity)			0	(334)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto kg CO2/kWh	or Emission kg CO2		
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%)	HP) Pusing two fuels repeat (363) to	(366) for the second f	uel	425	(367a)
Efficiency of heat source 2 (%)	) using two finals report (262) to		=		
Efficiency of fleat source 2 (%)	using two fuels repeat (363) to	(366) for the second f	uel	91	(367b)
	07b)+(310b)] x 100 ÷ (367b) x	0.52			(367b) (367)
CO2 associated with heat source 1 [(3)			= 4	95.82	
CO2 associated with heat source 1 [(3)	07b)+(310b)] x 100 ÷ (367b) x	0.52	= 4!	95.82 63.74	(367)
CO2 associated with heat source 1 [(3) CO2 associated with heat source 2	07b)+(310b)] x 100 ÷ (367b) x 07b)+(310b)] x 100 ÷ (367b) x	0.52 0.22 0.52	= 4: = 9: = 4	95.82 63.74 12.14	(367) (368)
CO2 associated with heat source 1 [(3) CO2 associated with heat source 2 [(3) Electrical energy for heat distribution	07b)+(310b)] x 100 ÷ (367b) x 07b)+(310b)] x 100 ÷ (367b) x [(313) x	0.52 0.22 0.52	= 4: = 9: = 4	95.82 63.74 12.14 501.71	(367) (368) (372)
CO2 associated with heat source 1 [(3) CO2 associated with heat source 2 [(3) Electrical energy for heat distribution Total CO2 associated with community systems	07b)+(310b)] x 100 ÷ (367b) x 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) (309) x	0.52	= 4! = 9! = 4 = 15	95.82   63.74   12.14   501.71   0	(367) (368) (372) (373)
CO2 associated with heat source 1 [(3) CO2 associated with heat source 2 [(3) Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	07b)+(310b)] x 100 ÷ (367b) x 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) (309) x	0.52 0.22 0.52	= 4! = 9! = 4 = 15 = =	95.82   63.74   12.14   501.71   0   0	(367) (368) (372) (373) (374)
CO2 associated with heat source 1 [(3) CO2 associated with heat source 2 [(3) 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	07b)+(310b)] x 100 ÷ (367b) x 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) (309) x (309) x (373) + (374) + (375) =	0.52 0.22 0.52	= 49 = 90 = 15 = 15	95.82   63.74   12.14   501.71   0   0   501.71	(367) (368) (372) (373) (374) (375)
CO2 associated with heat source 1 [(3) CO2 associated with heat source 2 [(3) 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 Total CO2 associated with space and water heating	07b)+(310b)] x 100 ÷ (367b) x 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) (309) x (309) x (373) + (374) + (375) =	0.52 0.22 0.52 0 0 0.52	= 49 = 90 = 15 = 15 = 30	95.82   63.74   12.14   501.71   0   0   501.71   0   0   6.25   1   6.25	(367) (368) (372) (373) (374) (375) (376)
CO2 associated with heat source 1 [(3) CO2 associated with heat source 2 [(3) 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 Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within decompositions.	07b)+(310b)] x 100 ÷ (367b) x 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) (309) x (373) + (374) + (375) = [welling (331)) x (332))) x	0.52 0.22 0.52 0 0 0.52	= 49 = 99 = 15 = 15 = 30 = 2	95.82 63.74 12.14 501.71 0 0 501.71 06.25 76.26	(367) (368) (372) (373) (374) (375) (376) (378)
CO2 associated with heat source 1 [(3) CO2 associated with heat source 2 [(3) 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 Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within decomposition of the code in the code in the code is a specific point of the code in the code in the code is a specific point of the code in the code in the code is a specific point of the code in the code in the code is a specific point of the code in the code in the code in the code is a specific point of the code in the cod	07b)+(310b)] x 100 ÷ (367b) x 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) (309) x (373) + (374) + (375) = [welling (331)) x (332))) x	0.52 0.22 0.52 0.52 0.52 0.52	= 49 = 99 = 4 = 15 = 15 = 30 = 2	95.82 63.74 12.14 501.71 0 0 501.71 06.25 76.26	(367) (368) (372) (373) (374) (375) (376) (378) (379)
CO2 associated with heat source 1 [(3) CO2 associated with heat source 2 [(3) 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 Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within decomposition of the code in the code in the code is a specific code in the	07b)+(310b)] x 100 ÷ (367b) x 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) (309) x (373) + (374) + (375) = [welling (331)) x (332))) x	0.52 0.22 0.52 0.52 0.52 0.52	= 49 = 99 = 4 = 15 = 15 = 30 = 22	95.82 63.74 12.14 501.71 0 0 501.71 06.25 76.26 27.74	(367) (368) (372) (373) (374) (375) (376) (378) (379)

				Jser D	otoilo:						
Access Names	losset Ter					. M	h a ===		CTDO	000000	
Assessor Name:	Joseph Tre				Stroma					032062	
Software Name:	Stroma FS	AP 2012			Softwa		rsion:		versic	n: 1.0.4.14	
					Address:	A3					
Address :	, Gondar Ga	ardens, Lond	don, N	W6 1F	IG						
Overall dwelling dime	ensions:			_							
Decement				Area		<i>(4.</i> )		eight(m)	_	Volume(m <sup>3</sup>	
Basement				6	8.93	(1a) x	2	2.55	(2a) =	175.77	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1d)+(1e)+	(1n)	6	8.93	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	175.77	(5)
2. Ventilation rate:											
	main heating	secoi heat			other		total			m³ per hou	r
Number of chimneys	0	¬	)	+	0	] = [	0	х	40 =	0	(6a)
Number of open flues	0	] + [ (		+ 🗀	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans					, <u>,</u>	0	x	10 =	0	
Number of passive vents	2					F	0	x	10 =	0	(7b)
·						Ļ			40 =		= ' '
Number of flueless gas f	ires						0		40 =	0	(7c)
									Air ch	anges per ho	our
Infiltration due to chimne	vs flues and fa	ans = (6a)+(6	b)+(7a)-	+( <b>7</b> b)+(7	7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has t						ontinue fr			- (0) -		(0)
Number of storeys in t				- ( /,, -			(-)	()		0	(9)
Additional infiltration	3 ( )	,						[(9)	)-1]x0.1 =	0	(10)
Structural infiltration: 0	).25 for steel or	timber fram	e or 0.	.35 for	masonr	y constr	uction		•	0	(11)
if both types of wall are p	resent, use the va	lue correspond				•					` ′
deducting areas of openi	• / .		0.4	/l-	-ا/ ا						¬
If suspended wooden		,	or 0.1	(seale	a), eise	enter U				0	(12)
If no draught lobby, en	·									0	(13)
Percentage of window	s and doors dr	aught stripp	ed		0.05 10.0	(4.4)	001			0	(14)
Window infiltration					0.25 - [0.2	` '	_			0	(15)
Infiltration rate					(8) + (10) -					0	(16)
Air permeability value,					•	•	etre of e	envelope	e area	3	(17)
If based on air permeabi	•									0.15	(18)
Air permeability value applie		on test has bee	n done d	or a deg	ree air pei	meability	is being u	sed		<b>_</b>	_
Number of sides sheltered	ed				(00) 4 [	0.075 (4	10)1			2	(19)
Shelter factor					(20) = 1 - [		[9)] =			0.85	(20)
Infiltration rate incorpora	<del>-</del>				(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified	<del> </del>	<del></del>		1	Λ	0		NI -		1	
Jan Feb	Mar Apr		un	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			_						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 = (2	2)m ÷ 4										
(======================================	<del>, , ,</del>	1.00		0.05	0.00		T	T	T	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.16				-	d wind s	peed) =	(21a) x	(ZZa)III					
Calculate effe	0.16	0.16	0.14	0.14 he appli	0.12 Cable ca	0.12 Se	0.12	0.13	0.14	0.14	0.15		
If mechanica		•	ate for ti	пс арри	sabic ca	30					ſ	0.5	(23a
If exhaust air h	eat pump u	sing Appe	endix N, (2	3b) = (23a	) × Fmv (e	equation (N	N5)) , othe	wise (23b	) = (23a)		Ī	0.5	(23b
If balanced with	n heat recov	very: effici	ency in %	allowing for	or in-use f	actor (from	n Table 4h	) =			Ī	68.85	(230
a) If balance	ed mecha	ınical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	ı)m = (22	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(24a
b) If balance	ed mecha	ınical ve	ntilation	without	heat rec	covery (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 h if (22b)n	nouse exti n < 0.5 ×			•	•				5 × (23b	)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)n	ventilatio n = 1, the								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change r	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25)
3. Heat losse	s and he	at loss r	paramete	er:									
ELEMENT	Gross	•	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	A 2	Χk
	area (	(m²)	· m	2	A ,r		W/m2	-	(W/I	<)	kJ/m²-k	kJ/	′K
Windows Type					8.96	x1/	/[1/( 1.2 )+	0.04] =	10.26				(27)
Windows Type	∌ 2				2.26	x1/	/[1/( 1.2 )+	0.04] =	2.59				(27)
Windows Type	∍ 3 				2.26	x1/	/[1/( 1.2 )+	0.04] =	2.59				(27)
Walls Type1	65.3	,	13.48	3	51.82	<u>x</u>	0.18	=	9.33				(29)
Walls Type2	15.33	3	0		15.33	3 X	0.23	= [	3.46				(29)
Walls Type3	28.15	5	0		28.15	5 X							
. 71							0.2	= [	5.63				(29)
Total area of e	elements,	m²			108.7	8	0.2	= [	5.63				(29)
	elements,	m²				8 x	0.2	= [ = [	5.63				=
Total area of e	l roof windo	ows, use e			108.79 8.49	x	0	= [	0	s given in	paragraph	3.2	(29)
Total area of e Party wall * for windows and ** include the area	l roof windo as on both s	ows, use e sides of in	iternal wall		108.79 8.49	x ated using	0 formula 1	= [ /[(1/U-valu	0	s given in	paragraph		(29) (31) (32)
Total area of e Party wall  * for windows and ** include the area Fabric heat los	I roof windo as on both s ss, W/K =	ows, use e sides of in = S (A x	iternal wall		108.79 8.49	x ated using	0	$= \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix} $	0 e)+0.04] a		[	33.85	(29) (31) (32) (33)
Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity	I roof windo as on both s ss, W/K = Cm = S(A	ows, use e sides of in = S (A x A x k )	iternal wall U)	s and part	108.70 8.49 alue calculations	x ated using	0 formula 1	= [ /[(1/U-valu + (32) = ((28)	0 e)+0.04] a	2) + (32a).	[	33.85 6100.28	(29) (31) (32) (33) (34)
Total area of e Party wall  * for windows and ** include the area Fabric heat los Heat capacity Thermal mass	I roof windo as on both s ss, W/K = Cm = S(A paramet	ows, use e sides of in S (A x A x k ) ter (TMF	oternal wall U) P = Cm ÷	s and part	108.74 8.49 alue calculations	x ated using	0 1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28)	0 e)+0.04] a .(30) + (32 tive Value	2) + (32a). : Low	(32e) = [	33.85	(29) (31) (32) (33) (34)
Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity	I roof windo as on both s ss, W/K = Cm = S(A s paramet sments whe	ows, use e sides of in S (A x A x k ) ter (TMF	ternal wall $U)$ $P = Cm \div tails of the$	s and part	108.74 8.49 alue calculations	x ated using	0 1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28)	0 e)+0.04] a .(30) + (32 tive Value	2) + (32a). : Low	(32e) = [	33.85 6100.28	(29) (31) (32) (33) (34)
Total area of e Party wall  * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess	I roof windo as on both s ss, W/K = Cm = S(A s paramet sments whe ead of a deta	ows, use e sides of in = S (A x A x k ) ter (TMF ere the dec ailed calcu	ternal wall $U)$ $P = Cm \div tails of the ulation.$	s and part  - TFA) in	108.74 8.49 alue calculations a kJ/m²K	x ated using	0 1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28)	0 e)+0.04] a .(30) + (32 tive Value	2) + (32a). : Low	(32e) = [	33.85 6100.28	(29) (31) (32) (33) (34) (35)
Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of thermal	I roof windo as on both s ss, W/K = Cm = S(A s paramet sments whe ead of a deta es : S (L 2 al bridging a	ows, use e sides of in = S (A x A x k ) ter (TMF ere the det ailed calcu x Y) calcu	eternal wall U) $P = Cm \div tails of the ulation. $ culated t	s and part - TFA) in constructi	108.74 8.49 alue calculations kJ/m²K fon are not	x ated using	0 1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28) Indica	0 e)+0.04] a .(30) + (32 tive Value values of	2) + (32a). : Low	(32e) = [	33.85 6100.28 100	(29) (31) (32) (33) (34) (35)
Total area of e Party wall  * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of therma Total fabric he	I roof windo as on both s ss, W/K = Cm = S(A s paramet sments whe ead of a deta es : S (L s al bridging a eat loss	ows, use e sides of in = S (A x A x k ) ter (TMF ere the det ailed calcu x Y) calcu are not kno	eternal wall U) $P = Cm \div tails of the ulation.$ $culated to own (36) = 0$	s and part TFA) in constructi using Ap	108.74 8.49 alue calculations kJ/m²K fon are not	x ated using	0 1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28) Indica e indicative	0 e)+0.04] a .(30) + (32 tive Value values of	2) + (32a). : Low TMP in Ta	(32e) = [ [ able 1f	33.85 6100.28 100	(29) (31) (32) (33) (34) (35)
Total area of e Party wall  * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of therma Total fabric he Ventilation hea	I roof windo as on both s ss, W/K = Cm = S(A s paramet sments whe had of a deta es : S (L s al bridging a eat loss at loss ca	ows, use e sides of in S (A x A x k ) ter (TMF ere the de ailed calcu x Y) calc are not kn	ternal wall U) $P = Cm \div tails of the ulation. culated u own (36) =$	TFA) in constructions and part	108.74 8.49 alue calculations a kJ/m²K fon are not	x ated using t known pr	0 of formula 1. (26)(30) recisely the	= [ /[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m	0 e)+0.04] a .(30) + (32 tive Value values of (36) = = 0.33 × (	2) + (32a). : Low TMP in Ta 25)m x (5)	(32e) = [   [   able 1f	33.85 6100.28 100	(29) (31) (32) (33) (34) (35) (36)
Total area of e Party wall  * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of therma Total fabric he Ventilation hea	roof windo as on both s ss, W/K = Cm = S(A s paramet sments whe ead of a deta es : S (L x al bridging a eat loss at loss ca	ows, use e sides of in = S (A x A x k ) ter (TMF ere the det ailed calcu x Y) calcu are not known	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) =	TFA) in constructiusing Ap 0.15 x (3	108.74 8.49 alue calculations a kJ/m²K fon are not spendix k 1) Jun	x ated using t known pro	0 I formula 1 (26)(30) Recisely the	= [/[(1/U-valu + (32) = ((28) Indica indicative (33) + (38)m Sep	0 e)+0.04] a .(30) + (32 tive Value values of  (36) = = 0.33 × ( Oct	2) + (32a). Low TMP in Ta 25)m x (5) Nov	(32e) = [	33.85 6100.28 100	(29) (31) (32) (33) (34) (35) (36)
Total area of end of Party wall  * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of therma Total fabric heat Ventilation heat [State of the Jan (38)m= 18.46]	roof windo as on both s ss, W/K = Cm = S(A s paramet sments whe had of a deta es : S (L s al bridging a eat loss at loss ca Feb 18.28	ows, use e sides of in = S (A x A x k ) ter (TMF ere the det ailed calcu x Y) calcu are not known alculated Mar 18.09	ternal wall U) $P = Cm \div tails of the ulation. culated u own (36) =$	TFA) in constructions and part	108.74 8.49 alue calculations a kJ/m²K fon are not	x ated using t known pr	0 of formula 1. (26)(30) recisely the	= [/(1/U-valu + (32) = ((28) Indica * indicative (33) + (38)m Sep 16.43	0 e)+0.04] a .(30) + (32 tive Value values of  (36) = = 0.33 × ( Oct 16.98	2) + (32a). Low TMP in Ta 25)m x (5) Nov 17.35	(32e) = [   [   able 1f	33.85 6100.28 100	(29) (31) (32) (33) (34) (35) (36)
Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of therma Total fabric he Ventilation hea	roof windo as on both s ss, W/K = Cm = S(A s paramet sments whe had of a deta es : S (L s al bridging a eat loss at loss ca Feb 18.28	ows, use e sides of in = S (A x A x k ) ter (TMF ere the det ailed calcu x Y) calcu are not known alculated Mar 18.09	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) =	TFA) in constructiusing Ap 0.15 x (3	108.74 8.49 alue calculations a kJ/m²K fon are not spendix k 1) Jun	x ated using t known pro	0 I formula 1 (26)(30) Recisely the	= [/(1/U-valu + (32) = ((28) Indica * indicative (33) + (38)m Sep 16.43	0 e)+0.04] a .(30) + (32 tive Value values of  (36) = = 0.33 × ( Oct	2) + (32a). Low TMP in Ta 25)m x (5) Nov 17.35	(32e) = [	33.85 6100.28 100	(29) (31) (32) (33) (34) (35) (36)

Heat loss para	ameter (I	HLP), W	m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.9	0.9	0.9	0.89	0.88	0.87	0.87	0.87	0.88	0.88	0.89	0.89		
Niversham of slav	:		- 4 -\						Average =	Sum(40) <sub>1</sub> .	12 /12=	0.89	(40)
Number of day Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30 30	31	30	31		(41)
(,						<u> </u>	<u> </u>				<u> </u>		( )
4. Water hea	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		22		(42)
Annual averag Reduce the annua not more that 125	ge hot wa al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o		5.92		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 95.61	92.14	88.66	85.18	81.71	78.23	78.23	81.71	85.18	88.66	92.14	95.61		_
Energy content of	f hot water	used - cal	culated m	onthly = $4$ .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	1043.06	(44)
(45)m= 141.79	124.01	127.97	111.57	107.05	92.38	85.6	98.23	99.4	115.84	126.45	137.32		
. ,	1	1							L Total = Su	L m(45) <sub>112</sub> =	=	1367.62	(45)
If instantaneous w	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	to (61)					
(46)m= 21.27	18.6	19.2	16.74	16.06	13.86	12.84	14.73	14.91	17.38	18.97	20.6		(46)
Water storage Storage volum		) includir	ng anv se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` .					_					<u> </u>		(,
Otherwise if no	•			-			, ,	ers) ente	er '0' in (	47)			
Water storage				!	(1-\ \ / /	- /-1							(10)
a) If manufact				or is kno	wn (Kvvr	n/day):					0		(48)
Temperature f Energy lost fro				oor			(48) x (49)	١ _			0		(49)
b) If manufact		•			or is not		(40) X (40)	, –		1	10		(50)
Hot water stor	•			e 2 (kW	h/litre/da	ay)				0.	02		(51)
If community had Volume factor	•		on 4.3										(50)
Temperature f			2b							-	.6		(52) (53)
Energy lost fro				ear			(47) x (51)	) x (52) x (	53) =		03		(54)
Enter (50) or		_	, ,						,		.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 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 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	3							0		(58)
Primary circuit	,	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by			ı —	ı —			<del></del>	<u> </u>		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)

0 1 - 1		<b>(</b>		(04)	(00)	05 (44)	<b>.</b>						
Combi loss				,	<u> </u>	· ` `	<del></del>	Ι ,	Ι ,	Ι ,	Ι ,	1	(61)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	(50)	(61)
	<del></del>						<del>`</del>		<del>`                                    </del>	<del>ì ´                                     </del>	<del>`</del>	(59)m + (61)m 1	(00)
(62)m= 197.0		183.25	165.06	162.33	145.87	140.88	153.51	152.9	171.12	179.95	192.6	J	(62)
Solar DHW inp									r contribut	ion to wate	er heating)		
(add addition					applies 0	, see Ap	<del></del>	(S)	0	0	Ι ο	1	(63)
(63)m= 0	0	0	0	0	U	0	0	0		0	0	J	(03)
Output from (64)m= 197.0		ter 183.25	165.06	162.33	145.87	140.88	153.51	152.9	171.12	179.95	192.6	1	
(64)m= 197.0	173.94	103.23	100.00	102.33	143.07	140.00		put from w		<u> </u>	L	2018.46	(64)
Llast asias f		h a a ti a a	14\	4h 0 01	- ′ [0 0=	(45)							](04)
Heat gains f		neating, 86.77	79.89	79.82		72.68	76.88	75.85	82.74		1	. J 1	(65)
` '	ļ				73.51	ļ				84.84	89.88	]	(03)
· ·	7)m in cal			•	yıınaer ı	s in the o	aweiling	or not w	ater is ti	rom com	imunity r	ieating	
5. Internal				):									
Metabolic ga			_			<del></del>			<u> </u>	<u> </u>		1	
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ļ	(66)
(66)m= 110.9		110.99	110.99	110.99	110.99	110.99	110.99	110.99	110.99	110.99	110.99	J	(66)
Lighting gair	<u> </u>					<del></del>		1	1 4 40	1 400	1,000	1	(67)
(67)m= 17.53	_!	12.66	9.59	7.17	6.05	6.54	8.5	11.41	14.48	16.9	18.02	J	(67)
Appliances (	<del>-                                    </del>			·		1	<del></del>	1	ı		1	1	(00)
(68)m= 194.7	_	191.71	180.87	167.18	154.32	145.72	143.7	148.8	159.64	173.33	186.19	J	(68)
Cooking gai	<del>_`</del>	<del>         i</del>										1	
(69)m= 34.1		34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	J	(69)
Pumps and	<del></del>	r <del>`</del>				<del></del>			1		1	1	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(70)
Losses e.g.	evaporation	n (negat	ive valu	<u> </u>						T		1	
(71)m= -88.7	9 -88.79	-88.79	-88.79	-88.79	-88.79	-88.79	-88.79	-88.79	-88.79	-88.79	-88.79	J	(71)
Water heating	<del>~~</del>	<del> </del>						_			1	1	
(72)m= 122.8	120.8	116.63	110.96	107.28	102.1	97.69	103.34	105.34	111.21	117.83	120.81	J	(72)
Total intern	_ <del>.</del>							+ (69)m +	· · · · · · · · · · · · · · · · · · ·			1	
(73)m= 391.4		377.3	357.72	337.93	318.76	306.25	311.83	321.84	341.63	364.36	381.32		(73)
6. Solar ga				<b>-</b>									
Solar gains ar		•				•	itions to c		ie applicat		tion.	Oning	
Orientation:	Table 6d		Area m²		Flu Tal	ıx ble 6a		g_ Fable 6b	Т	FF able 6c		Gains (W)	
East 0.9				20			, —				_	` '	1(76)
		X	8.9		<b>—</b>	19.64	X	0.5		0.7	=	42.68	(76)
		X	2.2		_	19.64		0.5		0.7	=	10.77	[(76)
_		X	2.2			19.64	X	0.5	x	0.7	=	10.77	](76) ] <sub>(70)</sub>
East 0.9		X	8.9		-	38.42	X	0.5	X	0.7	=	83.5	[(76)
East 0.9	<b>X</b> 1	X	2.2	26	X 3	38.42	X	0.5	X	0.7	=	21.06	(76)

Foot	٦. ٦					7			1 .			<b>-</b>	_	<del></del>		(70)
East East	0.9x	1		X	2.26	] х П	<b>—</b>	88.42	] X ]		0.5	_ X □	0.7	=	21.06	(76)
	0.9x	1	_	X	8.96	」× ¬		3.27	] X ]		0.5	_ ×	0.7	=	137.51	(76)
East East	0.9x	1		X	2.26	」× ¬		33.27	J X 1		0.5	_ ×	0.7	╡ -	34.68	(76)
	0.9x	1		X	2.26	」× ¬		33.27	J X 1		0.5	X	0.7	=	34.68	(76)
East	0.9x	1		X	8.96	」 × ¬		92.28	] X		0.5	X	0.7	=	200.55	(76)
East	0.9x	1		X	2.26	_ x		2.28	X		0.5	×	0.7	_ =	50.58	(76)
East	0.9x	1		X	2.26	_ ×	9	2.28	X		0.5	×	0.7	_ =	50.58	(76)
East	0.9x	1		X	8.96	X	1	13.09	X		0.5	X	0.7	=	245.78	(76)
East	0.9x	1	_	X	2.26	_ ×	1	13.09	X		0.5	×	0.7	_ =	61.99	(76)
East	0.9x	1		X	2.26	_ ×	1	13.09	X		0.5	X	0.7	_ =	61.99	(76)
East	0.9x	1		X	8.96	X	1	15.77	X		0.5	X	0.7	=	251.6	(76)
East	0.9x	1		X	2.26	X	1	15.77	X		0.5	X	0.7	=	63.46	(76)
East	0.9x	1		X	2.26	×	1	15.77	X		0.5	X	0.7	=	63.46	(76)
East	0.9x	1		X	8.96	X	1	10.22	X		0.5	X	0.7	=	239.53	(76)
East	0.9x	1		X	2.26	×	1	10.22	X		0.5	x	0.7	=	60.42	(76)
East	0.9x	1		X	2.26	x	1	10.22	X		0.5	x	0.7	=	60.42	(76)
East	0.9x	1		X	8.96	×	9	94.68	X		0.5	x	0.7	=	205.75	(76)
East	0.9x	1		X	2.26	×	9	94.68	X		0.5	x	0.7	=	51.9	(76)
East	0.9x	1		x	2.26	x	9	94.68	X		0.5	x	0.7	=	51.9	(76)
East	0.9x	1		x	8.96	×	7	'3.59	X		0.5	x	0.7	=	159.93	(76)
East	0.9x	1		x	2.26	×	7	'3.59	X		0.5	x	0.7	=	40.34	(76)
East	0.9x	1		x	2.26	Ī×	7	'3.59	X		0.5	×	0.7	_ =	40.34	(76)
East	0.9x	1		x	8.96	Ī×		5.59	X		0.5	×	0.7	_ =	99.08	(76)
East	0.9x	1		x	2.26	×		5.59	X		0.5	×	0.7	<del>=</del>	24.99	(76)
East	0.9x	1		X	2.26	Ī×		5.59	X		0.5	x	0.7	<del></del> =	24.99	(76)
East	0.9x	1		X	8.96	Ī×	2	24.49	X		0.5	x	0.7		53.22	(76)
East	0.9x	1		X	2.26	Ī×	2	24.49	x		0.5	x	0.7	=	13.42	(76)
East	0.9x	1		X	2.26	Ī×	2	24.49	X		0.5	T x	0.7	=	13.42	(76)
East	0.9x	1		x	8.96	Īx	1	6.15	x		0.5	×	0.7	=	35.1	(76)
East	0.9x	1		x	2.26	Ī×	1	6.15	x		0.5	×	0.7	=	8.85	(76)
East	0.9x	1		X	2.26	Īx	1	6.15	x		0.5	X	0.7		8.85	(76)
	_					_			,							
Solar	gains in	watts, ca	alculat	ed	for each mor	nth			(83)m	n = Su	um(74)m	.(82)m				
(83)m=	64.22	125.62	206.8	8	301.72 369.7	7	378.52	360.37	309	.55	240.61	149.06	80.07	52.81		(83)
Total g	ains – ir	nternal a	and so	lar	(84)m = $(73)$ i	m +	(83)m	, watts							_	
(84)m=	455.64	515.09	584.1	8	659.43 707.6	9	697.28	666.62	621	.38	562.45	490.69	444.43	434.12		(84)
7. Me	an inter	nal temp	peratu	re (	heating seas	on)										
Temp	erature	during h	neating	g pe	eriods in the I	iving	g area	from Tal	ble 9	, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains fo	or li	ving area, h1	,m (	see Ta	ble 9a)								
	Jan	Feb	Ма	r	Apr Ma	ıy	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	0.95	0.93	0.89		0.8 0.67		0.51	0.38	0.4	12	0.63	0.84	0.93	0.96		(86)
Mean	interna	l temper	ature	in li	ving area T1	(foll	ow ste	ps 3 to 7	 7 in T	able	9c)					
(87)m=	19.28	19.52	19.92	$\overline{}$	20.39 20.73	Ť	20.92	20.97	20.		20.83	20.37	19.75	19.24	]	(87)
			•							!				•	•	

Temperature during heating periods in rest of dwelling from	om Tab	ole 9. Th	n2 (°C)										
	20.19	20.2	20.19	20.18	20.18	20.17		(88)					
Utilisation factor for gains for rest of dwelling, h2,m (see	Table 9	 9a)											
	0.32	0.36	0.58	0.82	0.92	0.95		(89)					
Mean internal temperature in the rest of dwelling T2 (follows:	ow step	os 3 to 7	in Tabl	e 9c)									
	20.18	20.17	20.02	19.42	18.54	17.8		(90)					
	•		f	LA = Livin	g area ÷ (4	1) =	0.4	(91)					
Mean internal temperature (for the whole dwelling) = fLA	× T1 +	- (1 – fL	A) × T2										
(92)m= 18.43 18.73 19.23 19.82 20.22 20.44 :	20.5	20.49	20.35	19.8	19.03	18.38		(92)					
Apply adjustment to the mean internal temperature from	Table 4	4e, whe	re appro	priate									
	20.5	20.49	20.35	19.8	19.03	18.38		(93)					
8. Space heating requirement				. —									
Set Ti to the mean internal temperature obtained at step the utilisation factor for gains using Table 9a	11 of T	able 9b	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate						
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
Utilisation factor for gains, hm:	<u> </u>		· ·										
(94)m= 0.93 0.9 0.85 0.76 0.63 0.47	0.34	0.38	0.59	0.8	0.9	0.94		(94)					
Useful gains, hmGm , W = (94)m x (84)m													
` '	227.91	236.36	332.57	394.27	401.19	407.07		(95)					
Monthly average external temperature from Table 8								(00)					
` '	16.6	16.4	14.1	10.6	7.1	4.2		(96)					
Heat loss rate for mean internal temperature, Lm , W =[(3)] (97)m=   880.95   860.03   789.14   666.62   518.82   350.07   2	<del></del>	244.49	376.74	J 560.31	730.73	873.7		(97)					
Space heating requirement for each month, kWh/month :						0.0		(- )					
(98)m= 340.02 264.98 216.3 119.31 54.73 0	0	0	0	123.53	237.27	347.17							
		Total	per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1703.32	(98)					
Space heating requirement in kWh/m²/year						Ï	24.71	(99)					
9b. Energy requirements – Community heating scheme						L							
This part is used for space heating, space cooling or water		• .	-		unity sch	neme.		7					
Fraction of space heat from secondary/supplementary hea	ating (T	Table 11	I) '0' if no	one			0	(301)					
Fraction of space heat from community system 1 – (301) =	=						1	(302)					
The community scheme may obtain heat from several sources. The procincludes boilers, heat pumps, geothermal and waste heat from power sta				ıp to four d	other heat	sources; th	ne latter						
Fraction of heat from Community heat pump							0.5	(303a)					
Fraction of community heat from heat source 2							0.5	(303b)					
Fraction of total space heat from Community heat pump				(3)	02) x (303	a) =	0.5	(304a)					
Fraction of total space heat from community heat source 2	2			(3)	02) x (303)	b) =	0.5	(304b)					
Factor for control and charging method (Table 4c(3)) for c	commur	nity hea	ting syst	tem			1	(305)					
Distribution loss factor (Table 12c) for community heating	system	n				Ī	1.05	(306)					
Space heating						•	kWh/year	_					
Annual space heating requirement							1703.32						

Space heat from Community heat pump		(98) x (304a) x	(305) x (306) =	894.24	(307a)
Space heat from heat source 2		(98) x (304b) x	(305) x (306) =	894.24	(307b)
Efficiency of secondary/supplementary heating sy	stem in % (from Table	4a or Appen	ndix E)	0	(308
Space heating requirement from secondary/suppl	lementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating					
Annual water heating requirement				2018.46	
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x	(305) x (306) =	1059.69	(310a)
Water heat from heat source 2		(64) x (303b) x	(305) x (306) =	1059.69	(310b)
Electricity used for heat distribution	0.01	× [(307a)(307	'e) + (310a)(310e)] =	39.08	(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 (Tal mechanical ventilation - balanced, extract or posi-	,			225.16	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =	225.16	(331)
Energy for lighting (calculated in Appendix L)				309.61	(332)
Electricity generated by PVs (Appendix M) (negative	tive quantity)			-420.73	(333)
Electricity generated by wind turbine (Appendix M	1) (negative quantity)			0	(334)
12b. CO2 Emissions – Community heating schen	ne				
	Ene kWl	ergy n/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	r
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	ing (not CHP) there is CHP using two fuels	repeat (363) to	(366) for the second fue	el 425	(367a)
Efficiency of heat source 2 (%)	there is CHP using two fuels	repeat (363) to	(366) for the second fue	el 91	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x 1	00 ÷ (367b) x	0.52	= 238.61	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x 1	00 ÷ (367b) x		= 463.79	(368)
Electrical energy for heat distribution	[(313) x			= 20.28	(372)
Total CO2 associated with community systems	(363)(36	66) + (368)(372		= 722.68	(373)
CO2 associated with space heating (secondary)	(309) x		0 :	= 0	(374)
CO2 associated with water from immersion heate	er or instantaneous hea	ter (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heati	ng (373) + (37	74) + (375) =		722.68	(376)
CO2 associated with electricity for pumps and far	ns within dwelling (331)	)) x	0.52	116.86	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	= 160.69	(379)
Energy saving/generation technologies (333) to (3	334) as applicable				(200)
Item 1			0.52 X 0.01 =	-218.36	(380)

Total CO2, kg/year sum of (376)...(382) = Dwelling CO2 Emission Rate  $(383) \div (4) =$  El rating (section 14)

781.87	(383)
11.34	(384)
90.8	(385)

			Llear F	Details:						
<b>A N</b> 1			USELL					OTDO		
Assessor Name:	Joseph Tre			Strom					032062	
Software Name:	Stroma FS	AP 2012	5 (	Softwa		rsion:		versic	n: 1.0.4.14	
			Property		: A4					
Address :		ardens, Londo	n, NW6 11	⊣G						
1. Overall dwelling dime	ensions:		_							
One word floor				a(m²)	l., ,		eight(m)	٦,,	Volume(m <sup>3</sup>	<u>-</u>
Ground floor				93.61	(1a) x	2	2.55	(2a) =	238.71	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(	(1d)+(1e)+(	(1n)	93.61	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	238.71	(5)
2. Ventilation rate:										
	main heating	second heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [	0	= [	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	<b>=</b>   +	0		0	x	20 =	0	(6b)
Number of intermittent fa	ans					0	x	10 =	0	(7a)
Number of passive vents	<b>.</b>					0	x	10 =	0	(7b)
·					Ļ		<del>_</del>	40 =		=
Number of flueless gas f	iies				L	0	^	40 -	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fa	ans = (6a)+(6b)	+(7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	•				L continue fr			( )		``
Number of storeys in t	he dwelling (ns	s)							0	(9)
Additional infiltration							[(9]	)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber frame	or 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are p deducting areas of openi			to the grea	ter wall are	ea (after			'		
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dr	aught stripped	l						0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic met	res per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	+(8), otherw	rise (18) = (	(16)				0.15	(18)
Air permeability value applie	es if a pressurisation	on test has been o	done or a de	gree air pe	rmeability	is being u	ised			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x ( <sup>*</sup>	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified	<del> </del>	<del>'</del>		1		•	1	1	1	
Jan Feb	Mar Apr	May Jur	) Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tabl	e 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 <i>÷ 4</i>									
(00)	100 T 1	1.00	0.05	1 0 00	Γ.	1.00	1 446	1 4 4 6	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

djusted infiltration rate (allowing for shelt	.14 0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effective air change rate for the		1	0.12	0.10	0.11	0.11			
If mechanical ventilation:							[	0.5	(2
If exhaust air heat pump using Appendix N, (23b)	` , , , ,	. `	,, .	`	) = (23a)		[	0.5	(2
If balanced with heat recovery: efficiency in % allo	_						L	68.85	(2
a) If balanced mechanical ventilation wit		<del>- ` ` </del>	<del>- ^ ` </del>	<del>í `</del>	<del>– `</del>	<del></del>	<del>- `                                   </del>	÷ 100]	,
	.29 0.28	0.28	0.27	0.28	0.29	0.3	0.31		(2
b) If balanced mechanical ventilation wit		, · · · ·	1	<u> </u>	· ·	· ·			,,
(4b)m= 0 0 0 0	0 0	0	0	0	0	0	0		(2
c) If whole house extract ventilation or p if $(22b)m < 0.5 \times (23b)$ , then $(24c) =$	•				5 × (23b	)			
4c)m= 0 0 0 0	0 0	0	0	0	0	0	0		(
d) If natural ventilation or whole house p if $(22b)m = 1$ , then $(24d)m = (22b)m$	•				0.5]				
4d)m= 0 0 0 0	0 0	0	0	0	0	0	0		(
Effective air change rate - enter (24a) or	(24b) or (24	c) or (24	d) in box	(25)					
5)m= 0.32 0.32 0.31 0.3 0	.29 0.28	0.28	0.27	0.28	0.29	0.3	0.31		(2
3. Heat losses and heat loss parameter:									
LEMENT Gross Openings area (m²) m²	Net Aı A ,ı		U-valı W/m2		A X U (W/l	K)	k-value kJ/m².k		X k J/K
indows Type 1	4.72	x1	/[1/( 1.2 )+	0.04] =	5.4	$\dot{\Box}$			(
indows Type 2	2.29	x1	/[1/( 1.2 )+	0.04] =	2.62	一			(
indows Type 3	4.5	x1	/[1/( 1.2 )+	0.04] =	5.15	=			(
/indows Type 4	2.26	x1	/[1/( 1.2 )+	0.04] =	2.59	=			(
oor	21.6	7 X	0.13	i	2.8171	<b>=</b> [		<b>1</b>	
/alls Type1 87.82 23.07	64.7	5 X	0.18	<b>=</b>	11.66	F i		i	
/alls Type2 23.15 0	23.1	5 X	0.23	<b>=</b>	5.26	F i		i	
otal area of elements, m²	132.6	=							
arty wall	5.94	=	0		0	<b>—</b> [		<b>-</b>	
for windows and roof windows, use effective window				 /[(1/U-valu		⊥ L as given in	paragraph		`
include the areas on both sides of internal walls ar	nd partitions						_		
abric heat loss, W/K = S (A x U)			(26)(30)	+ (32) =			[	46.15	
eat capacity Cm = S(A x k)				((28).	(30) + (32	2) + (32a).	(32e) =	7166.55	
nermal mass parameter (TMP = Cm ÷ TF	•				tive Value		[	100	
r design assessments where the details of the con n be used instead of a detailed calculation.	struction are no	t known pi	recisely the	indicative	e values of	TMP in T	able 1f		
nermal bridges : S (L x Y) calculated usir	ng Appendix	K					ſ	14.04	
details of thermal bridging are not known (36) = 0.1	•						L		
otal fabric heat loss				(33) +	(36) =			60.19	(
entilation heat loss calculated monthly	·			(38)m	= 0.33 × (	25)m x (5	)		
Jan Feb Mar Apr I	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	3.07 21.81	21.81	21.56	22.31	23.07	23.57	24.07		(
3)m= 25.07 24.82 24.57 23.32 23	I					•			
B)m= 25.07 24.82 24.57 23.32 23 eat transfer coefficient, W/K				(39)m	= (37) + (3	38)m			

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.91	0.91	0.91	0.89	0.89	0.88	0.88	0.87	0.88	0.89	0.89	0.9		
				ı					Average =	Sum(40) <sub>1</sub> .	12 /12=	0.89	(40)
Number of day	<u> </u>	nth (Tab	le 1a)			·	ı			i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		67		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o		7.66		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea			ctor from	Table 1c x		<u>'</u>	ļ.	!			
(44)m= 107.43	103.52	99.61	95.71	91.8	87.89	87.89	91.8	95.71	99.61	103.52	107.43		
									Total = Su	m(44) <sub>112</sub> =		1171.91	(44)
Energy content of	f hot water	used - cal	culated mo	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= 159.31	139.33	143.78	125.35	120.28	103.79	96.18	110.36	111.68	130.15	142.07	154.28		
If instantaneous u	vatar baati	na at naint	of upo (no	hat water	, ataragal	antar O in	haves (46		Total = Su	m(45) <sub>112</sub> =	-	1536.56	(45)
If instantaneous v			,	ı	, , , , , , , , , , , , , , , , , , ,	·	` '			1	i I		(40)
(46)m= 23.9 Water storage	20.9 loss:	21.57	18.8	18.04	15.57	14.43	16.55	16.75	19.52	21.31	23.14		(46)
Storage volum		) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` .					_							` '
Otherwise if no	•			_			' '	ers) ente	er '0' in (	47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•					(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stor</li></ul>			-							0	02		(51)
If community h	•			(	.,, o, ac	•97				0.	02		(01)
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m wate	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (	55)								1.	03		(55)
Water storage	loss cal	culated t	or each	month			((56)m = (	55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder 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	хН	
(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	nual) fro	m Table	e 3							0		(58)
Primary circuit	,	,			59)m = (	(58) ÷ 36	65 × (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)

				(0.4)	(00)	o= (44)							
Combi loss o	1					<del>- ` ` `</del>		Ι.				1	(04)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(61)
	<del>-</del>						<del>`</del>		<del>ì '</del>	<del>`                                    </del>	<del>`</del>	· (59)m + (61)m	
(62)m= 214.5		199.06	178.84	175.55	157.28	151.45	165.64	165.18	185.43	195.57	209.56	J	(62)
Solar DHW inpu									r contribut	ion to wate	er heating)		
(add addition	1					<del> </del>	<del></del>	<del> </del>				1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from	water hea	ter										-	
(64)m= 214.5	9 189.26	199.06	178.84	175.55	157.28	151.45	165.64	165.18	185.43	195.57	209.56		7
							Out	put from w	ater heate	r (annual)₁	12	2187.4	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	<u>.</u> ]	
(65)m= 97.19	86.27	92.03	84.47	84.21	77.3	76.2	80.92	79.93	87.5	90.03	95.52	]	(65)
include (5	7)m in cald	culation c	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	om com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):									
Metabolic ga	ains (Table	5). Watt	S										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m= 133.6	6 133.6	133.6	133.6	133.6	133.6	133.6	133.6	133.6	133.6	133.6	133.6	1	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				1	
(67)m= 21.89	9 19.44	15.81	11.97	8.95	7.56	8.16	10.61	14.24	18.08	21.11	22.5	1	(67)
Appliances of	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	see Ta	ble 5	!	ļ.	•	
(68)m= 245.5	<u> </u>	241.69	228.02	210.76	194.55	183.71	181.16	187.58	201.25	218.51	234.73	]	(68)
Cooking gair	ns (calcula	ıted in Ar	pendix	L. eguat	ion L15	or L15a	), also s	ee Table	5			,	
(69)m= 36.36	<del>_`</del>	36.36	36.36	36.36	36.36	36.36	36.36	36.36	36.36	36.36	36.36	1	(69)
Pumps and f	 fans gains	(Table 5	(a)			1	I	!	<u> </u>	<u> </u>	l	1	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(70)
Losses e.g.	I evanoratio	n (negat	ive valu	L es) (Tah	le 5)	<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>	1	
	8 -106.88	-106.88	-106.88	-106.88	-106.88	-106.88	-106.88	-106.88	-106.88	-106.88	-106.88	1	(71)
Water heating						1		1 .00.00	1.00.00	1 .00.00	100.00	1	` '
(72)m= 130.6	<del></del>	123.69	117.32	113.19	107.37	102.42	108.76	111.01	117.6	125.05	128.39	1	(72)
` '	_!		117.52	113.13		l	<u> </u>	+ (69)m +	l	l		]	(12)
<b>Total intern</b> (73)m= 461.1	<del>_</del>	444.28	420.4	395.98	372.55				400.02	427.75	448.7	1	(73)
` '		444.26	420.4	393.96	372.55	357.37	363.61	375.92	400.02	427.75	446.7	J	(13)
6. Solar gains ar		usina salar	flux from	Table 6a :	and assoc	riated equa	itions to c	onvert to th	ne annlicat	ole orientat	ion		
Orientation:		•	Area		Flu	•	110110 10 0	g_	о арриоак	FF		Gains	
Officiation.	Table 6d		m <sup>2</sup>			ble 6a	-	9_ Fable 6b	Т	able 6c		(W)	
East 0.9	x 1	x	4.	5	x ·	19.64	] x [	0.5	<b>Т</b> х Г	0.7		21.44	(76)
East 0.9					_		¦		<b>≓</b>		=		](76)
East 0.9		×	2.2			19.64		0.5		0.7	_ =	10.77	1
		X	4.5			38.42		0.5	×	0.7	_ =	41.94	](76) ] <sub>(76)</sub>
		X	2.2		-	38.42	X	0.5	x	0.7	=	21.06	(76)
East 0.9	x 1	X	4.	5	x (	53.27	X	0.5	X	0.7	=	69.06	(76)

			_		_								_
East	0.9x	1	X	2.26	X	63.27	X	0.5	X	0.7	=	34.68	(76)
East	0.9x	1	X	4.5	X	92.28	х	0.5	X	0.7	=	100.72	(76)
East	0.9x	1	X	2.26	X	92.28	X	0.5	X	0.7	=	50.58	(76)
East	0.9x	1	X	4.5	X	113.09	х	0.5	X	0.7	=	123.44	(76)
East	0.9x	1	X	2.26	X	113.09	x	0.5	X	0.7	=	61.99	(76)
East	0.9x	1	X	4.5	X	115.77	X	0.5	X	0.7	=	126.36	(76)
East	0.9x	1	X	2.26	X	115.77	x	0.5	X	0.7	=	63.46	(76)
East	0.9x	1	X	4.5	X	110.22	X	0.5	X	0.7	=	120.3	(76)
East	0.9x	1	X	2.26	X	110.22	X	0.5	X	0.7	=	60.42	(76)
East	0.9x	1	X	4.5	X	94.68	x	0.5	X	0.7	=	103.34	(76)
East	0.9x	1	X	2.26	X	94.68	X	0.5	X	0.7	=	51.9	(76)
East	0.9x	1	X	4.5	X	73.59	X	0.5	X	0.7	=	80.32	(76)
East	0.9x	1	X	2.26	X	73.59	x	0.5	x	0.7	=	40.34	(76)
East	0.9x	1	X	4.5	X	45.59	x	0.5	x	0.7	=	49.76	(76)
East	0.9x	1	X	2.26	X	45.59	X	0.5	X	0.7	=	24.99	(76)
East	0.9x	1	X	4.5	x	24.49	x	0.5	X	0.7	=	26.73	(76)
East	0.9x	1	X	2.26	X	24.49	X	0.5	X	0.7	=	13.42	(76)
East	0.9x	1	X	4.5	X	16.15	X	0.5	X	0.7	=	17.63	(76)
East	0.9x	1	X	2.26	X	16.15	X	0.5	X	0.7	=	8.85	(76)
West	0.9x	0.77	X	4.72	X	19.64	X	0.5	X	0.7	=	44.97	(80)
West	0.9x	0.77	X	2.29	X	19.64	x	0.5	X	0.7	=	32.73	(80)
West	0.9x	0.77	X	4.72	x	38.42	x	0.5	X	0.7	=	87.97	(80)
West	0.9x	0.77	X	2.29	X	38.42	X	0.5	X	0.7	=	64.02	(80)
West	0.9x	0.77	X	4.72	X	63.27	x	0.5	X	0.7	=	144.87	(80)
West	0.9x	0.77	X	2.29	X	63.27	X	0.5	X	0.7	=	105.43	(80)
West	0.9x	0.77	X	4.72	X	92.28	X	0.5	X	0.7	=	211.29	(80)
West	0.9x	0.77	X	2.29	X	92.28	X	0.5	X	0.7	=	153.77	(80)
West	0.9x	0.77	X	4.72	x	113.09	x	0.5	X	0.7	=	258.95	(80)
West	0.9x	0.77	X	2.29	X	113.09	x	0.5	X	0.7	=	188.45	(80)
West	0.9x	0.77	X	4.72	x	115.77	x	0.5	X	0.7	=	265.08	(80)
West	0.9x	0.77	X	2.29	X	115.77	X	0.5	X	0.7	=	192.91	(80)
West	0.9x	0.77	X	4.72	X	110.22	X	0.5	X	0.7	=	252.36	(80)
West	0.9x	0.77	X	2.29	X	110.22	X	0.5	X	0.7	=	183.66	(80)
West	0.9x	0.77	X	4.72	X	94.68	x	0.5	X	0.7	=	216.78	(80)
West	0.9x	0.77	X	2.29	X	94.68	X	0.5	X	0.7	] =	157.76	(80)
West	0.9x	0.77	×	4.72	x	73.59	x	0.5	x	0.7	=	168.5	(80)
West	0.9x	0.77	x	2.29	×	73.59	x	0.5	x	0.7	] =	122.62	(80)
West	0.9x	0.77	x	4.72	x	45.59	x	0.5	x	0.7	] =	104.38	(80)
West	0.9x	0.77	x	2.29	x	45.59	x	0.5	x	0.7	=	75.97	(80)
West	0.9x	0.77	x	4.72	x	24.49	x	0.5	x	0.7	=	56.07	(80)
West	0.9x	0.77	x	2.29	x	24.49	x	0.5	x	0.7	=	40.81	(80)

West	0.9x	0.77	x	4.7	72	x	1	6.15	x		0.5	x [	0.7		36.98	(80)
West	0.9x	0.77	x	2.2	29	X	1	6.15	x		0.5	x	0.7		26.91	(80)
	_											_				<b>'</b>
Solar	gains in	watts, ca	alculated	I for eac	h month				(83)m	= St	um(74)m .	(82)m				
(83)m=	109.9	214.99	354.05	516.37	632.82	_	47.81	616.74	529.	77	411.78	255.1	137.03	90.38	7	(83)
Total g	ains – i	nternal a	and solar	(84)m =	= (73)m ·	+ (	83)m ,	watts	!				_ <b>!</b>		_	
(84)m=	571.07	674	798.33	936.76	1028.81	10	020.36	974.11	893.	38	787.7	655.12	564.78	539.07	7	(84)
7. Me	an inter	nal temp	perature	(heating	season	)										
			neating p				area f	rom Tab	ole 9,	Th	1 (°C)				21	(85)
_		_	ains for I			_					, ,					
	Jan	Feb	Mar	Apr	May	T	Jun	Jul	Αι	Ja T	Sep	Oct	Nov	Dec	:	
(86)m=	0.96	0.94	0.89	0.78	0.64		0.48	0.36	0.4	Ť	0.62	0.85	0.94	0.97	╡	(86)
				P. P	T4 ((			0			- 0 - )			<u>!</u>	_	
		<del></del>	ature in		· `	_	i		r —		9C) 20.84	20.25	10.00	1040	7	(87)
(87)m=	19.18	19.47	19.91	20.42	20.76		20.93	20.98	20.9	97	20.84	20.35	19.68	19.13		(67)
Temp	erature	during h	neating p	eriods ir	rest of	dw	/elling	from Ta	ble 9	), Th	n2 (°C)		_		_	
(88)m=	20.16	20.16	20.16	20.17	20.18	2	20.19	20.19	20.1	19	20.18	20.18	20.17	20.17		(88)
Utilisa	ation fac	tor for g	ains for i	rest of d	welling,	h2.	,m (se	e Table	9a)							
(89)m=	0.96	0.93	0.87	0.76	0.6	$\overline{}$	0.43	0.3	0.3	4	0.57	0.82	0.93	0.96		(89)
Moon	intorno	l tompor	oturo in i	the rest	of dwall	ina	T2 /fc	ollow etc	no 2	+o 7	7 in Tabl	0.00	1	!	_	
(90)m=	17.7	18.11	ature in	19.46	19.91	Ť	20.12	20.17	20.	$\neg$	20.02	19.38	18.43	17.64	7	(90)
(90)111=	17.7	10.11	10.75	13.40	19.91	<u>_</u>	20.12	20.17	20.	<u>''                                   </u>			ing area ÷ (		0.32	(91)
												L/ ( - L/V	ing area . (	, -	0.32	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llin	g) = fL	_A × T1	+ (1 -	– fL	A) × T2				_	
(92)m=	18.17	18.55	19.12	19.77	20.18	2	20.38	20.43	20.4	12	20.28	19.69	18.83	18.12		(92)
Apply	adjustn	nent to t	he mean	interna	temper	atu	ıre fro	m Table	4e, \	whe	re appro	priate			_	
(93)m=	18.17	18.55	19.12	19.77	20.18	2	20.38	20.43	20.4	12	20.28	19.69	18.83	18.12		(93)
8. Sp	ace hea	ting requ	uirement													
						ned	l at ste	ep 11 of	Table	e 9b	o, so tha	t Ti,m=	(76)m an	d re-ca	lculate	
the ut			or gains			_	. 1		_	_		_	1		¬	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
		<u>_</u>	ains, hm										1		¬	(0.4)
(94)m=	0.94	0.91	0.85	0.74	0.6	Ľ	0.44	0.32	0.3	6	0.58	0.81	0.91	0.95		(94)
			, W = (94	<u> </u>	r e	Ι.	1						T	l	_	(05)
(95)m=	536.81	612.96	678.61	695.54	617.43		49.52	307.71	319.	52	453.74	528.42	515.71	510.79	)	(95)
			rnal tem		r	_	T						<del> </del>		¬	(20)
(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)
			an intern	<u>.</u>		_		- ,	<del></del>	<del>'</del>	<u> </u>		T	1		(07)
(97)m=	1182.92	1160	1069.8	907.36	705.75	<u> </u>	73.84	314.04	328.		509.81	757	982.19	1172.4	5	(97)
•		ř	ement fo		i	Wh			r – -	Ì		<del>- `</del>	1	1	_	
(98)m=	480.7	367.61	291.04	152.51	65.71		0	0	0		0	170.06		492.27	_	
										Total	per year	(kWh/ye	ar) = Sum(9	8)15,912	= 2355.77	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year										25.17	(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 community system 1 – (301) =					_
The community scheme may obtain heat from serveral sources. The procedure allows for CHP and up to four other heat sources; the latter includes botiers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of notal from Community heat pump  Fraction of total space heat from Community heat pump  Fraction of total space heat from community heat pump  Fraction of total space heat from community heat pump  Fraction of total space heat from community heat source 2  Fractor for control and charging method (Table 4c(3)) for community heating system  In 1 (345)  Space heating  Annual space heating requirement  Space heating requirement  Space heat from Community heat pump  (38) x (304s) x (305) x (306) =  WWhylyear  Space heat from Community heating system in % (from Table 4a or Appendix E)  Friction of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (39) x (301s) x (305) x (306) =  In 1236.76  (307)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Deam source 2  (46) x (303s) x (305) x (306) =  In 148.39  (310)  Water heat from heat source 2  (46) x (303s) x (305) x (306) =  In 148.39  (310)  Water heat from heat source 2  (46) x (303s) x (305) x (306) =  In 148.39  (310)  Water heat from heat source 2  (46) x (303s) x (305) x (306) =  In 148.39  (310)  Water heat from heat source 2  (46) x (303s) x (305) x (306) =  In 148.39  (310)  Water heat from heat source 2  (47) x (313)  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 generated by PVs (Appendix M) (negative quantity)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by PVs (Appendix M) (nega	Fraction of space heat from secondary/supplementary heating (Tab	ole 11) '0' if none		0	(301)
Includes boliers, heat pumps, genthemal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump   (302) x (303a) =   0.5 (303a)	Fraction of space heat from community system 1 – (301) =			1	(302)
Fraction of heat from Community heat pump Fraction of community heat from heat source 2 Fraction of total space heat from Community heat pump Fraction of total space heat from Community heat source 2 Fractor for control and charging method (Table 4c(3)) for community heating system    1		•	four other heat sources;	the latter	
Fraction of total space heat from Community heat pump (302 × (303a) = 0.5 (304 Fraction of total space heat from community heat source 2 (302 × (303b) = 0.5 (304 Fraction of total space heat from community heat source 2 (302 × (303b) = 0.5 (304 Fraction of total space heat from community heating system		77		0.5	(303a)
Fraction of total space heat from community heat source 2 (302) x (303b) =	Fraction of community heat from heat source 2			0.5	(303b)
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 heat pump  (98) x (304a) x (305) x (306) = 1236.78 (307.8)  Space heat from heat source 2  (98) x (304b) x (305) x (306) = 1236.78 (307.8)  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 x (308) = 0 (308.8)  Water heating  Annual water heating requirement from secondary/supplementary system (98) x (301) x 100 x (308) = 0 (308.8)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community scheme:  Water heat from heat source 2  (64) x (303a) x (305) x (306) = 1148.39 (310.8)  Water heat from heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 47.7 (313.8)  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315.8)  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) = 305.78 (330.8)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  Energy for lighting (calculated in Appendix M) (negative quantity)  Energy for lighting (calculated in Appendix M) (negative quantity)  Energy for lighting (calculated in Appendix M) (negative quantity)  Energy for lighting (calculated in Appendix M) (negative quantity)  Energy for lighting (calculated in Appendix M) (negative quantity)  Energy for lighting (calculated in Appendix M) (negative quantity)  Energy for lighting (calculated in Appendix	Fraction of total space heat from Community heat pump		(302) x (303a) =	0.5	(304a
Distribution loss factor (Table 12c) for community heating system   1.05   (306)	Fraction of total space heat from community heat source 2		(302) x (303b) =	0.5	(304b
Space heating	Factor for control and charging method (Table 4c(3)) for community	y heating system		1	(305)
Annual space heat from Community heat pump  (98) x (304a) x (305) x (306) = 1236.78 (307)  Space heat from heat source 2 (98) x (304b) x (305) x (306) = 1236.78 (307)  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 (308)  Water heating  Annual water heating requirement 1 (2187.4 (307) x 100 + (308) = 0 (308)  Water heating  Annual water heating requirement (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from Community scheme:  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 3 fixed cooling system, if not enter 0) = (107) + (314) = 0 (316)  Water heating system from heat source 3 fixed cooling system, if not enter 0) = (107) + (314) = 0 (316)  Water heating system from heat source 3 fixed cooling system, if not enter 0) = (107) + (314) = 0 (316)  Water heating system from heat source 3 fixed cooling system, if not enter 0) =	Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heat from Community heat pump         (98) x (304a) x (305) x (306) =         1236.78         (307)           Space heat from heat source 2         (98) x (304b) x (305) x (306) =         1236.78         (307)           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 requirement         2187.4         2187.4         1148.39         (310)           If DHW from community scheme:         Water heat from Community scheme:         Water heat from Community heat pump         (64) x (303a) x (305) x (306) =         1148.39         (310)           Water heat from heat source 2         (64) x (303a) x (305) x (306) =         1148.39         (310)           Water heat from heat distribution         0.01 x [(307a)(307e) + (310a)(310e)] =         47.7         (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         (330)           mechanical ventilati	•			kWh/year	
Space heat from heat source 2 (98) x (304b) x (306) x (306) = 1236.78 (307)  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 (308)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303a) x (305) x (306) = 1148.39 (310)  Electricity used for heat distribution 0.01 x [(307a)(307e) + (310a)(310e)] = 47.7 (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 (305.78 (330))  warm air heating system fans 0 (330)  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = (357.8 (331))  Energy for lighting (calculated in Appendix L) (333)  Electricity generated by Wind turbine (Appendix M) (negative quantity) (571.4 (333))  Electricity generated by wind turbine (Appendix M) (negative quantity) (334)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) (15 cm cm Table 10	· · · · · · · · · · · · · · · · · · ·			2355.77	╛
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 2 (2187.4)  If DHW from community scheme:  Water heat from Community heat pump (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303b) x (305) x (306) = 1148.39 (310)  Electricity used for heat distribution 0.01 x [(307a)(307e) + (310a)(310e)] = 47.7 (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 305.78 (330)  warm air heating system fans 0 (330)  pump for solar water heating 0 (330)  Total electricity for the above, kWh/year = (330a) + (330b) + (330b) + (330g) = 305.78 (331)  Energy for lighting (calculated in Appendix L) (366.62 (332)  Electricity generated by PVs (Appendix M) (negative quantity) (334)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/k		(98) x (304a) x	x (305) x (306) =	1236.78	(307a
Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community heat pump  (64) × (303a) × (305) × (306) = 1148.39 (310) Water heat from heat source 2  (64) × (303a) × (305) × (306) = 1148.39 (310) Water heat from heat source 2  (64) × (303b) × (306) × (306) = 1148.39 (310) Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 47.7 (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  0 (330) Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 305.78 (330) Energy for lighting (calculated in Appendix L) Electricity generated by PVs (Appendix M) (negative quantity) Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kwh kg CO2/kwh kg CO2/kwh kg CO2/kwh co2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425	Space heat from heat source 2	(98) x (304b) x	( (305) x (306) =	1236.78	(307b
Water heating Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) × (303a) × (305) × (306) = 1148.39 (310a)  Water heat from heat source 2  (64) × (303b) × (305) × (306) = 1148.39 (310a)  Electricity used for heat distribution  0.01 × ((307a)(307e) + (310a)(310e)] = 47.7 (313a)  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315a)  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330a)  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 305.78 (331a)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy kmission factor kg CO2/kwh kg CO2/kwh  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367a)	Efficiency of secondary/supplementary heating system in % (from	Гable 4a or Appeı	ndix E)	0	(308
Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) × (303a) × (305) × (306) = 1148.39 (310)  Water heat from heat source 2  (64) × (303b) × (305) × (306) = 1148.39 (310)  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 47.7 (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) + (330b) + (330g) = 305.78 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor kg CO2/kWh  Emissions kg CO2/kWh  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)	Space heating requirement from secondary/supplementary system	(98) x (301) x	100 ÷ (308) =	0	(309)
Water heat from Community heat pump  (64) x (303a) x (305) x (306) = 1148.39 (310)  Water heat from heat source 2 (64) x (303b) x (305) x (306) = 1148.39 (310)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 47.7 (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  warm air heating system fans  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 305.78 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel 425 (367a)	<del>_</del>			2187.4	7
Water heat from heat source 2  (64) × (303b) × (305) × (306) = 1148.39 (310)  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 47.7 (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) = 305.78 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (367a)	· · · · · · · · · · · · · · · · · · ·				 
Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 47.7 [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) = 305.78 [330]  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 [367a]	·			1148.39	╡
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) = 305.78 (332)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (367a)				1148.39	╡`
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) = 305.78 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (367)	•	0.01 × [(307a)(30	7e) + (310a)(310e)] =	47.7	=
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)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy kWh/year kg CO2/kWh kg CO2/kWh  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  (305.78  (330)  (330				0	(314)
mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330)  pump for solar water heating  Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 305.78 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (367a)		= (107) ÷ (314	) =	0	(315)
pump for solar water heating  Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 305.78 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (3676)		tside		305.78	(330a
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 305.78 (331)  Energy for lighting (calculated in Appendix L) 386.62 (332)  Electricity generated by PVs (Appendix M) (negative quantity) -571.4 (333)  Electricity generated by wind turbine (Appendix M) (negative quantity) 0 (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)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (367a)	warm air heating system fans			0	(330k
Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  425 (3676)	pump for solar water heating			0	(3300
Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367a)	Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	305.78	(331)
Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367a)	Energy for lighting (calculated in Appendix L)			386.62	(332)
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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367a)	Electricity generated by PVs (Appendix M) (negative quantity)			-571.4	(333)
Energy Emission factor Emissions kWh/year kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  425 (367a)	Electricity generated by wind turbine (Appendix M) (negative quant	ity)		0	(334)
kWh/year kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  425 (367a)	12b. CO2 Emissions – Community heating scheme				
Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)					
420 (**)		o fuels reneat (363) to	) (366) for the second fue	el 405	7/267
Ciliciency of fleat source 2 (%)	(11)				Ⅎ`
	Efficiency of fleat source 2 (%)	J 14613 164641 (303) 10	(500) for the second luc	91	(367b

CO2 associated with heat source 1	[(307b	y)+(310b)] x 100 ÷ (367b) x	0.52	=	291.27	(367)
CO2 associated with heat source 2	[(307b	y)+(310b)] x 100 ÷ (367b) x	0.22	=	566.15	(368)
Electrical energy for heat distribution		[(313) x	0.52	=	24.76	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	)	=	882.18	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			882.18	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	158.7	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	200.66	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl		0.52 x 0.01	l = [	-296.56	(380)
Total CO2, kg/year	sum of (376)(382) =				944.98	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				10.09	(384)
El rating (section 14)					90.86	(385)

			l loor P	otoile.						
A	Is a set T		User D					OTDO	2000000	
Assessor Name: Software Name:	Joseph Treanor Stroma FSAP 201	2		Strom: Softwa					0032062 on: 1.0.4.14	
Software Name:	Stioma FSAF 201			Address		Sion:		VEISIG	JII. 1.U.4.14	
Address :	, Gondar Gardens, I		· ·		<i>A</i> 3					
1. Overall dwelling dime		20114011,	11110 11							
J			Area	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor					(1a) x		2.55	(2a) =	240.8	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	)+(1n	) 9	4.43	(4)			_		_
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	240.8	(5)
2. Ventilation rate:										
		econdary eating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0	] = [	0	X ·	40 =	0	(6a)
Number of open flues	0 +	0		0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans				<b>'</b>	0	X	10 =	0	(7a)
Number of passive vents	S				F	0	X	10 =	0	(7b)
Number of flueless gas f					F	0	x	40 =	0	(7c)
realiser of fideless gas i	1100				L				0	(70)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	a)+(6b)+(7	a)+(7b)+(	7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	been carried out or is intende	ed, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber t	rame or	0.35 for	r masonr	y constr	uction			0	(11)
	present, use the value corres	ponding to	the great	er wall are	a (after					
deducting areas of openi	ings); if equal user 0.35 floor, enter 0.2 (unseal	ed) or 0	1 (coalc	nd) also	ontor ()					7(12)
•	•	eu) oi o.	i (Seale	d), eise	enter 0				0	(12)
If no draught lobby, en		rinnad							0	(13)
•	s and doors draught st	пррец		0.25 - [0.2	v (14) ± 1	001 -			0	(14)
Window infiltration				(8) + (10)			± (15) =		0	(15)
Infiltration rate	arro avanced in sub	:		, , , ,	. , ,	, , ,	` '		0	(16)
•	q50, expressed in cub		•	•	•	etre or e	envelope	area	3	(17)
If based on air permeabi	es if a pressurisation test has					io hoina u	and.		0.15	(18)
Number of sides sheltere		s been don	e or a deg	gree air pei	пеаышу	is being u	seu			(19)
Shelter factor	5 <b>u</b>			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)					0.13	(21)
Infiltration rate modified	-	I							0.10	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp	peed from Table 7	·				•			_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
		I				1	1	1	4	
Wind Factor $(22a)m = (2a)m =$	<del></del>	0.55							1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rate (a	allowii	ng for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.16	1 1 1	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
Calculate effe		•	ate for t	пе арріі	cable ca	ise						0.5	(23a)
If exhaust air h	eat pump usin	ng Appe	endix N, (2	(23a) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23b)
If balanced with	h heat recover	y: effici	ency in %	allowing t	for in-use f	actor (fron	n Table 4h	ı) =				68.85	(23c)
a) If balance	ed mechani	cal ve	ntilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(24a)
b) If balance	ed mechani	cal ve	ntilation	without	heat red	covery (N	MV) (24b	o)m = (22	2b)m + (	23b)		,	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				•					F (00k	. \			
(24c)m = 0	$n < 0.5 \times (2)$	$\frac{(30)}{0}$	nen (240 0	C) = (230)	o); otner	wise (24 0	$\frac{C) = (221)}{0}$	0) m + 0.	.5 × (23t	0	0	1	(24c)
d) If natural												J	(240)
	n = 1, then								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24d)
Effective air	change rat	te - en	ter (24a	) or (24l	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(25)
3. Heat losse	s and heat	loss p	aramet	er:									
ELEMENT	Gross area (m	l <sup>2</sup> )	Openin m		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-		A X k <j k<="" td=""></j>
Windows Type	e 1				2.26	x1	/[1/( 1.2 )+	0.04] =	2.59				(27)
Windows Type	e 2				8.96	x1.	/[1/( 1.2 )+	0.04] =	10.26				(27)
Windows Type	e 3				4.5	x1	/[1/( 1.2 )+	0.04] =	5.15				(27)
Windows Type	e 4				2.26	x1	/[1/( 1.2 )+	0.04] =	2.59				(27)
Floor					9.17	X	0.13		1.1921				(28)
Walls Type1	91.51		27		64.5	1 X	0.18	<u> </u>	11.61				(29)
Walls Type2	15.93		0		15.93	3 x	0.23	<u> </u>	3.62				(29)
Roof	17.06		0		17.06	3 x	0.13	<u> </u>	2.22				(30)
Total area of e	elements, m	12			133.6	7							(31)
Party wall					5.86	X	0	=	0				(32)
* for windows and						lated using	formula 1	1/[(1/U-valu	ie)+0.04] a	as given in	paragrapi	h 3.2	
** include the are				is and par	นเนอกร		(26)(30	) + (32) =				49.56	(33)
Heat capacity		•	0)				( -) ()	, , ,	(30) + (3)	2) + (32a).	(32e) =	5931.39	(34)
Thermal mass	•	•	) = Cm -	- TFA) ir	n kJ/m²K			., ,	itive Value	, , ,	(= = 7	100	(35)
For design asses	-						ecisely the	e indicative	e values of	TMP in Ta	able 1f		
can be used inste	ad of a detaile											Г	
The				icina Ar	nnendix l	K						15.87	(36)
Thermal bridg					-								``
Thermal bridg  if details of thermal  Total fabric he	al bridging are				-			(33) +	· (36) =				
if details of therm	al bridging are at loss	not kne	own (36) =	= 0.15 x (3	-			. ,	, ,	(25)m x (5)	)	65.42	(37)

(20) 25 20	05.04	04.70	22.52	00.07			04.75	22.54	22.27	00.77	04.00		(38)
(38)m= 25.29	25.04	24.79	23.52	23.27	22	22	21.75	22.51	23.27	23.77	24.28		(36)
Heat transfer (39)m= 90.72	90.46	90.21	88.94	88.69	87.43	87.43	87.17	(39)m 87.93	= (37) + (3 88.69	89.2	89.7		
(39)111= 30.72	30.40	90.21	00.94	00.09	07.43	07.43	07.17			Sum(39) <sub>1</sub>	1	88.88	(39)
Heat loss para	meter (l	HLP), W	m²K						= (39)m ÷				<b></b> `
(40)m= 0.96	0.96	0.96	0.94	0.94	0.93	0.93	0.92	0.93	0.94	0.94	0.95		_
Number of day	/s in mo	nth (Tab	le 1a)					/	Average =	Sum(40) <sub>1</sub>	12 /12=	0.94	(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. Water heat	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu	inancy	N									.68		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (1	ΓFA -13.		.00		(42)
if TFA £ 13.9 Annual average	•	ater usad	ae in litre	es per da	ıv Vd.av	erage =	(25 x N)	+ 36		97	7.89		(43)
Reduce the annua	al average	hot water	usage by	5% if the $a$	welling is	designed t	` ,		se target o		.00		(10)
not more that 125		· ·				<u> </u>							
Jan Hot water usage i	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 107.68	103.76	99.85	95.93	92.02	88.1	88.1	92.02	95.93	99.85	103.76	107.68		
(44)111= 107.08	103.76	99.00	95.95	92.02	00.1	00.1	92.02			m(44) <sub>112</sub> =	<del></del>	1174.67	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			· /	L		`
(45)m= 159.68	139.66	144.12	125.64	120.56	104.03	96.4	110.62	111.94	130.46	142.41	154.64		
If instantaneous w	vator hoati	na at noint	of use (no	n hot water	· storage)	enter∩in	hoves (46		Γotal = Su	m(45) <sub>112</sub> =	=	1540.17	(45)
(46)m= 23.95	20.95	21.62	18.85	18.08	15.6	14.46	16.59	16.79	19.57	21.36	23.2		(46)
Water storage		21.02	10.00	10.00	13.0	14.40	10.59	10.79	19.57	21.50	25.2		(10)
Storage volum	e (litres)	) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			_			. ,			`			
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	47)			
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		-	-				(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-								20		(E1)
If community h	•			IE Z (KVV	ii/iitie/ua	iy <i>)</i>				0.	.02		(51)
Volume factor	_									1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	0.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	.03		(54)
Enter (50) or (	. , .	•					(/==) (			1.	.03		(55)
Water storage							((56)m = (			ı			(==)
(56)m= 32.01 If cylinder contains	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 H11) is fro	32.01	, Н	(56)
		r				1							(E7\
(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 (annu	ual) from Table	3					(	0		(58)
Primary circuit loss calcu	,		(58) ÷ 365	5 × (41)ı	m					
(modified by factor from	m Table H5 if th	nere is solar wa	ter heating	g and a	cylinder	thermo	stat)			
(59)m= 23.26 21.01 2	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	r each month (6	61)m = (60) ÷ 3	65 × (41)n	n						
(61)m= 0 0	0 0	0 0	0	0	0	0	0	0		(61)
Total heat required for wa	ater heating ca	lculated for eac	ch month (6	62)m =	0.85 × (	45)m + (	(46)m +	(57)m +	(59)m + (61)m	
<del>`</del>	99.39 179.14	175.84 157.53	<del>,                                    </del>	165.9	165.44	185.74	195.9	209.92		(62)
Solar DHW input calculated usi	ing Appendix G or	Appendix H (negat	ive quantity)	(enter '0'	if no solar	· contributi	on to wate	r heating)		
(add additional lines if FG								0,		
(63)m= 0 0	0 0	0 0	0	0	0	0	0	0		(63)
Output from water heater	· · · · · · · · · · · · · · · · · · ·	!	!	1						
	99.39 179.14	175.84 157.53	151.68	165.9	165.44	185.74	195.9	209.92		
			1 1	Outp	ut from wa	ater heater	(annual) <sub>1</sub>	12	2191.01	(64)
Heat gains from water he	eating, kWh/mo	onth 0.25 ´ [0.85	5 × (45)m +	+ (61)m	1 + 0.8 x	[(46)m	+ (57)m	+ (59)m	1	-
	92.14 84.57	84.31 77.39	76.28	81	80.02	87.6	90.15	95.64	•	(65)
include (57)m in calcul	ation of (65)m	only if cylinder	is in the dv	wellina (	or hot w	ater is fr	om com	munitv h	eating	
5. Internal gains (see T	· ,	• •								
	·									
Metabolic gains (Table 5)  Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	34.08 134.08	134.08 134.08	+ +	134.08	134.08	134.08	134.08	134.08		(66)
Lighting gains (calculated						1000				,
	15.91 12.04	9 7.6	8.21	10.67	14.33	18.19	21.23	22.63		(67)
							21.20	22.00		(0.)
Appliances gains (calculation) (68)m= 247 249.56 2	243.1 229.35	211.99 195.68	<del></del>	182.22	188.68	202.43	219.78	236.1		(68)
` '							219.70	230.1		(00)
Cooking gains (calculated	<del>- i -</del>	<u>_</u>	<del> </del>				20.44	20.44		(69)
` '	36.41 36.41	36.41 36.41	36.41	36.41	36.41	36.41	36.41	36.41		(09)
Pumps and fans gains (T	<del></del>		<del></del>			•				(70)
(70)m= 0 0	0 0	0 0	0	0	0	0	0	0		(70)
Losses e.g. evaporation	<del>`                                    </del>	<del></del>								(74)
` '		-107.27 -107.27	-107.27 -	107.27	-107.27	-107.27	-107.27	-107.27		(71)
Water heating gains (Tab	<del></del>			-						
(72)m= 130.8 128.54 1	23.84 117.46	113.32 107.48	102.52	108.88	111.13	117.74	125.2	128.55		(72)
Total internal gains =		(66	s)m + (67)m +	+ (68)m +	(69)m + (	70)m + (7 <sup>-</sup>	1)m + (72)	m		
` '	46.07 422.08	397.54 373.98	358.74	364.99	377.36	401.58	429.44	450.5		(73)
6. Solar gains:										
Solar gains are calculated using				ons to co	nvert to the	e applicab		ion.		
Orientation: Access Fac Table 6d	ctor Area m²	Flo Ta	ux ıble 6a	т,	g_ able 6b	T,	FF able 6c		Gains (W)	
_				, i			ADIG UU			7
East 0.9x 2	X 2.26		19.64	X	0.5	_ x	0.7	=	21.53	(76)
East 0.9x 1	X 8.96	6 X	19.64	X	0.5	X	0.7	=	42.68	(76)

	_		,						ı		,		_
East	0.9x	2	X	2.26	X	38.42	X	0.5	X	0.7	=	42.12	(76)
East	0.9x	1	X	8.96	X	38.42	X	0.5	X	0.7	=	83.5	(76)
East	0.9x	2	X	2.26	X	63.27	X	0.5	X	0.7	=	69.37	(76)
East	0.9x	1	X	8.96	X	63.27	X	0.5	X	0.7	=	137.51	(76)
East	0.9x	2	X	2.26	x	92.28	X	0.5	X	0.7	=	101.17	(76)
East	0.9x	1	X	8.96	x	92.28	X	0.5	X	0.7	=	200.55	(76)
East	0.9x	2	X	2.26	x	113.09	X	0.5	X	0.7	=	123.99	(76)
East	0.9x	1	X	8.96	X	113.09	X	0.5	X	0.7	=	245.78	(76)
East	0.9x	2	X	2.26	x	115.77	X	0.5	X	0.7	=	126.92	(76)
East	0.9x	1	X	8.96	x	115.77	X	0.5	X	0.7	=	251.6	(76)
East	0.9x	2	X	2.26	X	110.22	X	0.5	X	0.7	=	120.84	(76)
East	0.9x	1	X	8.96	X	110.22	X	0.5	X	0.7	=	239.53	(76)
East	0.9x	2	X	2.26	x	94.68	x	0.5	x	0.7	=	103.8	(76)
East	0.9x	1	X	8.96	X	94.68	x	0.5	x	0.7	=	205.75	(76)
East	0.9x	2	X	2.26	X	73.59	x	0.5	x	0.7	=	80.68	(76)
East	0.9x	1	X	8.96	x	73.59	x	0.5	x	0.7	=	159.93	(76)
East	0.9x	2	X	2.26	X	45.59	x	0.5	x	0.7	=	49.98	(76)
East	0.9x	1	X	8.96	x	45.59	X	0.5	X	0.7	=	99.08	(76)
East	0.9x	2	X	2.26	x	24.49	x	0.5	x	0.7	=	26.85	(76)
East	0.9x	1	X	8.96	x	24.49	x	0.5	x	0.7	=	53.22	(76)
East	0.9x	2	X	2.26	x	16.15	x	0.5	x	0.7	=	17.71	(76)
East	0.9x	1	X	8.96	x	16.15	X	0.5	x	0.7	=	35.1	(76)
South	0.9x	0.54	X	4.5	x	46.75	x	0.5	x	0.7	=	71.57	(78)
South	0.9x	0.54	X	2.26	x	46.75	x	0.5	x	0.7	=	35.95	(78)
South	0.9x	0.54	X	4.5	x	76.57	x	0.5	x	0.7	=	117.22	(78)
South	0.9x	0.54	X	2.26	x	76.57	x	0.5	x	0.7	=	58.87	(78)
South	0.9x	0.54	X	4.5	x	97.53	X	0.5	X	0.7	=	149.31	(78)
South	0.9x	0.54	X	2.26	x	97.53	x	0.5	x	0.7	=	74.99	(78)
South	0.9x	0.54	X	4.5	X	110.23	X	0.5	x	0.7	=	168.76	(78)
South	0.9x	0.54	X	2.26	x	110.23	X	0.5	X	0.7	=	84.75	(78)
South	0.9x	0.54	X	4.5	x	114.87	x	0.5	x	0.7	=	175.86	(78)
South	0.9x	0.54	X	2.26	x	114.87	x	0.5	x	0.7	=	88.32	(78)
South	0.9x	0.54	X	4.5	x	110.55	x	0.5	x	0.7	] =	169.24	(78)
South	0.9x	0.54	X	2.26	x	110.55	x	0.5	x	0.7	=	84.99	(78)
South	0.9x	0.54	X	4.5	x	108.01	x	0.5	x	0.7	=	165.36	(78)
South	0.9x	0.54	X	2.26	x	108.01	x	0.5	x	0.7	=	83.05	(78)
South	0.9x	0.54	X	4.5	x	104.89	x	0.5	x	0.7	=	160.58	(78)
South	0.9x	0.54	X	2.26	x	104.89	x	0.5	x	0.7	=	80.65	(78)
South	0.9x	0.54	X	4.5	x	101.89	x	0.5	x	0.7	=	155.98	(78)
South	0.9x	0.54	X	2.26	x	101.89	x	0.5	x	0.7	=	78.33	(78)
South	0.9x	0.54	X	4.5	x	82.59	x	0.5	x	0.7	=	126.43	(78)
	_		_		-						_		_

South 0.9x 0.54 x 2.26 x 82.59	x 0.5 × 0.7 =	63.5 (78)
South 0.9x 0.54 x 4.5 x 55.42	x 0.5 x 0.7 =	84.84 (78)
South 0.9x 0.54 x 2.26 x 55.42	x 0.5 x 0.7 =	42.61 (78)
South 0.9x 0.54 x 4.5 x 40.4	x 0.5 × 0.7 =	61.85 (78)
South 0.9x 0.54 x 2.26 x 40.4	x 0.5 x 0.7 =	31.06 (78)
		_
Solar gains in watts, calculated for each month	(83)m = Sum(74)m(82)m	
(83)m= 171.73 301.71 431.18 555.23 633.94 632.75 608.77	550.78 474.92 338.98 207.51 145.71	(83)
Total gains – internal and solar $(84)$ m = $(73)$ m + $(83)$ m , watts		<b>45.</b> 13
(84)m= 634.78 762.59 877.25 977.31 1031.48 1006.74 967.51	915.77 852.28 740.57 636.96 596.22	(84)
7. Mean internal temperature (heating season)		
Temperature during heating periods in the living area from Tal	ole 9, Th1 (°C)	21 (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= 0.95 0.92 0.87 0.78 0.66 0.51 0.38	0.42 0.61 0.82 0.93 0.96	(86)
Mean internal temperature in living area T1 (follow steps 3 to	7 in Table 9c)	
(87)m= 19.16 19.47 19.9 20.37 20.71 20.9 20.97	20.96 20.83 20.36 19.68 19.1	(87)
Temperature during heating periods in rest of dwelling from Ta	able 9, Th2 (°C)	
(88)m= 20.12 20.12 20.13 20.13 20.15 20.15	20.15 20.14 20.13 20.13 20.13	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table	9a)	
(89)m= 0.95 0.91 0.86 0.76 0.62 0.45 0.31	0.35 0.56 0.8 0.92 0.95	(89)
Mean internal temperature in the rest of dwelling T2 (follow ste	ens 3 to 7 in Table 9c)	
(90)m= 17.64 18.1 18.7 19.36 19.81 20.06 20.12	20.12 19.97 19.37 18.4 17.57	(90)
	fLA = Living area ÷ (4) =	0.3 (91)
Many internal terms and two (for the cubale decalling). If A v T4	L (4 - fl A) : TO	
Mean internal temperature (for the whole dwelling) = $fLA \times T1$ (92)m= 18.1 18.51 19.06 19.66 20.08 20.31 20.38	+ (I - ILA) × IZ 20.37   20.23   19.67   18.79   18.03	(92)
Apply adjustment to the mean internal temperature from Table		(62)
(93)m= 18.1 18.51 19.06 19.66 20.08 20.31 20.38	20.37 20.23 19.67 18.79 18.03	(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of	Table 9b, so that Ti,m=(76)m and re-calc	ulate
the utilisation factor for gains using Table 9a		
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:	0.27 0.56 0.79 0.99 0.04	(94)
(94)m= 0.93 0.89 0.83 0.74 0.62 0.46 0.33	0.37   0.56   0.78   0.89   0.94	(94)
Useful gains, hmGm, $W = (94)m \times (84)m$ $(95)m = \begin{bmatrix} 588.75 & 678.67 & 730.25 & 723.23 & 635.43 & 466.77 & 321.73 \end{bmatrix}$	334.58 478.91 576.34 569.81 558.46	(95)
Monthly average external temperature from Table 8	004.00 470.01 070.04 000.01 000.40	(33)
(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		, ,
(97)m= 1252.11 1231.65 1133.28 957.17 743.12 499.48 330.53	346.41 538.9 804.35 1042.68 1240.69	(97)
Space heating requirement for each month, kWh/month = 0.02	24 x [(97)m – (95)m] x (41)m	
(98)m= 493.54 371.61 299.86 168.44 80.12 0 0	0 0 169.64 340.47 507.58	
	Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	2431.26 (98)
Space heating requirement in kWh/m²/year	Ī	25.75 (99)

9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)
The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See		es; the latter	_
Fraction of heat from Community heat pump		0.5	(303a)
Fraction of community heat from heat source 2		0.5	(303b)
Fraction of total space heat from Community heat pump	(302) x (303a) =	0.5	(304a)
Fraction of total space heat from community heat source 2	(302) x (303b) =	0.5	(304b)
Factor for control and charging method (Table 4c(3)) for community	y heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating Annual space heating requirement		<b>kWh/year</b> 2431.26	7
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1276.41	(307a)
Space heat from heat source 2	(98) x (304b) x (305) x (306) =	1276.41	(307b)
Efficiency of secondary/supplementary heating system in % (from 7	Гable 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 If DHW from community scheme:		2191.01	]
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1150.28	(310a)
Water heat from heat source 2	(64) x (303b) x (305) x (306) =	1150.28	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)	] = 48.53	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from out	side	308.46	(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) =	308.46	(331)
Energy for lighting (calculated in Appendix L)		388.88	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-576.34	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission fact kWh/year kg CO2/kWh	or 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	I fuel 425	(367a)

Efficiency of heat source 2 (%)	If there is CHP using two fuels repeat (363) to (3	866) for the second	d fuel	91	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	296.34	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	576.01	(368)
Electrical energy for heat distribution	[(313) x	0.52	=	25.19	(372)
Total CO2 associated with community system	ms (363)(366) + (368)(372)		=	897.54	(373)
CO2 associated with space heating (second	ary) (309) x	0	=	0	(374)
CO2 associated with water from immersion h	neater or instantaneous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water	heating (373) + (374) + (375) =			897.54	(376)
CO2 associated with electricity for pumps an	d fans within dwelling (331)) x	0.52	=	160.09	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	201.83	(379)
Energy saving/generation technologies (333)	to (334) as applicable				_
Item 1		).52 x 0.0	1 =	-299.12	(380)
Total CO2, kg/year sum	of (376)(382) =			960.33	(383)
Dwelling CO2 Emission Rate (383	) ÷ (4) =			10.17	(384)
El rating (section 14)				90.77	(385)

			Hoor	) otoilo:						
Assessor Name:	Joseph Treanor		User D	Strom	a Num	bor		STDC	0032062	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.14	
		Р	roperty	Address						
Address :	, Gondar Gardens,		•							
1. Overall dwelling dim	ensions:									
			Area	a(m²)		Av. He	ight(m)	,	Volume(m <sup>3</sup>	<u>^</u>
Ground floor				92.1	(1a) x	2	2.55	(2a) =	234.85	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1e	e)+(1r	n) <u> </u>	92.1	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	234.85	(5)
2. Ventilation rate:										
		econdar heating	.у 	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	ans				Ī	0	X	10 =	0	(7a)
Number of passive vent	S				Ė	0	x -	10 =	0	(7b)
Number of flueless gas	fires				Ľ	0	X 4	40 =	0	(7c)
Ŭ					_					( -/
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	6a)+(6b)+(7	'a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intend	led, procee	d to (17), (	otherwise o	continue fr	om (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corres				•	uction			0	(11)
deducting areas of open		sponaing to	ine great	ler wall are	a (aner					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	nter 0.05, else enter 0								0	(13)
Percentage of window	vs and doors draught s	tripped							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 cul		•	•	•	etre of e	envelope	area	3	(17)
If based on air permeab	•								0.15	(18)
	ies if a pressurisation test ha	s been dor	ne or a de	gree air pe	rmeability	is being u	sed			<b>7</b>
Number of sides shelter Shelter factor	ea			(20) = 1 -	0.075 x (1	19)1 =			2	(19)
Infiltration rate incorpora	ating shelter factor			(21) = (18		- /1			0.85	(20)
Infiltration rate modified	_	Ч		(= -) ()	(==)				0.13	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind s		<b>V</b> 4		1 7149	ООР		1.01		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	1	
. , [ ] -	1 1 2	1	·	1	<u> </u>	I	1	I .	J	
Wind Factor $(22a)m = (2a)m =$	22)m ÷ 4	,	•			,			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	]	

0.16	0.16	0.16	0.14	0.14	0.12	peed) = 0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe		_	rate for t	he appli	cable ca	se	<b>I</b>		l				
If mechanica											ļ	0.5	(2
If exhaust air h		0		, ,	,	. ,	,, .	,	) = (23a)		Į	0.5	(2
If balanced with		•	-	_								68.85	(2
a) If balance						<u> </u>	<del>- ´ ` -</del>	<del>í `</del>	<del>– `</del>	<del> </del>	<del>r ` ´</del>	÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(2
b) If balance	ed mecha	anical ve	ntilation	without	heat rec	overy (N	MV) (24b	p)m = (22)	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(:
c) If whole h if (22b)r				-	ve input vo); otherv				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
d) If natural if (22b)r				•	ve input verwise (2				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in bo	x (25)	-	-			
25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(
B. Heat losse	s and he	at loss r	naramet	⊃r·									
LEMENT	Gros	·	Openin		Net Ar	<b>A</b> 2	U-val	IIA	AXU		k-value	Δ	Χk
LEIVIEINI	area		r		A,r		W/m2		(W/I		kJ/m <sup>2</sup> ·k		J/K
/indows Type	e 1				4.72	x1	/[1/( 1.2 )+	0.04] =	5.4				(
/indows Type	2				2.29	x1.	/[1/( 1.2 )+	0.04] =	2.62				(
/indows Type	3				4.5	x1	/[1/( 1.2 )+	0.04] =	5.15				(
/indows Type	e 4				2.26	x1,	/[1/( 1.2 )+	0.04] =	2.59	=			(
/alls Type1	92.1	3	25.3	3	66.8	x	0.18	i	12.02	<b>=</b> [			
/alls Type2	21.5	1	0		21.51	x	0.23	<b>=</b> i	4.89	Ŧ i		i	$\equiv$
oof	15.3	3	0		15.3	X	0.13	<u> </u>	1.99	<b>=</b>		<b>i</b> i i i i i i i i i i i i i i i i i i	$\exists$
otal area of e	lements	 , m²			128.9	4							(
for windows and			effective wi	ndow U-va			g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	`
include the area	as on both	sides of in	nternal wal	ls and par	titions	_		-	,	-			
abric heat lo	ss, W/K =	= S (A x	U)				(26)(30)	) + (32) =				47.91	
eat capacity	Cm = S(	Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	5436.3	
	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	
hermal mass		ore the de	taila of tha	construct	ion are not	known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
or design asses				COMOLIGOR									
or design asses: an be used inste	ad of a de	tailed calc	ulation.		nendiy k	<i>(</i>					Γ	16.22	$\neg$
or design asses In be used inste nermal bridg	ad of a dea es : S (L	tailed calci x Y) cal	ulation. culated (	using Ap	-	<					[	16.33	
or design assess in be used inste nermal bridg details of therma	ad of a dei es : S (L al bridging	tailed calci x Y) cal	ulation. culated (	using Ap	-	<		(33) +	(36) =		]	16.33	_
or design asses. an be used inste hermal bridg details of therma otal fabric he	ad of a der es:S(L al bridging at loss	tailed calci x Y) cal are not kn	ulation. culated ( own (36) =	using Ap = 0.15 x (3	-	<			(36) = = 0.33 × (	25)m x (5)	[		
hermal mass or design assess on be used inste hermal bridg details of therma otal fabric he entilation head	ad of a der es:S(L al bridging at loss	tailed calci x Y) cal are not kn	ulation. culated ( own (36) =	using Ap = 0.15 x (3	-	√ Jul	Aug			25)m x (5)	Dec		_
or design assessan be used inste hermal bridg details of therma otal fabric he entilation hea	ad of a deles: S (Lal bridging at loss cat	tailed calco x Y) cal are not kn	ulation. culated ( own (36) =	using Ap = 0.15 x (3	1)		Aug 21.21	(38)m	= 0.33 × (				_
or design assession be used instead in the used instead in the use	ad of a deres : S (L al bridging at loss at loss cal Feb	x Y) cal x Y) cal are not kn alculated Mar 24.18	ulation. culated ( own (36) = I monthly	using Ap = 0.15 x (3 / May	Jun	Jul	<del>l                                     </del>	(38)m Sep 21.95	= 0.33 × (	Nov 23.19	Dec		

Heat loss para	ımeter (l	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.97	0.96	0.96	0.95	0.94	0.93	0.93	0.93	0.94	0.94	0.95	0.95		
		!							Average =	Sum(40) <sub>1</sub>	12 /12=	0.95	(40)
Number of day		<u> </u>	· ·										
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 hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occurring TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		65		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed i			se target c		7.22		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 106.94	103.05	99.16	95.27	91.38	87.5	87.5	91.38	95.27	99.16	103.05	106.94		
	Į.	!				Į.	ļ.		Total = Su	ım(44) <sub>112</sub> =	=	1166.62	(44)
Energy content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x E	Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 158.59	138.7	143.13	124.78	119.73	103.32	95.74	109.86	111.18	129.57	141.43	153.58		
W. in a 4 a 1 d a					( )		h (40		Total = Su	ım(45) <sub>112</sub> =	=	1529.62	(45)
If instantaneous w	/ater neati ı		·	not water	· · ·		· · ·	) tO (61)					
(46)m= 23.79 Water storage	20.81	21.47	18.72	17.96	15.5	14.36	16.48	16.68	19.43	21.21	23.04		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` '					•					<u> </u>		(,
Otherwise if no	_			-			, ,	ers) ente	er '0' in (	(47)			
Water storage	loss:												
a) If manufact	urer's d	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		•					(48) x (49)	) =		1	10		(50)
b) If manufact			-								1		(54)
Hot water stor	-			e z (KVV	n/iitre/ua	iy)				0.	02		(51)
Volume factor	•		011 4.0							1.	03		(52)
Temperature f	actor fro	m Table	2b							-	.6		(53)
Energy lost fro	m watei	rstorage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or		_								-	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 contains												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)
	loce (c	anual\ fra	m Table	. 2		ı	ı		1		0		(58)
Primary circuit Primary circuit	`	,			59)m = 4	(58) ± 36	35 × (41)	ım			·		(50)
(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)
<u> </u>			<u> </u>	L	<u> </u>	<u> </u>	<u> </u>						

Combi loss	ralculated	for each	month (	(61)m –	(60) ·	365 × (41	)m							
(61)m= 0	0	0	0	01)111 =	(00) <del>.</del>	0 × (41	) 	)	0	0	T 0	0	1	(61)
	l		<u> </u>						<u> </u>				J · (59)m + (61)m	(- )
(62)m= 213.8	<del></del>	198.41	178.28	175.01	156.8		165		164.67	184.84	194.92	208.86	]	(62)
Solar DHW inpo				<u> </u>	<u> </u>						1			` '
(add addition												- · · · · · · · · · · · · · · · · · · ·		
(63)m= 0	0	0	0	0	0	0	C	_	0	0	0	0	1	(63)
Output from	water hea	ter				<b>!</b>							•	
(64)m= 213.8		198.41	178.28	175.01	156.8	1 151.02	165	.14	164.67	184.84	194.92	208.86	]	
				ı		<b>!</b>		Outp	out from w	ater heate	er (annual) <sub>1</sub>	112	2180.46	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.	85 × (45)m	ı + (6	31)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	n ]	
(65)m= 96.95	86.06	91.81	84.29	84.03	77.1	5 76.06	80.	75	79.76	87.3	89.82	95.29	]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinde	r is in the	dwell	ling	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											
Jar		Mar	Apr	May	Jui	n Jul	Α	ug	Sep	Oct	Nov	Dec	]	
(66)m= 132.6	7 132.67	132.67	132.67	132.67	132.6	7 132.67	132	.67	132.67	132.67	132.67	132.67	]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5			-	_	
(67)m= 21.65	5 19.23	15.64	11.84	8.85	7.47	8.07	10	.5	14.09	17.89	20.88	22.26	]	(67)
Appliances (	gains (calc	ulated in	Append	dix L, eq	uatior	L13 or L1	3a),	also	see Ta	ble 5		-	_	
(68)m= 242.8	9 245.41	239.06	225.54	208.47	192.4	3 181.71	179	.19	185.54	199.06	216.13	232.17	]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L	15 or L15a	), als	o se	ee Table	5	-	-	_	
(69)m= 36.23	7 36.27	36.27	36.27	36.27	36.2	7 36.27	36.	27	36.27	36.27	36.27	36.27		(69)
Pumps and	fans gains	(Table 5	5a)										_	
(70)m= 0	0	0	0	0	0	0	C	)	0	0	0	0	]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)									
(71)m= -106.1	4 -106.14	-106.14	-106.14	-106.14	-106.	4 -106.14	-106	5.14	-106.14	-106.14	-106.14	-106.14	]	(71)
Water heatir	ng gains (T	able 5)											_	
(72)m= 130.3	1 128.07	123.4	117.06	112.95	107.1	5 102.22	108	.54	110.78	117.34	124.75	128.08	]	(72)
Total intern	al gains =				(	66)m + (67)n	า + (68	3)m +	+ (69)m +	(70)m + (7	71)m + (72)	)m	_	
(73)m= 457.6	6 455.51	440.9	417.24	393.07	369.8	354.81	361	.02	373.21	397.09	424.56	445.3		(73)
6. Solar ga														
Solar gains ar		_					ations	to co		ne applica		tion.		
Orientation:	Access F Table 6d		Area m²			Flux Fable 6a		т	g_ able 6b	Т	FF able 6c		Gains (W)	
East a.a.					_		1					_	. ,	1(70)
East 0.9		X	4.		x	19.64	] x ]		0.5		0.7	=	21.44	(76)
		X	2.2		x	19.64	] X ] .,		0.5	_	0.7	=	21.53	[(76)]
_		X	4.		x	38.42	] X ]	_	0.5		0.7	=	41.94	[76]
East 0.9		X	2.2		X	38.42	] X ]		0.5	X	0.7	=	42.12	(76)
East 0.9	1	X	4.	5	X	63.27	X		0.5	X	0.7	=	69.06	(76)

East	0.9x	2	X	2.26	x	63.27	x	0.5	x	0.7	=	69.37	(76)
East	0.9x	1	X	4.5	x	92.28	x	0.5	x	0.7	=	100.72	(76)
East	0.9x	2	X	2.26	x	92.28	x	0.5	x	0.7	=	101.17	(76)
East	0.9x	1	X	4.5	x	113.09	x	0.5	x	0.7	=	123.44	(76)
East	0.9x	2	X	2.26	x	113.09	x	0.5	x	0.7	=	123.99	(76)
East	0.9x	1	X	4.5	x	115.77	x	0.5	x	0.7	=	126.36	(76)
East	0.9x	2	X	2.26	x	115.77	x	0.5	x	0.7	=	126.92	(76)
East	0.9x	1	X	4.5	x	110.22	x	0.5	x	0.7	=	120.3	(76)
East	0.9x	2	X	2.26	X	110.22	X	0.5	X	0.7	=	120.84	(76)
East	0.9x	1	X	4.5	x	94.68	x	0.5	X	0.7	=	103.34	(76)
East	0.9x	2	X	2.26	x	94.68	X	0.5	X	0.7	=	103.8	(76)
East	0.9x	1	X	4.5	X	73.59	X	0.5	X	0.7	=	80.32	(76)
East	0.9x	2	X	2.26	x	73.59	x	0.5	x	0.7	=	80.68	(76)
East	0.9x	1	X	4.5	x	45.59	X	0.5	X	0.7	=	49.76	(76)
East	0.9x	2	X	2.26	x	45.59	X	0.5	X	0.7	=	49.98	(76)
East	0.9x	1	X	4.5	x	24.49	x	0.5	x	0.7	=	26.73	(76)
East	0.9x	2	X	2.26	X	24.49	X	0.5	X	0.7	=	26.85	(76)
East	0.9x	1	X	4.5	x	16.15	X	0.5	X	0.7	=	17.63	(76)
East	0.9x	2	X	2.26	x	16.15	x	0.5	X	0.7	=	17.71	(76)
West	0.9x	0.77	X	4.72	x	19.64	X	0.5	X	0.7	=	44.97	(80)
West	0.9x	0.77	X	2.29	x	19.64	X	0.5	X	0.7	=	32.73	(80)
West	0.9x	0.77	X	4.72	x	38.42	x	0.5	x	0.7	=	87.97	(80)
West	0.9x	0.77	X	2.29	X	38.42	X	0.5	X	0.7	=	64.02	(80)
West	0.9x	0.77	X	4.72	x	63.27	X	0.5	X	0.7	=	144.87	(80)
West	0.9x	0.77	X	2.29	X	63.27	x	0.5	X	0.7	=	105.43	(80)
West	0.9x	0.77	X	4.72	x	92.28	X	0.5	X	0.7	=	211.29	(80)
West	0.9x	0.77	X	2.29	X	92.28	X	0.5	x	0.7	=	153.77	(80)
West	0.9x	0.77	X	4.72	X	113.09	X	0.5	X	0.7	=	258.95	(80)
West	0.9x	0.77	X	2.29	x	113.09	X	0.5	X	0.7	=	188.45	(80)
West	0.9x	0.77	X	4.72	X	115.77	X	0.5	X	0.7	=	265.08	(80)
West	0.9x	0.77	X	2.29	X	115.77	X	0.5	X	0.7	=	192.91	(80)
West	0.9x	0.77	X	4.72	X	110.22	X	0.5	x	0.7	=	252.36	(80)
West	0.9x	0.77	X	2.29	X	110.22	X	0.5	X	0.7	=	183.66	(80)
West	0.9x	0.77	X	4.72	X	94.68	X	0.5	X	0.7	=	216.78	(80)
West	0.9x	0.77	X	2.29	X	94.68	X	0.5	X	0.7	=	157.76	(80)
West	0.9x	0.77	X	4.72	x	73.59	x	0.5	x	0.7	=	168.5	(80)
West	0.9x	0.77	X	2.29	x	73.59	x	0.5	x	0.7	] =	122.62	(80)
West	0.9x	0.77	X	4.72	x	45.59	x	0.5	x	0.7	<b>=</b>	104.38	(80)
West	0.9x	0.77	X	2.29	x	45.59	x	0.5	x	0.7	] =	75.97	(80)
West	0.9x	0.77	X	4.72	x	24.49	x	0.5	X	0.7	=	56.07	(80)
West	0.9x	0.77	X	2.29	x	24.49	x	0.5	x	0.7	=	40.81	(80)

West	0.9x	0.77	х	4.7	′2	x	1	6.15	x		0.5		· [	0.7		=	36.98	(80)
West	0.9x	0.77	x	2.2	29	X	1	6.15	x		0.5	,	·Γ	0.7		=	26.91	(80)
	_		<u>_</u>										_					
Solar ga	ains in v	watts, ca	alculated	for eacl	h month	١			(83)m	= St	um(74)m .	(82)	m					
7-	120.67	236.05	388.74	566.95	694.82	$\overline{}$	11.27	677.16	581.	.67	452.12	280	.09	150.46	99.2	23		(83)
Total ga	ains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (	83)m	, watts						•			ı	
(84)m=	578.32	691.56	829.64	984.19	1087.89	10	081.12	1031.97	942.	.69	825.32	677	.18	575.01	544.	53		(84)
7. Mea	an interi	nal temp	erature	(heating	season	1)												
Tempe	erature	during h	eating p	eriods ir	n the livi	ng	area 1	from Tab	ole 9,	Th	1 (°C)						21	(85)
Utilisat	tion fac	tor for g	ains for I	iving are	ea, h1,m	า (ร	ee Ta	ble 9a)										
Γ	Jan	Feb	Mar	Apr	May	T	Jun	Jul	Αι	Ja T	Sep	0	ct	Nov	De	<u></u>		
(86)m=	0.96	0.93	0.88	0.77	0.63	T	0.47	0.35	0.4	<del>-</del>	0.62	0.6	34	0.94	0.9	7		(86)
N/1		4		lii.a. a a	T4 /5	- 11 -	4-	24- 7			. 0-)			<u> </u>			l	
г			ature in	_ <u> </u>	· ·	_		i	r —			20	2	10.50	10.0	2	l	(87)
(87)m=	19.07	19.38	19.85	20.39	20.74	L	20.92	20.97	20.9	96	20.82	20	.3	19.59	19.0	)2	l	(01)
Tempe	erature	during h	eating p	eriods ir	rest of	dw	/elling	from Ta	ble 9	), Th	n2 (°C)						,	
(88)m=	20.11	20.11	20.12	20.13	20.13	2	20.14	20.14	20.1	14	20.14	20.	13	20.13	20.1	12		(88)
Utilisat	tion fac	tor for ga	ains for ı	rest of d	welling,	h2	,m (se	e Table	9a)									
(89)m=	0.95	0.93	0.86	0.75	0.59	_	0.42	0.29	0.3	3	0.56	3.0	32	0.93	0.9	6		(89)
Mooni	intornal	tompor	ature in	the rest	of dwoll	ina	T2 (f	ollow sto	nc 3	+o 7	in Tabl		`				J	
(90)m=	17.52	17.96	18.64	19.38	19.84	Ť	20.07	20.12	20.1		19.96	19.		18.28	17.4	15	l	(90)
(50)111=	17.02	17.00	10.04	10.00	10.04	<u> </u>	20.07	20.12	20.	<u>'</u>				g area ÷ (4			0.33	(91)
											·			9 4.04 . (	.,		0.55	(31)
Mean			ature (fo			llin	g) = fl	LA × T1	+ (1 -	– fL							1	
(92)m=	18.03	18.43	19.04	19.71	20.14	2	20.35	20.4	20.	4	20.24	19.	62	18.71	17.9	97		(92)
Apply			ne mean		· ·	_		1	1			_					1	
(93)m=	18.03	18.43	19.04	19.71	20.14		20.35	20.4	20.	4	20.24	19.	62	18.71	17.9	97		(93)
8. Spa	ice hea	ting requ	uirement															
				•		nec	l at ste	ep 11 of	Table	e 9b	o, so tha	t Ti,r	n=(	76)m an	d re-d	calc	culate	
tne util			or gains			г					0		-1	NI.			1	
Litiliant	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug [	Sep		ct	Nov	De	ec		
	0.94	0.9	ains, hm <sub>0.84</sub>	0.73	0.59	Г	0.43	0.31	0.3	_	0.57	0.	0	0.91	0.9	E	1	(94)
(94)m=							0.43	0.51	0.3	5	0.57	0.	0	0.91	0.9	<u> </u>		(34)
г	541.99	625.39	W = (94)	719.24	639.45	Τ	65.94	318.84	330.	02	468.43	54′		522.91	514.	63	1	(95)
` ' L						_		310.04	330.	.92	400.43	54	.5	522.91	514.	03		(33)
г	y avera	age exte	rnal tem 6.5	8.9	11.7	$\overline{}$	e 8 14.6	16.6	16.	<u>,                                    </u>	14.1	10	6	7.1	4.2	<u> </u>	1	(96)
(96)m=						_			<u> </u>			L	.0	7.1	4.2		İ	(30)
г	1220.86		an intern 1108.37	942.35	733.55	_	92.68	=[(39)m : 326.03	X [(93	<del>'</del>	- (96)M 529.44	] 784	1 /	1015.18	1210	1.4	1	(97)
` ' L								l							1210	J. <del>4</del>	İ	(31)
· -	505.08	385.7	ment fo 305.16	160.64	70.01	T VVI	0	n = 0.02	24 X [	Ì	0 (95)	180		354.43	517.	65	I	
(30)111=	303.06	505.1	303.10	100.04	70.01	_	U										0470.4	(00)
										ıotal	per year (	(KVVN	yeai	r) = Sum(9	<b>O )</b> 15,91	12 =	2479.4	(98)
Space	heating	g require	ement in	kWh/m²	/year												26.92	(99)

This part is used for space heating, space cooling or water heating provided by a community scheme.

9b. Energy requirements – Community heating scheme

Traction 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 latter includes bollers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	Fraction of space heat from secondary/supplementary h	eating (Table 11) '0' if none	0	(301)
Praction of heat from Community heat pump   (302) x (303a)   (303)		`		(302)
Fraction of heat from Community heat from heat source 2 Fraction of community heat from heat source 2 Fraction of total space heat from Community heat pump Fraction of total space heat from community heat ource 2  Fraction of total space heat from community heat source 2  Fraction of total space heat from community heating system  Distribution loss factor (Table 12c) for community heating system  Distribution loss factor (Table 12c) for community heating system  Fraction of total space heat from Community heating system  Distribution loss factor (Table 12c) for community heating system  Fraction of total space heat from Community heating system  Fraction of total space heat from Community heat pump  Fraction of total space heating requirement  Space heating  Annual space heating requirement  Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  (98) x (304b) x (305) x (306) =  (1301-68) (307)  Fraction of total space heat from Community heating system in % (from Table 4a or Appendix E)  Distribution of the stating requirement from secondary/supplementary system (98) x (301) x 100 + (308) =  Water heating  Water heating  Water heating requirement  Fraction of total space heat from Community heat pump  (64) x (303a) x (305) x (306) =  (707) x (310a) x (306) x (306) =  (708) x (306) x	·	•	latter	
Fraction of total space heat from Community heat pump  (302) x (303a) =			0.5	(303a)
Fraction of total space heat from community heat source 2   (302) x (303b) =   0.5   (304   10.5	Fraction of community heat from heat source 2		0.5	(303b)
Cooling System Energy Efficiency Ratio   Cooling System System   Cooling	Fraction of total space heat from Community heat pump	(302) x (303a) =	0.5	(304a)
Space heating   Space heating requirement   Space heating requirement   Space heating requirement   Space heating requirement   Space heat from Community heat pump   (98) x (304a) x (305) x (306) =   (3016)	Fraction of total space heat from community heat source	e 2 (302) x (303b) =	0.5	(304b)
Space heating   RWhhyear   2479.4   2	Factor for control and charging method (Table 4c(3)) for	community heating system	1	(305)
Annual space heating requirement  Space heat from Community heat pump  (98) × (304a) × (305) × (306) = 1301.68 (307)  Space heat from heat source 2  (98) × (304b) × (305) × (306) = 1301.68 (307)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) × (301) × 100 + (308) = 0 (308)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Loan community heat pump  (64) × (303a) × (305) × (306) = 1144.74 (310)  Water heat from heat source 2  (64) × (303b) × (305) × (306) = 1144.74 (310)  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 46.93 (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) = 300.85 (330)  Total electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  Energy Emission factor Emissions kWh/year  Energy Emission factor Emissions kWh/year (363) to (366) for the second fuel (425) (367)	Distribution loss factor (Table 12c) for community heating	g system	1.05	(306)
Space heat from Community heat pump	•	_	kWh/year	_
Space heat from heat source 2   (98) x (304b) x (305) x (306) =   1301.68   (307   (308   1301.68   1301.68   (307   (308   1301.68   1301.68   (307   (308   1301.68   1301.68   (307   (308   1301.68   (308   1301.68   (308   (308   1301.68   (308   (3	•	<u>_</u>	2479.4	_
Space heating requirement from secondary/supplementary system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) × (301) × 100 + (308) =  0  (309)  Water heating Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) × (303a) × (305) × (306) =  1144.74  (310)  Water heat source 2  (64) × (303b) × (305) × (306) =  1144.74  (310)  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  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) =  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  Energy kWh/year Emission factor Emissions kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  425 (387)		(98) x (304a) x (305) x (306) =	1301.68	(307a
Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community heat pump Water heat from Community heat pump  Water heat from heat source 2  (64) × (303a) × (305) × (306) = 1144.74  [310] Water heat from heat source 2  (64) × (303b) × (305) × (306) = 1144.74  [310] Water heat from heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 48.93  [313] Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 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  warm air heating system fans  0  (330) warm air heating system fans  0  (330) Total electricity for the above, kWh/year  = (330a) + (330b) + (330b) + (330g) = 300.85  [331] Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  [25] Energy  Emission factor Emissions  kg CO2/kwh 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 fuels repeat (363) to (366) for the second fuel  425  (367)	Space heat from heat source 2	(98) x (304b) x (305) x (306) =	1301.68	(307b
Water heating Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) × (303a) × (305) × (306) = 1144.74 (310)  Water heat from heat source 2 (64) × (303b) × (305) × (306) = 1144.74 (310)  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) = 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) = 300.85 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  Display and factor 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 fuels repeat (363) to (366) for the second fuel (425) (367)	Efficiency of secondary/supplementary heating system in	n % (from Table 4a or Appendix E)	0	(308
Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) = 1144.74 (310)  Water heat from heat source 2  (64) x (303b) x (305) x (306) = 1144.74 (310)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 48.93 (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) = 300.85 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions - Community heating scheme  Energy kWh/year Emission factor kg CO2/kWh kg CO2/kyar  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)	Space heating requirement from secondary/supplementa	ary system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heat from Community heat pump  (64) x (303a) x (305) x (306) = 1144.74 (310)  Water heat from heat source 2 (64) x (303b) x (305) x (306) = 1144.74 (310)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 48.93 (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) = 300.85 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy kg CO2/kWh kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  425 (367)	<del>-</del>	Г	2180.46	7
Water heat from heat source 2  (64) x (303b) x (305) x (306) = 1144.74 (310)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 48.93 (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) = 300.85 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel 425 (367)	•	_		_ _
Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 48.93 (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) = 300.85 (331 (332 (332 (333 (333 (333 (333 (333	, , ,		1144.74	(310a
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) = 300.85 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  D (334)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel 425 (367)			1144.74	(310b
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) = 300.85 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (367)	·	0.01 × [(307a)(307e) + (310a)(310e)] =	48.93	(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  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy kWh/year	<i>o</i> ,	<u>_</u>	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)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  I there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)		<u></u>	0	(315)
pump for solar water heating  Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 300.85 (331 (332 Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (367)			300.85	(330a
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 300.85 (331 Energy for lighting (calculated in Appendix L)	warm air heating system fans		0	(330b
Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel 425 (367)	pump for solar water heating		0	(330g
Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)	Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	300.85	(331)
Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)	Energy for lighting (calculated in Appendix L)		382.41	(332)
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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)	Electricity generated by PVs (Appendix M) (negative qua	antity)	-562.35	(333)
Energy Emission factor Emissions kWh/year kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  425 (367)	Electricity generated by wind turbine (Appendix M) (nega	ative quantity)	0	(334)
kWh/year kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  425 (367)	12b. CO2 Emissions – Community heating scheme			
Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425  (367)		= -		
420 (4)	•		405	7,267
Ciniciency of fleat Source 2 (70) in there is Of it doing two fleat (505) to (500) for the second fleat 91 (367)	(1.1)			
	Emiciency of heat source 2 (%)	or it asing two lucis repeat (303) to (300) for the second fuel	91	_(367b

CO2 associated with heat source 1	[(307b	y)+(310b)] x 100 ÷ (367b) x	0.52	=	298.75	(367)
CO2 associated with heat source 2	[(307b	y)+(310b)] x 100 ÷ (367b) x	0.22	=	580.69	(368)
Electrical energy for heat distribution		[(313) x	0.52	=	25.39	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	)	=	904.84	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	vater heating	(373) + (374) + (375) =			904.84	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	156.14	(378)
CO2 associated with electricity for lighting	ing	(332))) x	0.52	=	198.47	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl		0.52 x 0.01	=	-291.86	(380)
Total CO2, kg/year	sum of (376)(382) =				967.59	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				10.51	(384)
El rating (section 14)					90.54	(385)

			lloor D	) otoilo:						
Assessor Name:	Joseph Treaner		User D	Strom	o Num	bori		STDC	0032062	
Software Name:	Joseph Treanor Stroma FSAP 20	12		Softwa					on: 1.0.4.14	
		Р	roperty	Address						
Address :	, Gondar Gardens,									
1. Overall dwelling dim	nensions:									
			Are	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	<u> </u>
Ground floor			7	77.46	(1a) x	2	2.55	(2a) =	197.52	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) 7	77.46	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	197.52	(5)
2. Ventilation rate:										
		econdar heating	'у 	other	_	total			m³ per hou	ır —
Number of chimneys	0 +	0	] + [	0	] = [	0	X ·	40 =	0	(6a)
Number of open flues	0 +	0	<b>]</b> + [	0	] = [	0	x :	20 =	0	(6b)
Number of intermittent f	ans				Ī	0	x -	10 =	0	(7a)
Number of passive vent	ts				Ē	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	x -	40 =	0	(7c)
										(* 5)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (	6a)+(6b)+(7	'a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
	been carried out or is intend	led, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 (		0.05.6				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corre-				•	uction			0	(11)
	nings); if equal user 0.35	oponumy to	rino groat	or wan are	a (ano					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
•	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	tripped		0.05 (0.0	(4.4) 4	001			0	(14)
Window infiltration				0.25 - [0.2] (8) + (10)			. (15) -		0	(15)
Infiltration rate	e, q50, expressed in cu	hia matra	o por bo	. , , ,	, , ,	, , ,	, ,	oroo	0	(16)
If based on air permeat	• • • •		•	•	•	elle oi e	rivelope	alea	3	(17)
·	lies if a pressurisation test ha					is being u	sed		0.15	(10)
Number of sides shelter				,	·				2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind spee	d		,					•	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	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 <i>∸</i> 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	1	
,		1 5.55							J	

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		ı		ı		_	<b>—</b> ,
If mechanica			andiv N (2	3h) - (23a	a) v Emy (e	aguation (1	VSV) other	rwica (23h	) = (23a)			0.5	(2
If balanced with									) = (23a)			0.5	(2
		-	-	_					2h\ //	00h) [/	1 (00.0)	68.85	(2
a) If balance	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	230) <b>x</b> [	0.31	) ÷ 100] ]	(2
,		l									0.31	_	(2
b) If balance	o mech	anicai ve	niliation 0	without	neat rec	overy (r	0	$\int_{0}^{\infty} \int_{0}^{\infty} \int_{0$	2b)m + (2 0	230)	0	1	(2
									0	0		_	(-
c) If whole h if (22b)n				•	•				5 x (23h	<b>)</b>			
4c)m= 0	0.07	0	0	0	0	0	0) = (22)	0	0 7 (200	0	0	1	(
d) If natural		n or wh				Ventilatio						_	·
if (22b)n					•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	· (25)		•	•	-	
5)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(
Llocklosso	م ما لم	ot loop :	t	~ # ·							•	4	
. Heat losse		•			Not Ar	••	امراا	10	AXU		le volu	Λ Λ	Χk
LEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		(W/I	<b>〈</b> )	k-valu kJ/m²·		лк J/K
indows Type	e 1				8.96	x1.	/[1/( 1.2 )+	0.04] =	10.26	, T			(
indows Type	2				4.5	x1	/[1/( 1.2 )+	0.04] =	5.15	=			(
indows Type	3				2.26		/[1/( 1.2 )+	0.04] =	2.59	=			(
alls Type1	83.9	1	17.98		65.93	_	0.18		11.87	=		$\neg$	) (
alls Type2	14.1		0		14.15		0.23	╡┇	3.22	북 ¦			=\`(
oof				=		=		_		믁 ¦		$\dashv$ $\vdash$	=
	77.4		0		77.46	=	0.13	= [	10.07				(
otal area of e			effootivo vii	ndou II v	175.5		, formula 1	/[/4/  L vol	·a) · 0 041 a	a siran in	n	h 2 2	(
or windows and include the area						ated using	i iorriula i	/[( I/ <b>U-</b> valu	ie)+0.04j a	is giveri iri	paragrapi	11 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	) + (32) =				45.74	
eat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	5501.94	=(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	: Low		100	
r design assess	sments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
n be used inste													_
nermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						17.44	(
letails of therma		are not kn	own (36) =	= 0.15 x (3	11)			(22)	(26) -				<b>—</b> ,
tal fabric he		مامان مام	را طائمت مصا						(36) =	OE) ·· (E)		63.18	(
entilation hea					1,,,,	1, ,1	۸		= 0.33 × (	<del>-                                    </del>		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	(
3)m= 20.75	20.54	20.33	19.29	19.09	18.05	18.05	17.84	18.46	19.09	19.5	19.92	J	(
eat transfer o	coefficie	nt, W/K				81.23		(39)m	= (37) + (3	38)m		1	
9)m= 83.93	83.72			82.27	81.23		81.02	81.64	82.27		83.1		

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.08	1.08	1.08	1.06	1.06	1.05	1.05	1.05	1.05	1.06	1.07	1.07		
						l	l		Average =	Sum(40) <sub>1</sub>	12 /12=	1.06	(40)
Number of day	<u> </u>	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	rement:								kWh/ye	ar:	
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		41		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t	` ,		se target o		.51		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								*F					
(44)m= 100.66	97	93.34	89.68	86.02	82.36	82.36	86.02	89.68	93.34	97	100.66		
									Total = Su	m(44) <sub>112</sub> =	-	1098.08	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 149.27	130.55	134.72	117.45	112.7	97.25	90.12	103.41	104.64	121.95	133.12	144.56		_
If instantaneous w	vator hoati	na at naint	of uso (no	hot water	r storago)	ontor O in	havas (16		Total = Su	m(45) <sub>112</sub> =	= [	1439.75	(45)
			,	1	, , , , , , , , , , , , , , , , , , ,		· · ·	, , , I					(40)
(46)m= 22.39 Water storage	19.58 loss:	20.21	17.62	16.9	14.59	13.52	15.51	15.7	18.29	19.97	21.68		(46)
Storage volum		) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•					(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water store</li></ul>			-							0	02		(51)
If community h	•			_ (	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-77					.02		(0.7)
Volume factor	from Ta	ble 2a								1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in ( <del></del>	55)								1.	03		(55)
Water storage	loss cal	culated 1	or each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m 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	,	,			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	calculated	for each	month (	′61)m =	(60) ÷ :	365 x (41	)m							
(61)m= 0	0	0	0	0	0	0	) 	)	0	0	0	0	1	(61)
	auired for	water he	eating ca	Lulated	L I for ea	ch month	(62)	—— m =	0 85 x (	 ′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 204.5	<del>-i</del>	190	170.95	167.97	150.74	T	158	_	158.14	177.23	186.62	199.84	]	(62)
Solar DHW inp	ut calculated	using App	endix G or	· Appendix	: H (nega	tive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	<b>.</b>	
(add addition												•		
(63)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(63)
Output from	water hea	ter				•					•	!	•	
(64)m= 204.5	5 180.48	190	170.95	167.97	150.74	145.39	158	.69	158.14	177.23	186.62	199.84	1	
	•			•	•	•		Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2090.59	(64)
Heat gains f	rom water	heating,	kWh/mo	onth 0.2	5 ´[0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	١]	
(65)m= 93.8	5 83.35	89.02	81.85	81.69	75.13	74.19	78.	61	77.59	84.77	87.06	92.29	]	(65)
include (5	7)m in cald	culation of	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	gains (see	Table 5	and 5a	):										
Metabolic ga	ains (Table	5), Wat	ts											
Jar		Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	]	
(66)m= 120.6	120.64	120.64	120.64	120.64	120.64	120.64	120	.64	120.64	120.64	120.64	120.64	]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				-	
(67)m= 19.1	17	13.82	10.47	7.82	6.6	7.14	9.2	28	12.45	15.81	18.45	19.67	]	(67)
Appliances (	gains (calc	ulated in	Append	dix L, eq	uation	_13 or L1	3a),	also	see Tal	ble 5		_	-	
(68)m= 214.0	5 216.27	210.67	198.76	183.72	169.58	160.13	157	.91	163.51	175.43	190.47	204.61	]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L1	or L15a	), als	o se	ee Table	5	-	-		
(69)m= 35.0	35.06	35.06	35.06	35.06	35.06	35.06	35.	06	35.06	35.06	35.06	35.06	]	(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= -96.5	2 -96.52	-96.52	-96.52	-96.52	-96.52	-96.52	-96	.52	-96.52	-96.52	-96.52	-96.52	]	(71)
Water heatir	ng gains (T	able 5)											_	
(72)m= 126.1	5 124.03	119.64	113.68	109.8	104.35	99.71	105	.65	107.76	113.94	120.91	124.04	]	(72)
Total intern	al gains =				(6	6)m + (67)m	n + (68	3)m +	+ (69)m + (	(70)m + (7	'1)m + (72)	)m	_	
(73)m= 418.5	3 416.5	403.34	382.09	360.54	339.73	326.18	332	.04	342.92	364.37	389.03	407.51	]	(73)
6. Solar ga														
Solar gains ar		•				•	ations	to co		e applical		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
Courth					_		1							1,,
South 0.9		X	4.		X _	46.75	X	<u> </u>	0.5	_  ×	0.7	_ =	35.79	(78)
South 0.9		X	2.2		X _	46.75	] X		0.5	_  ×	0.7	=	35.95	(78)
South 0.9		X	4.		X	76.57	] X		0.5		0.7	=	58.61	[(78)
South 0.9		X	2.2		X	76.57	] X	<u></u>	0.5	╣ <sup>ϫ</sup> ┢	0.7	_ =	58.87	(78)
South 0.9	× 0.54	X	4.	5	X	97.53	X		0.5	X	0.7	=	74.66	(78)

	_									_			_					_
South	0.9x	0.54		X	2.26		X	9	7.53	X		0.5	x	0.7	:	= [	74.99	(78)
South	0.9x	0.54		X	4.5		X	11	0.23	X		0.5	x	0.7	:	= [	84.38	(78)
South	0.9x	0.54		X	2.26		X	11	0.23	X		0.5	X	0.7	:	= [	84.75	(78)
South	0.9x	0.54		X	4.5		X	11	4.87	X		0.5	x	0.7	:	= [	87.93	(78)
South	0.9x	0.54		X	2.26		X	11	4.87	X		0.5	x	0.7	:	= [	88.32	(78)
South	0.9x	0.54		X	4.5		X	11	0.55	X		0.5	x	0.7	:	= [	84.62	(78)
South	0.9x	0.54		X	2.26		X	11	0.55	X		0.5	x	0.7	:	= [	84.99	(78)
South	0.9x	0.54		X	4.5		X	10	8.01	X		0.5	x	0.7	:	= [	82.68	(78)
South	0.9x	0.54		X	2.26		X	10	8.01	X		0.5	x	0.7	:	= [	83.05	(78)
South	0.9x	0.54		X	4.5		X	10	4.89	X		0.5	x	0.7	:	= [	80.29	(78)
South	0.9x	0.54		X	2.26		X	10	4.89	X		0.5	x	0.7	:	= [	80.65	(78)
South	0.9x	0.54		X	4.5		X	10	1.89	X		0.5	x	0.7	:	= [	77.99	(78)
South	0.9x	0.54		x	2.26		X	10	1.89	X		0.5	x	0.7	:	= [	78.33	(78)
South	0.9x	0.54		x	4.5		X	8:	2.59	X		0.5	x	0.7	:	= [	63.22	(78)
South	0.9x	0.54		X	2.26		X	8:	2.59	X		0.5	X	0.7	:	= [	63.5	(78)
South	0.9x	0.54		x	4.5		X	5	5.42	X		0.5	X	0.7	:	= [	42.42	(78)
South	0.9x	0.54		x	2.26		X	5	5.42	X		0.5	x	0.7	:	= [	42.61	(78)
South	0.9x	0.54		X	4.5		X	4	0.4	X		0.5	X	0.7	:	= [	30.92	(78)
South	0.9x	0.54		x	2.26		X	4	0.4	X		0.5	x	0.7		= [	31.06	(78)
West	0.9x	0.77		X	8.96		X	19	9.64	X		0.5	X	0.7	:	= [	42.68	(80)
West	0.9x	0.77		X	8.96		X	3	8.42	X		0.5	X	0.7	:	= [	83.5	(80)
West	0.9x	0.77		x	8.96		X	6:	3.27	X		0.5	X	0.7	:	= [	137.51	(80)
West	0.9x	0.77		x	8.96		X	9:	2.28	X		0.5	X	0.7	:	= [	200.55	(80)
West	0.9x	0.77		x	8.96		X	11	3.09	X		0.5	x	0.7	:	= [	245.78	(80)
West	0.9x	0.77		X	8.96		X	11	5.77	X		0.5	x	0.7	:	= [	251.6	(80)
West	0.9x	0.77		x	8.96		X	11	0.22	X		0.5	x	0.7	:	= [	239.53	(80)
West	0.9x	0.77		X	8.96		X	94	4.68	X		0.5	X	0.7	:	= [	205.75	(80)
West	0.9x	0.77		X	8.96		X	7:	3.59	X		0.5	X	0.7		= [	159.93	(80)
West	0.9x	0.77		X	8.96		X	4:	5.59	X		0.5	X	0.7	:	= [	99.08	(80)
West	0.9x	0.77		X	8.96		X	24	4.49	X		0.5	x	0.7	:	= [	53.22	(80)
West	0.9x	0.77		X	8.96		X	10	6.15	X		0.5	X	0.7		= [	35.1	(80)
ī				$\overline{}$	for each m		$\overline{}$	- 1		ř		um(74)m		ì	<del></del>			15 -:
(83)m=	114.41	200.98	287.1			22.03		21.21	405.25	366	.69	316.25	225.7	9 138.25	97.08	8		(83)
Ĭ				_	$\frac{(84)m}{754.77} = (7)$		<u> </u>	<del>'</del>		T 000	. <del>.</del>	050.47	500.4	0   507.07	T 504 5			(94)
(84)m=	532.94	617.47	690.4	9	751.77 78	32.56		60.94	731.43	698	5.73	659.17	590.1	6 527.27	504.5	9		(84)
					heating se											_		7
-		•	_	•	eriods in th		_			ble 9	, Th′	1 (°C)					21	(85)
Utilisa I				$\neg$	ving area,		Ť							<b>.</b>		_		
(00)	Jan	Feb	Ma	$\dashv$		May	+	Jun	Jul	<del>                                     </del>	ug 10	Sep	Oct	_	De	$\dashv$		(86)
(86)m=	0.95	0.93	0.89		Į	).72		0.58	0.45	0.4	!	0.67	0.85	0.93	0.96			(86)
1		· · ·			ving area		_	- i		1				_	ı	_		(CT)
(87)m=	18.89	19.17	19.59	)	20.1 2	0.53	2	20.82	20.94	20.	92	20.72	20.16	19.44	18.84	4		(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)				
(88)m= 20.01 20.02 20.02 20.03 20.03 20.04 20.04 20.05 20.04	20.03 20.03	20.02		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	ļ ļ			
(89)m= 0.95 0.92 0.88 0.8 0.68 0.52 0.37 0.4 0.61	0.82 0.92	0.95		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Tabl	e 9c)			
(90)m= 17.2 17.61 18.21 18.93 19.51 19.88 20 19.99 19.76	19.02 18	17.13		(90)
f	LA = Living area ÷ (	4) =	0.35	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		-		_
(92)m= 17.8 18.16 18.7 19.35 19.87 20.21 20.33 20.32 20.1	19.42 18.51	17.73		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appro	opriate			
(93)m= 17.8 18.16 18.7 19.35 19.87 20.21 20.33 20.32 20.1	19.42 18.51	17.73		(93)
8. Space heating requirement				
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that the utilisation factor for gains using Table 9a	it Ti,m=(76)m an	d re-calc	ulate	
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct Nov	Dec		
Utilisation factor for gains, hm:				
(94)m= 0.93 0.9 0.85 0.78 0.67 0.53 0.39 0.42 0.62	0.8 0.9	0.93		(94)
Useful gains, hmGm , W = (94)m x (84)m				
(95)m= 493.98 554.57 589.36 586.62 528.12 403.96 286.95 296.91 407.16	474.22 473.8	471.64		(95)
Monthly average external temperature from Table 8	г т			(2.0)
(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 = $1132.87$ $1110.2$ $1018.82$ $861.53$ $671.92$ $455.76$ $303.05$ $317.42$ $489.62$	725.98 943.29	1124.68		(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)]$		1124.00		(0.)
(98)m= 475.34 373.38 319.51 197.94 106.98 0 0 0 0	187.31 338.04	485.86		
Total per year	(kWh/year) = Sum(9	98) <sub>15,912</sub> =	2484.36	(98)
Space heating requirement in kWh/m²/year		[	32.07	<b>]</b> (99)
9b. Energy requirements – Community heating scheme		L		
This part is used for space heating, space cooling or water heating provided by	•	heme.		7
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if no	one		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 uncludes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	up to four other heat	sources; th	ne latter	
Fraction of heat from Community heat pump			0.5	(303a)
Fraction of community heat from heat source 2		ĺ	0.5	(303b)
Fraction of total space heat from Community heat pump	(302) x (303	8a) =	0.5	(304a)
Fraction of total space heat from community heat source 2	(302) x (303	3b) =	0.5	(304b)
Factor for control and charging method (Table 4c(3)) for community heating syst	tem	Ī	1	(305)
Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heating		L	kWh/year	_
Annual space heating requirement			2484.36	]
		•		_

Space heat from Community heat pump		(98) x (304a) x	(305) x (306) =	1304.29	(307a)
Space heat from heat source 2		(98) x (304b) x	(305) x (306) =	1304.29	(307b)
Efficiency of secondary/supplementary heating	g system in % (from Tabl	e 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/su	upplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating					
Annual water heating requirement				2090.59	
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x	(305) x (306) =	1097.56	(310a)
Water heat from heat source 2		(64) x (303b) x	(305) x (306) =	1097.56	(310b)
Electricity used for heat distribution	0.0	1 × [(307a)(307	(e) + (310a)(310e)] =	48.04	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling syste	m, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling mechanical ventilation - balanced, extract or p	` ,	9		253.03	一 (330a)
warm air heating system fans	•			0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =	253.03	(331)
Energy for lighting (calculated in Appendix L)				337.97	<u> </u>
Electricity generated by PVs (Appendix M) (ne	egative quantity)			-472.6	 (333)
Electricity generated by wind turbine (Append	,			0	(334)
12b. CO2 Emissions – Community heating sc	heme				
		ergy Vh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water h	eating (not CHP)	•	_		
Efficiency of heat source 1 (%)	If there is CHP using two fue	Is repeat (363) to	(366) for the second fue	425	(367a)
Efficiency of heat source 2 (%)	If there is CHP using two fue	Is repeat (363) to	(366) for the second fue	91	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x	0.52	293.31	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x	100 ÷ (367b) x	0.22	570.11	(368)
Electrical energy for heat distribution	[(313) x		0.52	24.93	(372)
Total CO2 associated with community system	S (363)(3	366) + (368)(372	2) =	888.35	(373)
CO2 associated with space heating (seconda	ry) (309) x		0	0	(374)
CO2 associated with water from immersion he	eater or instantaneous he	eater (312) x	0.52	0	(375)
Total CO2 associated with space and water h	eating (373) + (	374) + (375) =		888.35	(376)
CO2 associated with electricity for pumps and	fans within dwelling (33	(1)) x	0.52	131.32	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	175.41	(379)
Energy saving/generation technologies (333) Item 1	to (334) as applicable		0.52 × 0.01 =	-245.28	(380)

Total CO2, kg/year sum of (376)...(382) = Dwelling CO2 Emission Rate  $(383) \div (4) =$  El rating (section 14)

949.8	(383)
12.26	(384)
89.61	(385)

			User E	Octoile:						
Assessor Name:	Joseph Treanor		User L	Strom	a Num	her:		STRC	0032062	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.14	
		Р	roperty	Address	: A8					
Address :	, Gondar Gardens	, London,	NW6 11	HG						
1. Overall dwelling dim	nensions:									
Cround floor				a(m²)	l		ight(m)	7,0-1	Volume(m	<u>^</u>
Ground floor				71.04	(1a) x	2	2.55	(2a) =	181.15	(3a)
Total floor area TFA = (	(1a)+(1b)+(1c)+(1d)+(1	e)+(1r	1)	71.04	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	181.15	(5)
2. Ventilation rate:				-41		4-4-1				
	heating	secondar heating	· 	other		total			m³ per hou	_
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 t	fans					0	χ.	10 =	0	(7a)
Number of passive vent	ts				Ē	0	x -	10 =	0	(7b)
Number of flueless gas	fires				F	0	x	40 =	0	(7c)
· ·					L					`
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans =	(6a)+(6b)+(7	a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is inten	ded, procee	d to (17),	otherwise o	continue fr	rom (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 (an ataul an thaba		0.05 (-				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timbe present, use the value corre				•	uction			0	(11)
	nings); if equal user 0.35	oponang to	rino grou	io, wan are	a janoi					
If suspended wooder	floor, enter 0.2 (unsea	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
•	enter 0.05, else enter 0								0	(13)
· ·	ws and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2			. (45)		0	(15)
Infiltration rate				(8) + (10)	. , ,	, , ,	, ,		0	(16)
If based on air permeat	e, q50, expressed in cu		•	•	•	etre or e	envelope	area	3	(17)
·	lies if a pressurisation test h					is beina u	sed		0.15	(18)
Number of sides shelte				<b>9 ,</b>	,	3			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind spec	ed							_	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind s	speed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m (	22)m · 4									
Wind Factor $(22a)m = ($ $(22a)m = 1.27$ $1.25$	22)m ÷ 4 1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(22a)111- 1.21 1.20	1.20 1.1 1.00	0.95	1 0.90	0.32	L '	1.00	1.14	1.10	J	

Adjusted infiltration ra	te (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 effective air	_	rate for t	he appli	cable ca	se			!	!		•	<b>—</b> ,,,,
If mechanical venti		andiv N. (2	3h) - (22a	) v Emy (c	aguation (f	VEVV otho	nuico (22h	) - (232)			0.5	(23a
If balanced with heat re								) = (23a)			0.5	(23b
	-	•	_					Ola ) (	001-) [	4 (00)	68.85	(23c
a) If balanced mecl (24a)m= 0.32 0.32	nanicai ve	o.3	0.29	o.28	0.28	HR) (248	0.28	2b)m + ( 0.29	23b) <b>x</b> [	1 – (23c) 0.31	) ÷ 100] ]	(24a
` '		<u> </u>			<u> </u>			<u> </u>		0.31	]	(244
b) If balanced mecl	anicai ve	ntilation	o	neat red	overy (r	0 (240	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (24)$	2b)m + (.   0	230)	0	1	(24b
										0	]	(240
c) If whole house e if (22b)m < 0.5			•	-				.5 × (23k	)		1	
(24c)m = 0 0	0	0	0	0	0	0	0	0	0	0	]	(24c
d) If natural ventilat if (22b)m = 1, t				•				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 (24	c) or (24	d) in box	(25)					
(25)m= 0.32 0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25)
3. Heat losses and h	eat loss i	paramet	er:									
<b>ELEMENT</b> Gro		Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		X k J/K
Windows Type 1	(111)		•	4.72		+( 1.2 )/[1/		5.4		NO/III		(27)
Windows Type 2				2.29	= .			2.62	=			(27)
Windows Type 3					=	/[1/( 1.2 )+			=			, ,
Windows Type 4				4.57	ऱ .	/[1/( 1.2 )+		5.23	=			(27)
Windows Type 5				2.26		/[1/( 1.2 )+ /[1/( 1.2 )+		2.59	<b>=</b>			(27)
	10	05.0		4.5				5.15	륵 ,			(27)
Walls Type 1 85		25.3		60.14	=	0.18	=	10.83	믁 ¦			(29)
_ · ·	99	0	_	22.99	=	0.23	=	5.22	닠 ¦		$\dashv$ $\vdash$	(29)
	04	0		71.04	×	0.13	=	9.24				(30)
Total area of element	·			179.4			/F/4/11 1	\ 0.047		,		(31)
* for windows and roof win  ** include the areas on bot					ated using	j formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapi	1 3.2	
Fabric heat loss, W/K	= S (A x	U)	,			(26)(30)	) + (32) =				54.28	(33)
Heat capacity Cm = S	S(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	5627.16	(34)
Thermal mass param	eter (TMI	c = Cm -	- TFA) ir	ı kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assessments w			constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridges : S (	_xY) cal	culated (	using Ap	pendix ł	<						20.73	(36)
if details of thermal bridging	g are not kr	own (36) =	= 0.15 x (3	1)								
Total fabric heat loss							(33) +	(36) =			75.01	(37)
Ventilation heat loss	1	<del>г '</del>			1	1		= 0.33 × (		<u> </u>	1	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 19.03 18.84	18.65	17.69	17.5	16.55	16.55	16.36	16.93	17.5	17.89	18.27	]	(38)
Heat transfer coefficie	ent, W/K						(39)m	= (37) + (	38)m		,	
(39)m= 94.04 93.85	93.66	92.7	92.51	91.56	91.56	91.37	91.94	92.51	92.89	93.27		
Stroma FSAP 2012 Versio	n: 1.0.4.14	(SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39) <sub>1</sub>	12 /12=	92.6 <b>5</b> age	<u>2 of 39)</u>

eat loss par	ameter (l	HLP), W	m²K					(40)m	= (39)m ÷	(4)			
)m= 1.32	1.32	1.32	1.3	1.3	1.29	1.29	1.29	1.29	1.3	1.31	1.31		
ımber of da	ve in mo	nth (Tah	lo 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.3	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
	1												
. Water hea	ating ene	rgy requi	rement:								kWh/ye	ar:	
sumed occ	unancy	NI									07		
if TFA > 13	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (	TFA -13.		27		(4
if TFA £ 13 inual avera	,	atar usac	na in litra	s nar da	v Vd av	orano –	(25 v NI)	<b>+</b> 36			44		(4
duce the annu									se target o		3.14		(-
t more that 12	5 litres per <sub>l</sub>	person per	day (all w	ater use, l	not and co	ld)		,	,	,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage	· ·					1	· <i>'</i>	1		1			
)m= 96.95	93.43	89.9	86.38	82.85	79.32	79.32	82.85	86.38	89.9	93.43	96.95	1057.07	<b>—</b> ,
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) <sub>112</sub> = ables 1b, 1	L	1057.67	(4
)m= 143.78	125.75	129.76	113.13	108.55	93.67	86.8	99.6	100.79	117.47	128.22	139.24		
´		<u>l</u>				l	l		<u>I</u> Total = Su	<u>I</u> m(45) <sub>112</sub> =	=	1386.77	(4
nstantaneous	water heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)			_		
)m= 21.57	18.86	19.46	16.97	16.28	14.05	13.02	14.94	15.12	17.62	19.23	20.89		(•
ater storage		المماريطانم		olor or M	WHDC	otoro ao	within o		امما				,
orage volur	, ,		•			_		allie ves	SCI		0		(4
community herwise if r	_			-			' '	ers) ente	er '0' in (	47)			
ater storage			. (-					, ,		,			
If manufac	turer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(4
mperature	factor fro	m Table	2b								0		(-
ergy lost fr		_	-				(48) x (49)	) =		1	10		(
If manufact of water sto			-								02		(!
community	•			C 2 (KVV)	11/11110/00	·y <i>)</i>				0.	.02		(•
lume facto	-									1.	.03		(
mperature	factor fro	m Table	2b							0	.6		(
ergy lost fr		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(
nter (50) or	` , , ,	,								1.	.03		(
ater storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m 				
)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		(
ylinder contair	ns 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	×Н	
)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		(
mary circui	t loss (ar	nnual) fro	m Table	3							0		(
mary circu				,		. ,	, ,			· · · · · · · · · · · · · · · · · · ·			
(modified b	y factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
)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		(

Combile		المعاملية	<b>.</b>	. حاد		(04)	(00	N . 20	CE (44)	١									
Combi lo		r		in i	i		(60 T		· ` `	_		0						1	(61)
(61)m=	0	0	0		0	0	Ļ	0	0	(22)		0	0		0	0		(50)	(01)
				_			_			<del>`</del>	_		<del>`</del>		<del>` ´                                     </del>	<del>`</del>		(59)m + (61)m	(60)
` '	199.05	175.68	185.0		166.62	163.83	<u> </u>	47.16	142.08	154		154.29	172.7		181.72	194.			(62)
Solar DHW			_					-					r contri	buti	ion to wate	er heati	ing)		
(add add				<b>Б</b> 8			ap T		·	<del>-</del>								1	(63)
(63)m=	0	0	0		0	0		0	0	0		0	0		0	0		l	(63)
Output fr				. 1														1	
(64)m= 1	199.05	175.68	185.0	4	166.62	163.83	14	47.16	142.08	154		154.29	172.7		181.72	194.	52	0007.04	1(64)
									1						r (annual) <sub>1</sub>			2037.61	(64)
Heat gair				Ť			_		<del>``</del>	r È	_		<del>-``</del>		<del>`</del>	<del>`</del>	_	1] 1	(a=)
` '	92.03	81.75	87.37	_	80.41	80.31	<u> </u>	3.94	73.08	77.		76.31	83.2		85.43	90.5			(65)
include	e (57)	m in calc	culation	1 0	f (65)m	only if o	ylir	nder i	s in the o	dwell	ing	or hot w	ater is	s fr	om com	munit	y ł	neating	
5. Inter	nal ga	ains (see	Table	5	and 5a)	):													
Metab <u>oli</u>	c gair	s (Table	5), W	atts	S								_						
	Jan	Feb	Ма	r L	Apr	May		Jun	Jul	Α	ug	Sep	Oc	t	Nov	De	ес		
(66)m= 1	13.56	113.56	113.5	6	113.56	113.56	1′	13.56	113.56	113	.56	113.56	113.	56	113.56	113.	56		(66)
Lighting	gains	(calculat	ted in	App	pendix I	L, equat	ion	L9 o	r L9a), a	lso s	ee -	Table 5							
(67)m=	17.8	15.81	12.86		9.74	7.28	6	5.14	6.64	8.6	3	11.58	14.7	1	17.17	18.3	3		(67)
Applianc	es ga	ins (calc	ulated	in	Append	dix L, eq	uat	ion L	13 or L1	3a), :	also	see Ta	ble 5					•	
(68)m= 1	199.71	201.78	196.5	3 T	185.44	171.41	15	58.22	149.41	147	.34	152.56	163.6	86	177.71	190.	.9	]	(68)
Cooking	gains	(calcula	ted in	Ap	pendix	L, equa	tion	L15	or L15a	, als	o se	e Table	5					•	
(69)m=	34.36	34.36	34.36	Ť	34.36	34.36	3	4.36	34.36	34.	36	34.36	34.3	6	34.36	34.3	6	]	(69)
Pumps a	and fa	ns gains	(Table	- 5a	 a)													1	
(70)m=	0	0	0	T	0	0		0	0	0	)	0	0		0	0		]	(70)
Losses e	e.g. ev	/aporatio	n (neg	  ati	ve valu	es) (Tab	le :	5)							Į.			1	
	90.84	-90.84	-90.84	_	-90.84	-90.84	_	90.84	-90.84	-90	.84	-90.84	-90.8	34	-90.84	-90.8	34	]	(71)
Water he	eating	gains (T	able 5	 ()			_		!	l			!			!		1	
_	23.69	121.66	117.4	<del>_</del>	111.68	107.95	1	02.7	98.23	103	.95	105.98	111.9	93	118.65	121.6	67	]	(72)
 Total int	ernal	gains =						(66)	)m + (67)m	ı ı + (68	3)m +	- (69)m + (	(70)m +	ı (7	1)m + (72)	m		ı	
	398.28	396.32	383.9	2	363.93	343.7	32	24.13	311.34	316	.98	327.19	347.3	38	370.59	387.9	93	]	(73)
6. Solar	r gains	S:					_												
	Ĭ	calculated i	using so	olar	flux from	Table 6a	and	assoc	iated equa	tions	to co	nvert to th	e appli	cab	le orientat	ion.			
Orientation	on: A	Access F	actor		Area			Flu	IX			g_			FF			Gains	
		Table 6d			m²			Tal	ble 6a		Т	able 6b		Ta	able 6c			(W)	
East	0.9x	2		x	2.2	26	x	1	9.64	x		0.5	x	Г	0.7		=	21.53	(76)
East	0.9x	1	$\overline{}$	х	4.5	5	x	1	19.64	x		0.5	×	F	0.7		=	21.44	(76)
East	0.9x	2		x	2.2	16	x	3	38.42	X		0.5	x	F	0.7	一	=	42.12	(76)
East	0.9x	1		х	4.5	5	x	3	38.42	X		0.5	X	F	0.7	一	=	41.94	(76)
East	0.9x	2		x	2.2	26	x	6	3.27	X		0.5	×	F	0.7	一	=	69.37	(76)

_	_		-						ı				_
East	0.9x	1	X	4.5	X	63.27	X	0.5	X	0.7	=	69.06	(76)
East	0.9x	2	X	2.26	x	92.28	X	0.5	X	0.7	=	101.17	(76)
East	0.9x	1	X	4.5	X	92.28	X	0.5	X	0.7	=	100.72	(76)
East	0.9x	2	X	2.26	X	113.09	X	0.5	X	0.7	=	123.99	(76)
East	0.9x	1	X	4.5	X	113.09	X	0.5	X	0.7	=	123.44	(76)
East	0.9x	2	X	2.26	x	115.77	X	0.5	X	0.7	=	126.92	(76)
East	0.9x	1	X	4.5	x	115.77	X	0.5	X	0.7	=	126.36	(76)
East	0.9x	2	X	2.26	x	110.22	x	0.5	x	0.7	=	120.84	(76)
East	0.9x	1	X	4.5	x	110.22	X	0.5	x	0.7	=	120.3	(76)
East	0.9x	2	X	2.26	x	94.68	x	0.5	x	0.7	=	103.8	(76)
East	0.9x	1	X	4.5	x	94.68	x	0.5	x	0.7	=	103.34	(76)
East	0.9x	2	X	2.26	x	73.59	x	0.5	x	0.7	=	80.68	(76)
East	0.9x	1	X	4.5	x	73.59	X	0.5	x	0.7	=	80.32	(76)
East	0.9x	2	X	2.26	x	45.59	X	0.5	x	0.7	=	49.98	(76)
East	0.9x	1	X	4.5	x	45.59	X	0.5	x	0.7	=	49.76	(76)
East	0.9x	2	X	2.26	x	24.49	X	0.5	x	0.7	=	26.85	(76)
East	0.9x	1	X	4.5	x	24.49	x	0.5	x	0.7	=	26.73	(76)
East	0.9x	2	X	2.26	x	16.15	x	0.5	x	0.7	=	17.71	(76)
East	0.9x	1	X	4.5	x	16.15	x	0.5	x	0.7	=	17.63	(76)
West	0.9x	0.77	X	4.72	x	19.64	x	0.5	x	0.7	=	44.97	(80)
West	0.9x	0.77	X	2.29	x	19.64	x	0.5	x	0.7	=	10.91	(80)
West	0.9x	0.77	X	4.57	x	19.64	X	0.5	x	0.7	=	21.77	(80)
West	0.9x	0.77	X	4.72	x	38.42	X	0.5	x	0.7	=	87.97	(80)
West	0.9x	0.77	X	2.29	x	38.42	X	0.5	X	0.7	=	21.34	(80)
West	0.9x	0.77	X	4.57	x	38.42	X	0.5	X	0.7	=	42.59	(80)
West	0.9x	0.77	X	4.72	x	63.27	X	0.5	X	0.7	=	144.87	(80)
West	0.9x	0.77	X	2.29	x	63.27	x	0.5	x	0.7	=	35.14	(80)
West	0.9x	0.77	X	4.57	x	63.27	X	0.5	x	0.7	=	70.14	(80)
West	0.9x	0.77	X	4.72	x	92.28	X	0.5	x	0.7	=	211.29	(80)
West	0.9x	0.77	X	2.29	x	92.28	x	0.5	x	0.7	=	51.26	(80)
West	0.9x	0.77	X	4.57	x	92.28	X	0.5	x	0.7	=	102.29	(80)
West	0.9x	0.77	X	4.72	x	113.09	X	0.5	x	0.7	=	258.95	(80)
West	0.9x	0.77	X	2.29	x	113.09	X	0.5	x	0.7	=	62.82	(80)
West	0.9x	0.77	x	4.57	x	113.09	x	0.5	x	0.7	=	125.36	(80)
West	0.9x	0.77	X	4.72	x	115.77	X	0.5	x	0.7	=	265.08	(80)
West	0.9x	0.77	x	2.29	x	115.77	x	0.5	x	0.7	=	64.3	(80)
West	0.9x	0.77	X	4.57	x	115.77	x	0.5	x	0.7	=	128.33	(80)
West	0.9x	0.77	x	4.72	x	110.22	x	0.5	x	0.7	j =	252.36	(80)
West	0.9x	0.77	X	2.29	x	110.22	x	0.5	x	0.7	=	61.22	(80)
West	0.9x	0.77	x	4.57	x	110.22	x	0.5	x	0.7	j =	122.17	(80)
West	0.9x	0.77	X	4.72	x	94.68	x	0.5	x	0.7	j =	216.78	(80)
			_		-		- '		-		-		_

West	0.9x	0.77	x	2.2	29	X	9	4.68	x		0.5	x	0.7		=	52.59	(80)
West	0.9x	0.77	x	4.5	57	X	9	4.68	x		0.5	×	0.7		=	104.94	(80)
West	0.9x	0.77	x	4.7	72	X	7	3.59	x		0.5	x	0.7		=	168.5	(80)
West	0.9x	0.77	x	2.2	29	X	7	3.59	x		0.5	×	0.7		=	40.87	(80)
West	0.9x	0.77	x	4.5	57	X	7	3.59	x		0.5	×	0.7		=	81.57	(80)
West	0.9x	0.77	x	4.7	72	X	4	5.59	x		0.5	x	0.7		=	104.38	(80)
West	0.9x	0.77	x	2.2	29	X	4	5.59	x		0.5	×	0.7		=	25.32	(80)
West	0.9x	0.77	x	4.5	57	X	4	5.59	x		0.5	x	0.7		=	50.53	(80)
West	0.9x	0.77	x	4.7	72	X	2	4.49	x		0.5	X	0.7		=	56.07	(80)
West	0.9x	0.77	x	2.2	29	X	2	4.49	x		0.5	X	0.7		=	13.6	(80)
West	0.9x	0.77	х	4.5	57	X	2	4.49	х		0.5	x	0.7		=	27.15	(80)
West	0.9x	0.77	х	4.7	72	X	1	6.15	x		0.5	x	0.7		=	36.98	(80)
West	0.9x	0.77	х	2.2	29	X	1	6.15	x		0.5	x	0.7		=	8.97	(80)
West	0.9x	0.77	х	4.5	57	X	1	6.15	х		0.5	x	0.7		=	17.9	(80)
									_								
Solar	gains in	watts, ca	alculated	for eac	h month	<u>1</u>			(83)m	ı = Su	ım(74)m .	(82)m				•	
(83)m=		235.95	388.58	566.73	694.54		10.99	676.89	581	.44	451.94	279.9	8 150.4	99.	19		(83)
`		nternal a		·	·	Ť					ı			1		I	
(84)m=	518.89	632.28	772.5	930.65	1038.25	10	035.12	988.23	898	.42	779.13	627.3	6 520.99	487	.12		(84)
7. Me	ean inter	nal temp	erature	(heating	seaso	n)											
Tem	perature	during h	eating p	eriods i	n the liv	ing	area f	from Tab	ole 9	. Th1	I (°C)					21	(85)
										,	` '						
Utilis	ation fac	tor for g	ains for	living are	ea, h1,n	n (s	ee Ta	ble 9a)		,							
Utilis	ation fac	tor for g	ains for Mar	living are	ea, h1,n May	T	ee Ta Jun	ble 9a) Jul	ı	ug	Sep	Oc	Nov	D	ec		
Utilis (86)m=					ı	Ĺ			ı	ug	· , ,	Oct	. Nov 0.93	D(			(86)
(86)m=	Jan 0.95	Feb	Mar 0.87	Apr 0.77	May 0.64	(	<b>Jun</b> 0.49	Jul 0.38	0.4	ug 13	Sep 0.63		+	-			(86)
(86)m= Mear	Jan 0.95	Feb 0.92	Mar 0.87	Apr 0.77	May 0.64	follo	<b>Jun</b> 0.49	Jul 0.38	0.4	ug 13 able	Sep 0.63		0.93	-	96		(86)
(86)m= Mear (87)m=	Jan 0.95 n interna 18.45	Feb 0.92 Il temper 18.8	Mar 0.87 ature in 19.37	Apr 0.77 living ar 20.03	0.64 ea T1 (t	follo	Jun 0.49 ow ste 20.82	Jul 0.38 ps 3 to 7 20.93	7 in T	ug   13   able	Sep 0.63 9c) 20.66	0.84	0.93	0.9	96		
(86)m= Mear (87)m=	Jan 0.95 n interna 18.45	Feb 0.92	Mar 0.87 ature in 19.37	Apr 0.77 living ar 20.03	0.64 ea T1 (t	follo 2	Jun 0.49 ow ste 20.82	Jul 0.38 ps 3 to 7 20.93	7 in T	ug 13 able 91 9, Th	Sep 0.63 9c) 20.66	0.84	0.93	0.9	38		
(86)m=  Mear (87)m=  Temp (88)m=	Jan 0.95 n interna 18.45 perature 19.82	Feb 0.92 Il temper 18.8 during h	Mar 0.87 ature in 19.37 eating p	Apr 0.77 living ar 20.03 periods in	May 0.64 ea T1 (t 20.53 n rest of 19.84	follo 2 f dw	Jun 0.49 ow ste 20.82 velling	Jul 0.38 ps 3 to 7 20.93 from Ta	Ai 0.47 in T 20.	ug 13 able 91 9, Th	Sep 0.63 99c) 20.66 12 (°C)	19.96	0.93	18.3	38		(87)
(86)m=  Mear (87)m=  Temp (88)m=	Jan 0.95 n interna 18.45 perature 19.82	Feb 0.92 I temper 18.8 during h	Mar 0.87 ature in 19.37 eating p	Apr 0.77 living ar 20.03 periods it 19.84	May 0.64 ea T1 (t 20.53 n rest of 19.84	follo 2 f dw 1 h2,	Jun 0.49 ow ste 20.82 velling	Jul 0.38 ps 3 to 7 20.93 from Ta	Ai 0.47 in T 20.	ug    3	Sep 0.63 99c) 20.66 12 (°C)	19.96	0.93	18.3	38		(87)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=	Jan 0.95 n interna 18.45 perature 19.82 ation fac	Feb 0.92 I temper 18.8 during h 19.82 etor for ga 0.91	Mar 0.87 ature in 19.37 eating p 19.83 ains for 0.85	Apr 0.77 living ar 20.03 periods ii 19.84 rest of d 0.74	May 0.64 ea T1 (1 20.53 n rest of 19.84 welling, 0.59	follo 2 f dw 1 h2,	Jun 0.49 bw ste 20.82 velling 19.85 ,m (se 0.42	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29	Ai 0.4 7 in T 20. able 9 19. 9a) 0.3	ug   33   7able 91   9, Th 85	Sep 0.63 e 9c) 20.66 12 (°C) 19.85	0.84 19.96 19.84 0.81	0.93	18.:	38		(87)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear	Jan 0.95 n interna 18.45 Derature 19.82 ation fact 0.94 n interna	Feb 0.92 Il temper 18.8 during h 19.82 ctor for gas 0.91 Il temper	Mar 0.87 ature in 19.37 eating p 19.83 ains for 0.85 ature in	Apr 0.77 living ar 20.03 periods in 19.84 rest of d 0.74 the rest	May 0.64 ea T1 (find 20.53 no rest of 19.84 welling, 0.59 of dwel	f dw h2,	Jun 0.49 ow ste 20.82 relling 19.85 ,m (se 0.42	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29 collow ste	A 0.4 7 in T 20. able 9 19. 9a) 0.3	ug	Sep 0.63 90) 20.66 12 (°C) 19.85 0.56	0.84 19.96 19.84 0.81 e 9c)	0.93	19.4	96 338 83		(87)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=	Jan 0.95 n interna 18.45 perature 19.82 ation fac	Feb 0.92 I temper 18.8 during h 19.82 etor for ga 0.91	Mar 0.87 ature in 19.37 eating p 19.83 ains for 0.85	Apr 0.77 living ar 20.03 periods ii 19.84 rest of d 0.74	May 0.64 ea T1 (1 20.53 n rest of 19.84 welling, 0.59	f dw h2,	Jun 0.49 bw ste 20.82 velling 19.85 ,m (se 0.42	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29	Ai 0.4 7 in T 20. able 9 19. 9a) 0.3	ug	Sep 0.63 9 9c) 20.66 0.2 (°C) 19.85 0.56 in Table 19.53	0.84 19.96 19.84 0.81 e 9c)	0.93 19.08 19.83 0.92	0.9 18.: 19.4 0.9	96 338 83		(87) (88) (89) (90)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear (90)m=	Jan 0.95 n interna 18.45 Derature 19.82 ation fact 0.94 n interna 16.45	Feb 0.92 I temper 18.8 during h 19.82 ctor for ga 0.91 I temper 16.96	Mar 0.87 ature in 19.37 eating p 19.83 ains for 0.85 ature in 17.77	Apr 0.77 living ar 20.03 periods ii 19.84 rest of d 0.74 the rest 18.69	May  0.64  ea T1 (final 20.53  n rest of 19.84  welling,  0.59  of dwel  19.34	follo 2 f dw 1 h2,	Jun 0.49  ow ste 20.82  velling 19.85  ,m (se 0.42  T2 (fo	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29 collow ste	A 0.4 7 in T 20. able 9 19. 9a) 0.3 19.	ug   13   14   15   15   15   15   15   15   15	Sep 0.63 9c) 20.66 12 (°C) 19.85 0.56 7 in Table 19.53	0.84 19.96 19.84 0.81 e 9c)	0.93	0.9 18.3 19.4 0.9	96 338 83	0.39	(87) (88) (89)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear (90)m=	Jan 0.95 n interna 18.45 perature 19.82 ation fac 0.94 n interna 16.45	Feb 0.92 Il temper 18.8 during h 19.82 etor for ga 0.91 Il temper 16.96	Mar 0.87 ature in 19.37 eating p 19.83 ains for 0.85 ature in 17.77	Apr 0.77 living ar 20.03 periods ii 19.84 rest of d 0.74 the rest 18.69	May 0.64 ea T1 (1 20.53 n rest of 19.84 welling, 0.59 of dwel 19.34	follo 2 f dw 1 h2,	Jun 0.49  ow ste 20.82  velling 19.85  ,m (se 0.42  T2 (fo 19.7	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29 ollow ste 19.81  A × T1	9a) 0.3 19.	ug	Sep 0.63 99c) 20.66 12 (°C) 19.85 0.56 in Table 19.53	0.84 19.96 19.84 0.81 e 9c) 18.62 LA = Li	0.93  19.08  19.83  0.92  17.37  ving area ÷ (	0.9 18.3 19.4 0.9 16.3 4) =	96 338 83 95		(87) (88) (89) (90) (91)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear (90)m=	Jan 0.95 n interna 18.45 Derature 19.82 ation fact 0.94 n interna 16.45 n interna 17.23	Feb 0.92 Il temper 18.8 during h 19.82 ctor for ga 0.91 Il temper 16.96 Il temper 17.68	Mar 0.87 ature in 19.37 eating p 19.83 ains for 0.85 ature in 17.77 ature (fo	Apr 0.77 living ar 20.03 periods in 19.84 rest of d 0.74 the rest 18.69 or the wh	May	f dw 11 h2,	Jun 0.49  ow ste 20.82  velling 19.85  m (se 0.42  T2 (fo 19.7	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29 collow ste 19.81  A × T1 20.25	A 0.4 7 in T 20. able 9 19. 9a) 0.3 19. + (1 20.	ug   13   14   15   15   15   15   15   15   15	Sep 0.63 90) 20.66 12 (°C) 19.85 0.56 7 in Table 19.53 ft A) × T2 19.97	0.84 19.96 19.84 0.81 e 9c) 18.62 LA = Li	0.93 19.08 19.83 0.92 17.37 ving area ÷ (	0.9 18.3 19.4 0.9	96 338 83 95		(87) (88) (89) (90)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear (90)m=  Mear (92)m=  Apply	Jan 0.95 n interna 18.45 perature 19.82 ation fac 0.94 n interna 16.45 n interna 17.23 y adjustr	Feb 0.92 Il temper 18.8 during h 19.82 etor for ga 0.91 Il temper 16.96 Il temper 17.68 ment to th	Mar 0.87 ature in 19.37 eating p 19.83 ains for 0.85 ature in 17.77 ature (for 18.39 ne mear	Apr 0.77 living ar 20.03 periods in 19.84 rest of d 0.74 the rest 18.69 or the wh 19.21 n interna	May	follo  2  f dw  1  h2,  colored a secon	Jun 0.49  ow ste 20.82  velling 19.85  ,m (se 0.42  T2 (fo 19.7  g) = fl 20.14  ure fro	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29 collow ste 19.81  A × T1 20.25 m Table	9a) 0.3 eps 3 19. + (1 20.	ug	Sep 0.63 99c) 20.66 12 (°C) 19.85 0.56 7 in Table 19.53 f A) × T2 19.97 re approximately approximate	0.84 19.96 19.84 0.81 e 9c) 18.62 LA = Li	0.93 19.08 19.83 0.92 17.37 ving area ÷ (	0.9 18.3 19.4 0.9 16.3 4) =	96 338 83 95 336		(87) (88) (89) (90) (91) (92)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear (90)m=  Mear (92)m=  Apply (93)m=	Jan 0.95 n interna 18.45 perature 19.82 ation fac 0.94 n interna 16.45 n interna 17.23 / adjustr 17.23	Feb  0.92  I temper  18.8  during h  19.82  ctor for ga  0.91  I temper  16.96  I temper  17.68  ment to th  17.68	Mar  0.87  ature in  19.37  eating p  19.83  ains for  0.85  ature in  17.77  ature (for  18.39  ne mear  18.39	Apr 0.77 living ar 20.03 periods in 19.84 rest of d 0.74 the rest 18.69 or the wh 19.21 n interna	May	follo  2  f dw  1  h2,  colored a secon	Jun 0.49  ow ste 20.82  velling 19.85  m (se 0.42  T2 (fo 19.7	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29 collow ste 19.81  A × T1 20.25	A 0.4 7 in T 20. able 9 19. 9a) 0.3 19. + (1 20.	ug	Sep 0.63 90) 20.66 12 (°C) 19.85 0.56 7 in Table 19.53 ft A) × T2 19.97	0.84 19.96 19.84 0.81 e 9c) 18.62 LA = Li	0.93 19.08 19.83 0.92 17.37 ving area ÷ (	0.9 18.3 19.4 0.9 16.3 4) =	96 338 83 95 336		(87) (88) (89) (90) (91)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear (90)m=  Mear (92)m=  Apply (93)m=  8. Sp	Jan 0.95 n interna 18.45 perature 19.82 ation fac 0.94 n interna 16.45 n interna 17.23 v adjustr 17.23 pace hea	Feb 0.92 Il temper 18.8 during h 19.82 etor for ga 0.91 Il temper 16.96 Il temper 17.68 ment to th 17.68 tting requ	Mar 0.87 ature in 19.37 eating p 19.83 ains for 0.85 ature in 17.77 ature (for 18.39 ne mear 18.39 uirement	Apr 0.77 living ar 20.03 periods ii 19.84 rest of d 0.74 the rest 18.69 or the wh 19.21 n interna 19.21	May	follo  2  f dw  1  h2,  Colored a co	Jun 0.49  ow ste 20.82  velling 19.85  ,m (se 0.42  T2 (fo 19.7  g) = fl 20.14  ure fro 20.14	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29 collow ste 19.81  A × T1 20.25 m Table 20.25	9a) 0.3 eps 3 19. + (1 20.	ug   33   34 to 779   37 where 23   31   32   33   34 to 779   35   35   35   35   35   35   35   3	Sep 0.63 9 9c) 20.66 12 (°C) 19.85 0.56 7 in Table 19.53 f A) × T2 19.97 re appro	0.84 19.96 19.84 0.81 e 9c) 18.62 LA = Li	0.93 19.08 19.83 0.92 17.37 ving area ÷ (	0.9 18.3 19.4 0.9 16.3 4) =	96 338 83 95 336 115	0.39	(87) (88) (89) (90) (91) (92)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear (90)m=  Mear (92)m=  Apply (93)m=  8. Sp	Jan 0.95 n interna 18.45 perature 19.82 ation fac 0.94 n interna 16.45 n interna 17.23 y adjustr 17.23 vace hea	Feb 0.92 Il temper 18.8 during h 19.82 etor for ga 0.91 Il temper 16.96 Il temper 17.68 ment to th 17.68 tting requ	Mar  0.87  ature in  19.37  leating p  19.83  ains for  0.85  ature in  17.77  ature (for  18.39  ne mear  18.39  uirement  ernal tel	Apr O.77 living ar 20.03 periods if 19.84 rest of d 0.74 the rest 18.69 or the wh 19.21 in interna	May  0.64  ea T1 (for 20.53)  rest of 19.84  welling, 0.59  of dwell 19.34  nole dwell 19.8  I tempe 19.8  re obtain	follo  2  f dw  1  h2,  Colored a co	Jun 0.49  ow ste 20.82  velling 19.85  ,m (se 0.42  T2 (fo 19.7  g) = fl 20.14  ure fro 20.14	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29 collow ste 19.81  A × T1 20.25 m Table 20.25	9a) 0.3 eps 3 19. + (1 20.	ug   33   34 to 779   37 where 23   31   32   33   34 to 779   35   35   35   35   35   35   35   3	Sep 0.63 9 9c) 20.66 12 (°C) 19.85 0.56 7 in Table 19.53 f A) × T2 19.97 re appro	0.84 19.96 19.84 0.81 e 9c) 18.62 LA = Li	0.93 19.08 19.83 0.92 17.37 ving area ÷ (	0.9 18.3 19.4 0.9 16.3 4) =	96 338 83 95 336 115	0.39	(87) (88) (89) (90) (91) (92)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear (90)m=  Mear (92)m=  Apply (93)m=  8. Sp	Jan 0.95 n interna 18.45 perature 19.82 ation fac 0.94 n interna 16.45 n interna 17.23 y adjustr 17.23 vace hea	Feb  0.92  I temper  18.8  during h  19.82  ctor for ga  0.91  I temper  16.96  I temper  17.68  ment to tl  17.68  tting requesting	Mar  0.87  ature in  19.37  leating p  19.83  ains for  0.85  ature in  17.77  ature (for  18.39  ne mear  18.39  uirement  ernal tel	Apr O.77 living ar 20.03 periods if 19.84 rest of d 0.74 the rest 18.69 or the wh 19.21 in interna	May  0.64  ea T1 (for 20.53)  rest of 19.84  welling, 0.59  of dwell 19.34  nole dwell 19.8  I tempe 19.8  re obtain	folloo 2 f dw 1 h2, lling 2 ratu 2	Jun 0.49  ow ste 20.82  velling 19.85  ,m (se 0.42  T2 (fo 19.7  g) = fl 20.14  ure fro 20.14	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 ee Table 0.29 collow ste 19.81  A × T1 20.25 m Table 20.25	A 0.4 7 in T 20. able 9 19. 9a) 0.3 eps 3 19. + (1 20. Table	ug   33   34 to 779   37 where 23   31   32   33   34 to 779   35   35   35   35   35   35   35   3	Sep 0.63 9 9c) 20.66 12 (°C) 19.85 0.56 7 in Table 19.53 f A) × T2 19.97 re appro	0.84 19.96 19.84 0.81 e 9c) 18.62 LA = Li	0.93  19.08  19.83  0.92  17.37  ving area ÷ ( 18.04  18.04	0.9  18.:  19.8  0.9  16.:  4) =  17.:  17.:  17.:	96 338 83 95 336 115	0.39	(87) (88) (89) (90) (91) (92)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear (90)m=  Mear (92)m=  Apply (93)m=  8. Sp Set T the u	Jan 0.95 n interna 18.45 perature 19.82 ation face 0.94 n interna 16.45 n interna 17.23 v adjustr 17.23 vace hea it to the tillisation Jan	Feb  0.92 Il temper  18.8 during h  19.82 ctor for ga  0.91 Il temper  16.96  Il temper  17.68 ment to th  17.68 ting required	Mar  0.87 ature in  19.37 eating p  19.83 ains for  0.85 ature in  17.77 ature (for  18.39 ne mean  18.39 direment ernal teleor gains  Mar	Apr 0.77 living ar 20.03 periods ii 19.84 rest of d 0.74 the rest 18.69 or the wh 19.21 n interna 19.21 mperatu using Ta Apr	May  0.64 ea T1 (for 20.53) n rest or 19.84 welling, 0.59 of dwell 19.34 nole dwell 19.8 I tempe 19.8 re obtain able 9a	folloo 2 f dw 1 h2, lling 2 ratu 2	Jun 0.49  ow ste 20.82  velling 19.85  ,m (se 0.42  172 (fo 19.7  g) = fl 20.14  ure fro 20.14	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 pe Table 0.29 pollow ste 19.81  A × T1 20.25 m Table 20.25 pp 11 of	A 0.4 7 in T 20. able 9 19. 9a) 0.3 eps 3 19. + (1 20. Table	ug   13   14   15   15   15   15   15   15   15	Sep 0.63 9 9c) 20.66 12 (°C) 19.85 0.56 7 in Table 19.53 f A) × T2 19.97 re appro-	0.84 19.96 19.84 0.81 e 9c) 18.62 LA = Li	0.93  19.08  19.83  0.92  17.37  ving area ÷ ( 18.04  18.04	0.9  18.:  19.8  0.9  16.:  4) =  17.:  17.:  17.:	96 338 83 95 115 calc	0.39	(87) (88) (89) (90) (91) (92)
(86)m=  Mear (87)m=  Temp (88)m=  Utilis (89)m=  Mear (90)m=  Mear (92)m=  Apply (93)m=  8. Sp Set T the u	Jan 0.95 n interna 18.45 perature 19.82 ation face 0.94 n interna 16.45 n interna 17.23 v adjustr 17.23 vace hea it to the tillisation Jan	Feb  0.92  I temper  18.8  during h  19.82  ctor for ga  0.91  I temper  16.96  I temper  17.68  ment to th  17.68  ting requesting	Mar  0.87 ature in  19.37 eating p  19.83 ains for  0.85 ature in  17.77 ature (for  18.39 ne mean  18.39 direment ernal teleor gains  Mar	Apr 0.77 living ar 20.03 periods ii 19.84 rest of d 0.74 the rest 18.69 or the wh 19.21 n interna 19.21 mperatu using Ta Apr	May  0.64 ea T1 (for 20.53) n rest or 19.84 welling, 0.59 of dwell 19.34 nole dwell 19.8 I tempe 19.8 re obtain able 9a	folloo 2 f dw 1 h2, lling 2 ratu 2	Jun 0.49  ow ste 20.82  velling 19.85  ,m (se 0.42  172 (fo 19.7  g) = fl 20.14  ure fro 20.14	Jul 0.38 ps 3 to 7 20.93 from Ta 19.85 pe Table 0.29 pollow ste 19.81  A × T1 20.25 m Table 20.25 pp 11 of	A 0.4 7 in T 20. able 9 19. 9a) 0.3 eps 3 19. + (1 20. Table	ug   13   14   15   15   15   15   15   15   15	Sep 0.63 9 9c) 20.66 12 (°C) 19.85 0.56 7 in Table 19.53 f A) × T2 19.97 re appro-	0.84 19.96 19.84 0.81 e 9c) 18.62 LA = Li	0.93  19.08  19.83  0.92  17.37  ving area ÷ ( 18.04  18.04	0.9  18.:  19.8  0.9  16.:  4) =  17.:  17.:  17.:	96 338 83 95 115 calc	0.39	(87) (88) (89) (90) (91) (92)

Useful gains, hmGm , W = (94)m x (84)m						
	27.52 444.88	491.97	464.69	453.01		(95)
Monthly average external temperature from Table 8						
	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	]				
	19.77 539.74	790.22	1015.9	1207.77		(97)
Space heating requirement for each month, kWh/month = 0.024 x		<del> </del>	r e	ı	1	
(98)m= 548.89 429.59 356.49 207.94 104.84 0 0	0 0	221.9	396.88	561.54		7(00)
On any hearting, an action and in 1980 (m. 2) and	Total per yea	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	2828.07	(98)
Space heating requirement in kWh/m²/year					39.81	(99)
9b. Energy requirements – Community heating scheme	ana Sala da					
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tal	•		unity scr	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 allow	ws for CHP and	up to four	other heat	sources; ti	he latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See	Appendix C.				0.5	7(2025)
Fraction of heat from Community heat pump					0.5	(303a)
Fraction of community heat from heat source 2					0.5	(303b)
Fraction of total space heat from Community heat pump		(3	02) x (303	a) =	0.5	(304a)
Fraction of total space heat from community heat source 2		(3	02) x (303	b) =	0.5	(304b)
Factor for control and charging method (Table 4c(3)) for community	y heating sy	stem			1	(305)
Distribution loss factor (Table 12c) for community heating system					1.05	(306)
Space heating				ı	kWh/yea	·
Annual space heating requirement					2828.07	╛
Space heat from Community heat pump	(98) x (3	804a) x (30	5) x (306) :	=	1484.74	(307a)
Space heat from heat source 2	(98) x (3	804b) x (30	5) x (306) :	=	1484.74	(307b)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or a	Appendix	E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (3	801) x 100	÷ (308) =		0	(309)
Water heating						
Annual water heating requirement					2037.61	
If DHW from community scheme: Water heat from Community heat pump	(64) x (	803a) x (30	5) x (306) :	=	1069.74	(310a)
Water heat from heat source 2	(64) x (3	803b) x (30	5) x (306) :	=	1069.74	(310b)
Electricity used for heat distribution	0.01 × [(307a	)(307e) +	- (310a)(	(310e)] =	51.09	(313)
Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107)	÷ (314) =			0	(315)
Electricity for pumps and fans within dwelling (Table 4f):						_
mechanical ventilation - balanced, extract or positive input from out	tside				232.06	(330a)
warm air heating system fans					0	(330b)
						_

						_
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b	o) + (330g) =		232.06	(331)
Energy for lighting (calculated in Appendix	_)				314.43	(332)
Electricity generated by PVs (Appendix M)	(negative quantity)			Ī	-433.91	(333)
Electricity generated by wind turbine (Appe	ndix M) (negative qua	antity)		Ī	0	(334)
12b. CO2 Emissions – Community heating	scheme			_		_
		Energy kWh/year	Emission fact kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and wate Efficiency of heat source 1 (%)		two fuels repeat (363) to	(366) for the second	l fuel	425	(367a)
Efficiency of heat source 2 (%)	If there is CHP using	two fuels repeat (363) to	(366) for the second	l fuel	91	(367b)
CO2 associated with heat source 1	[(307b)+(	310b)] x 100 ÷ (367b) x	0.52	=	311.95	(367)
CO2 associated with heat source 2	[(307b)+(	310b)] x 100 ÷ (367b) x	0.22	=	606.34	(368)
Electrical energy for heat distribution	]	(313) x	0.52	=	26.52	(372)
Total CO2 associated with community syste	ems (	363)(366) + (368)(372	2)	=	944.8	(373)
CO2 associated with space heating (second	dary) (	309) x	0	=	0	(374)
CO2 associated with water from immersion	heater or instantane	ous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water	heating (	373) + (374) + (375) =			944.8	(376)
CO2 associated with electricity for pumps a	nd fans within dwellir	ng (331)) x	0.52	=	120.44	(378)
CO2 associated with electricity for lighting	(	332))) x	0.52	=	163.19	(379)
Energy saving/generation technologies (33: Item 1	3) to (334) as applica	ble	0.52 x 0.0	1 = [	-225.2	(380)
Total CO2, kg/year sur	n of (376)(382) =			Ē	1003.23	(383)
Dwelling CO2 Emission Rate (38	3) ÷ (4) =			Ē	14.12	(384)

El rating (section 14)

		Use	Details:						
Assessor Name:	Joseph Treanor		Strom	a Nium	hor:		STRO	032062	
Software Name:	Stroma FSAP 20°	12	Softwa					n: 1.0.4.14	
John Ware Hame.	Otroma i Orai Zo		ty Address		31011.		VCISIO	11. 1.0.4.14	
Address :	, Gondar Gardens,	•	·	710					
Overall dwelling dime		20114011, 11110							
3		Α	rea(m²)		Av. Hei	ght(m)		Volume(m <sup>3</sup>	3)
Ground floor				(1a) x		55	(2a) =	226.41	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	88.79	(4)			<b>-</b> '		
Dwelling volume				(3a)+(3b)	)+(3c)+(3d)	)+(3e)+	(3n) =	226.41	(5)
2. Ventilation rate:									
		econdary	other		total			m³ per hou	ır
Number of chimneys	heating 0 +	heating +	0	] = [	0	<b>x</b>	40 =	0	(6a)
Number of open flues	0 +	0 +	0	j = [	0	x	20 =	0	(6b)
Number of intermittent fa	ans			'   	0	x	10 =	0	(7a)
Number of passive vents	3				0	x	10 =	0	(7b)
Number of flueless gas f	ires			F	0	x	40 =	0	(7c)
				L			ı		
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6	6a)+(6b)+(7a)+(7b	)+(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has b	oeen carried out or is intend	led, proceed to (17	7), otherwise o	continue fro	om (9) to (	16)	ı		_
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber	frame or 0.35	for masoni	y constr	uction			0	(11)
	resent, use the value corres	sponding to the gr	eater wall are	a (after			•		
deducting areas of openi If suspended wooden		led) or 0.1 (se	aled), else	enter 0			i	0	(12)
If no draught lobby, en	•		,,				i	0	(13)
Percentage of window		tripped					ļ	0	(14)
Window infiltration	o and accio araugin c	шрроц	0.25 - [0.2	x (14) ÷ 1	001 =			0	(15)
Infiltration rate			(8) + (10)			· (15) =	l I		(16)
Air permeability value,	a50 expressed in cul	hic metres ner					area l	0	(17)
If based on air permeabi		•	·	•		пусторо	, area	3	(17)
Air permeability value applie					is beina us	ed	l	0.15	(10)
Number of sides sheltered			g				ĺ	2	(19)
Shelter factor			(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified t	for monthly wind spee	d							
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
							•		
Wind Factor $(22a)m = (2a)m =$	2)m ÷ 4								

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.16	ation rate	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe			-	-	l -		J	00	<b></b>	J			
If mechanica											إ	0.5	(23
If exhaust air h		0 11		, ,	,	. `	,, .	•	) = (23a)		إ	0.5	(23
If balanced with		•	-	_								68.85	(23
a) If balance						<u> </u>	<del></del>	<del>``</del>	<del> </del>	<del></del>	<del>r ` ´</del>	÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(24
b) If balance	1	i			i		<del>-                                    </del>	· ·	<del></del>		1		(0
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•					E (22h	. \			
$\frac{11(220)11}{24c)m=0}$	n < 0.5 ×	0	0	0 = (23L	0	0	0 = (221)	0	0 × (231	0	0		(24
			,						0				(2-
d) If natural if (22b)n	venilialion n = 1, the			•	•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(2
0 11											'		
3. Heat losse					<b>N.</b>								
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-k		X k J/K
Vindows Type		()			5.08		/[1/( 1.2 )+		5.82	<del>'</del>			(2
Vindows Type					5.06	=	/[1/( 1.2 )+	L	5.79	=			(27
Vindows Type					10.85	〓 .		L	12.42	$\dashv$			(2
Valls Type1	65.9		20.99		44.51	=	0.18		8.01	╡ ,			(2
Walls Type2				<u></u>		=				륵 ¦		-	(2)
Walls Type3	24.8		0	<b>=</b>	24.84	=	0.18	<b>=</b>	4.47				=
	7.3		0		7.37	×	0.23	= [	1.67				(2
Total area of e	nements	, 1112			97.71	=							(3
Party wall			· · · ·		33.69		0	= [	0				(3:
for windows and it include the area						atea using	i tormula 1.	/[(1/U-vaiu	ie)+0.04] a	as given in	paragrapn	3.2	
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =			[	38.19	(3:
	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6119.25	<del>=</del>  (3
Heat capacity											<u> </u>	400	=
	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
Heat capacity	•	•		•			ecisely the				able 1f	100	(3
Heat capacity Thermal mass For design assess an be used inste	sments whead of a dea	ere the de tailed calc	tails of the ulation.	constructi	ion are not	t known pr	ecisely the				able 1f	100	(3
Heat capacity Thermal mass For design assess an be used inste Thermal bridge	sments whead of a dec	ere the de tailed calco x Y) cal	tails of the ulation. culated u	constructius	ion are not pendix l	t known pr	ecisely the				able 1f	10.03	<u> </u>
leat capacity Thermal mass For design assess an be used inste Thermal bridge I details of therma	sments whead of a decent sead of a decent sead of a decent sead of a decent sead of the se	ere the de tailed calco x Y) cal	tails of the ulation. culated u	constructius	ion are not pendix l	t known pr	ecisely the	indicative	values of		able 1f	10.03	(3
Heat capacity Thermal mass For design assess an be used inste Thermal bridge details of therma Total fabric he	sments whead of a decent of a	ere the de tailed calcu x Y) cal- are not kn	tails of the ulation. culated u	constructiusing Ap	ion are not pendix l	t known pr	ecisely the	indicative	values of (36) =	TMP in T	[		(3
Heat capacity Thermal mass For design assess an be used inste Thermal bridge Total fabric he Tentilation hea	sments whead of a december : S (Leal bridging eat loss can	ere the de tailed calcu x Y) calcu are not kn	tails of the ulation. culated u own (36) =	constructions and constructions and constructions are constructed as the construction of the construction	pendix h	t known pr	,	(33) + (38)m	(36) = = 0.33 × (	7MP in To 25)m x (5)	[	10.03	(3
Theat capacity Thermal mass For design assess an be used inste Thermal bridge f details of therma Total fabric he Jan Jan	sments whead of a decest : S (Leal bridging eat loss cat	ere the de tailed calculatec x Y) calculatec Mar	tails of the ulation. culated u own (36) = I monthly	constructions are constructed using Ap = 0.15 x (3)	ppendix ł 1) Jun	t known pr	Aug	(33) + (38)m Sep	(36) = = 0.33 × (	25)m x (5 Nov	Dec	10.03	(3
Thermal mass For design assess an be used inste Thermal bridge f details of therma Total fabric he /entilation hea Jan 38)m= 23.78	esments whead of a decest : S (Leal bridging eat loss cat	ere the de tailed calculatec  X Y) calculatec  Mar  23.31	tails of the ulation. culated u own (36) =	constructions and constructions and constructions are constructed as the construction of the construction	pendix h	t known pr	,	(33) + (38)m Sep 21.16	(36) = = 0.33 × ( Oct 21.88	25)m x (5 Nov 22.35	[	10.03	(3)
Thermal mass For design assess an be used inste Thermal bridge details of therma Total fabric he Ventilation hea	esments whead of a decest : S (Leal bridging eat loss cat	ere the de tailed calculatec  X Y) calculatec  Mar  23.31	tails of the ulation. culated u own (36) = I monthly	constructions are constructed using Ap = 0.15 x (3)	ppendix ł 1) Jun	t known pr	Aug	(33) + (38)m Sep 21.16	(36) = = 0.33 × (	25)m x (5 Nov 22.35	Dec	10.03	(3

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.81	0.81	0.81	0.79	0.79	0.78	0.78	0.77	0.78	0.79	0.79	0.8		
				ı		l	l		Average =	: Sum(40) <sub>1</sub>	12 /12=	0.79	(40)
Number of day	<u> </u>	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 hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		61		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t	` ,		se target o		5.16		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								·'					
(44)m= 105.77	101.93	98.08	94.24	90.39	86.54	86.54	90.39	94.24	98.08	101.93	105.77		
	•								Total = Su	ım(44) <sub>112</sub> =	=	1153.91	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 156.86	137.19	141.57	123.42	118.43	102.19	94.7	108.67	109.97	128.15	139.89	151.91		
If instantaneous	water beati	na at naint	of upo (no	hat water	, ataragal	antar O in	haves (46		Total = Su	ım(45) <sub>112</sub> =	= [	1512.95	(45)
If instantaneous v			,	ı	, , , , , , , , , , , , , , , , , , ,		, ,	, , , I	1		<del></del> 1		(40)
(46)m= 23.53 Water storage	20.58 LOSS:	21.24	18.51	17.76	15.33	14.2	16.3	16.49	19.22	20.98	22.79		(46)
Storage volum		) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	nk in dw	/elling, e	nter 110	litres in	(47)				J		
Otherwise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufact				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, 0.0	-97				<u> </u>	.02		(0.)
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	factor fro	m Table	2b							0	.6		(53)
Energy lost fro	om wate	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (50) or	(54) in (	55)								1.	03		(55)
Water storage	loss cal	culated 1	or each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	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 Appendi	хН	
(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	nual) 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 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 calcu	lated for e	ach mo	nth (61)m	= (6)	0) ÷ 36	65 × (41)	)m							
(61)m= 0	0 0		<del>``</del>	<del>\(\frac{1}{2}\)</del>	0	0	0		0	0	0	0	]	(61)
Total heat require	ed for wate	r heatir	n calculat	ed fo	or eac	h month	(62)r	—— m =	0 85 x (	45)m ·	 + (46)m +	(57)m +	l (59)m + (61)m	
<del>_</del> _	37.12 196.		<del></del>	_	155.69	149.97	163.	_	163.46	183.43	<del>``</del>	207.19	]	(62)
Solar DHW input calc	ulated using	Appendix	G or Appen	dix H	(negati	ve quantity	() (ente	<b>l</b> er '0'	if no sola	contrib	ution to wate	er heating)	I	
(add additional lir	_				-							0,		
(63)m= 0	0 0		0	T	0	0	0		0	0	0	0		(63)
Output from water	r heater					•		'			•	•	•	
(64)m= 212.14 18	37.12 196.	85 176	.92 173.7	<b>7</b> 1	155.69	149.97	163.	.94	163.46	183.43	3 193.38	207.19		
	· · · · ·							Outp	ut from wa	ater hea	ter (annual)	112	2163.79	(64)
Heat gains from v	vater heat	ing, kW	n/month 0	.25 ′	[0.85	× (45)m	+ (6	1)m	] + 0.8 x	: [(46)r	n + (57)m	+ (59)m	1	
(65)m= 96.38 8	5.56 91.2	29 83	83 83.6	T -	76.77	75.71	80.3	35	79.36	86.83	89.31	94.73		(65)
include (57)m i	n calculati	on of (6	5)m only i	f cyli	nder i	s in the o	dwelli	ing (	or hot w	ater is	from com	munity h	i leating	
5. Internal gains	s (see Tab	le 5 and	5a):											
Metabolic gains (	Table 5). \	Vatts	,											
	Feb M		or Ma	у	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(66)m= 130.44 1:	30.44 130.	44 130	.44 130.4	4 1	130.44	130.44	130.	.44	130.44	130.4	4 130.44	130.44		(66)
Lighting gains (ca	alculated in	n Appen	dix L, equ	atior	ո L9 o	r L9a), a	lso s	ee 7	Table 5		•		•	
(67)m= 21.11 1	8.75 15.2	25 11	55 8.63		7.29	7.87	10.2	23	13.74	17.44	20.36	21.7		(67)
Appliances gains	(calculate	d in Apı	endix L, e	equa	tion L	13 or L1	3a), a	also	see Tal	ole 5	•	•	'	
(68)m= 236.83 23	39.29 233	.1 219	.91 203.2	7 1	187.63	177.18	174.	.72	180.92	194.1	210.74	226.38		(68)
Cooking gains (c	alculated in	n Apper	dix L, equ	atio	n L15	or L15a)	, also	o se	e Table	5	•	•	•	
(69)m= 36.04 3	6.04 36.0	04 36	04 36.04	; ;	36.04	36.04	36.0	04	36.04	36.04	36.04	36.04		(69)
Pumps and fans	gains (Tab	le 5a)	•					•			•	•	•	
(70)m= 0	0 0	(	0		0	0	0		0	0	0	0		(70)
Losses e.g. evap	oration (ne	egative	/alues) (T	able	5)	•		•			•	•	•	
(71)m= -104.35 -1	04.35 -104	.35 -104	.35 -104.3	5 -1	104.35	-104.35	-104.	.35	-104.35	-104.3	5 -104.35	-104.35		(71)
Water heating ga	ins (Table	5)	•			•		•			•	•	•	
(72)m= 129.54 12	27.32 122.	71 116	.44 112.3	6 1	106.63	101.76	108	8	110.22	116.7	1 124.04	127.33		(72)
Total internal ga	ins =	•	•		(66)	)m + (67)m	ı + (68	3)m +	· (69)m + (	70)m +	(71)m + (72)	)m	•	
(73)m= 449.62 4	47.5 433.	19 410	.03 386.4	1 3	363.68	348.94	355.	.09	367	390.38	3 417.27	437.54		(73)
6. Solar gains:	•		•					·			•	•		
Solar gains are calc	ulated using	solar flux	from Table 6	a and	d assoc	iated equa	tions t	to co	nvert to th	e applic	able orienta	tion.		
Orientation: Acc			rea		Flu			_	g_ - b l - Cb		FF		Gains	
	le 6d		m²		ı aı	ble 6a		16	able 6b		Table 6c		(W)	_
East 0.9x	1	х	10.85	X	1	9.64	х		0.5	X	0.7	=	51.69	(76)
East 0.9x	1	х	10.85	X	3	38.42	x		0.5	×	0.7	=	101.11	(76)
East 0.9x	1	X	10.85	×	6	3.27	x		0.5	X	0.7	=	166.51	(76)
East 0.9x	1	X	10.85	X	9	92.28	x		0.5	X	0.7	=	242.85	(76)
East 0.9x	1	X	10.85	X	1	13.09	х		0.5	X	0.7	=	297.62	(76)

East	<u>.</u> . Г					7			1			- I			г		7.70
	0.9x	1		X	10.85	J X	_	15.77	] X ]	0		X	0.7	╡ :	F	304.67	<b>」</b> (76)
East	0.9x	1		X	10.85	J X T		10.22	] X ]	0		_  X	0.7	╡ :	F	290.06	<u></u> (76)
East	0.9x	1		X	10.85	J X		94.68	] X ]	0		_  ×	0.7	_   -	F	249.16	<b>」</b> (76)
East	0.9x	1		X	10.85	X		'3.59	X	0	.5	X	0.7	┩ ᠄	Ļ	193.66	<u></u> (76)
East	0.9x	1		X	10.85	X	4	5.59	X	0	.5	X	0.7	•	Ļ	119.98	<u> </u> (76)
East	0.9x	1		X	10.85	X	2	24.49	X	0	.5	X	0.7		ِ ا	64.45	(76)
East	0.9x	1		X	10.85	X		6.15	X	0	.5	X	0.7	=	- <u>L</u>	42.5	(76)
West	0.9x	0.77		X	5.08	X	1	9.64	X	0	.5	X	0.7	=	• <u>L</u>	24.2	(80)
West	0.9x	0.77		X	5.06	X		9.64	X	0	.5	X	0.7	=	- <u>L</u>	24.1	(80)
West	0.9x	0.77		X	5.08	X	3	88.42	X	0	.5	X	0.7	=	- [	47.34	(80)
West	0.9x	0.77		X	5.06	X	3	88.42	X	0	.5	x	0.7		= [	47.15	(80)
West	0.9x	0.77		X	5.08	X	6	3.27	X	0	.5	x	0.7		• [	77.96	(80)
West	0.9x	0.77		X	5.06	X	6	3.27	X	0	.5	x	0.7	-	• [	77.66	(80)
West	0.9x	0.77		x	5.08	X	9	2.28	X	0	.5	X	0.7		• [	113.7	(80)
West	0.9x	0.77		X	5.06	x	9	2.28	X	0	.5	x	0.7		• [	113.26	(80)
West	0.9x	0.77		X	5.08	x	1	13.09	x	0	.5	x	0.7		• [	139.35	(80)
West	0.9x	0.77		x	5.06	x	1	13.09	X	0	.5	x	0.7		• [	138.8	(80)
West	0.9x	0.77		x	5.08	x	1	15.77	X	0	.5	x	0.7	-	- [	142.65	(80)
West	0.9x	0.77		x	5.06	x	1	15.77	x	0	.5	x	0.7		• [	142.09	(80)
West	0.9x	0.77		X	5.08	×	1	10.22	x	0	.5	x	0.7	╗.	• [	135.81	(80)
West	0.9x	0.77		X	5.06	×	1	10.22	x	0	.5	x	0.7	╡ =	• [	135.27	(80)
West	0.9x	0.77		X	5.08	x	9	94.68	x	0	.5	T x	0.7	╡:	• [	116.66	(80)
West	0.9x	0.77		X	5.06	x	9	94.68	x	0	.5	x	0.7	<b>=</b>	• [	116.2	(80)
West	0.9x	0.77		X	5.08	x	7	73.59	x	0	.5	x	0.7	<b>=</b>	• [	90.67	(80)
West	0.9x	0.77		X	5.06	x	7	73.59	x	0	.5	T x	0.7	<b>=</b>	֓֟֝֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓	90.32	(80)
West	0.9x	0.77		X	5.08	×	4	15.59	x	0	.5	x	0.7	<b>=</b>	• [	56.17	(80)
West	0.9x	0.77		X	5.06	x	4	15.59	x	0	.5	x	0.7	<b>=</b>   -	• [	55.95	(80)
West	0.9x	0.77		X	5.08	x	2	24.49	х	0	.5	X	0.7	<b>=</b>	֓֟֝֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֟֝֓֓֓֓֟֓֓֓֡֓֓֓֓֟֓֓֓֡֓֡	30.17	(80)
West	0.9x	0.77		X	5.06	x	2	24.49	х	0	.5	×	0.7	<u> </u>	֓֟֝֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓	30.06	(80)
West	0.9x	0.77		X	5.08	İx		6.15	x	0	.5	×	0.7	╡ -	ַ וֹ	19.9	(80)
West	0.9x	0.77		X	5.06	X		6.15	x	0	.5	X	0.7	╗.	ַ וֹ	19.82	(80)
	_					_			_			_ '			_		_
Solar g	ains in	watts, ca	lculate	ed	for each mon	th			(83)m	= Sum(	74)m	.(82)m					
(83)m=	99.99	195.6	322.13	3	469.81 575.7	7 :	589.4	561.13	482	.01 37	4.65	232.1	124.68	82.23	3		(83)
Total g	ains – ir	nternal a	nd sol	ar	(84)m = $(73)$ r	n + (	83)m	, watts					•		_		
(84)m=	549.61	643.1	755.32	2	879.84 962.1	7 9	53.08	910.08	837	'.1 74	1.66	622.48	541.95	519.7	7		(84)
7. Mea	an inter	nal temp	eratur	e (	heating seaso	on)											
Temp	erature	during h	eating	ре	eriods in the li	ving	area	from Tal	ole 9	Th1 (	C)				ſ	21	(85)
Utilisa	ition fac	tor for ga	ains fo	r li	ving area, h1	,m (s	ee Ta	ble 9a)									_
	Jan	Feb	Maı	·	Apr Ma	у	Jun	Jul	Α	ug :	Sep	Oct	Nov	Dec	2		
(86)m=	0.96	0.93	0.87		0.76 0.6		0.44	0.33	0.3	37 C	.58	0.83	0.93	0.96			(86)
Mean	internal	tempera	ature i	n li	ving area T1	(follo	w ste	ps 3 to 7	7 in T	able 9	c)				_		
(87)m=	19.46	19.73	20.13	_	20.57 20.84		20.96	20.99	20.		0.89	20.51	19.91	19.41			(87)
L															_		

Town creature during booting poriods in root of dualling from Toble 0. Th2 (9C)		
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.24 20.25 20.25 20.26 20.26 20.27 20.27 20.28 20.27 20.26 20.26 20.25		(88)
(88)m= 20.24   20.25   20.25   20.26   20.26   20.27   20.27   20.28   20.27   20.26   20.26   20.25    Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		(00)
(89)m= 0.95 0.92 0.86 0.73 0.57 0.4 0.28 0.31 0.54 0.8 0.92 0.96		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 18.16 18.55 19.12 19.74 20.08 20.24 20.27 20.26 20.16 19.66 18.82 18.1		(90)
fLA = Living area ÷ (4) =	0.38	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		1
(92)m= 18.66 19 19.51 20.06 20.37 20.51 20.54 20.54 19.99 19.24 18.6		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	l	
(93)m= 18.66 19 19.51 20.06 20.37 20.51 20.54 20.54 20.44 19.99 19.24 18.6		(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calc the utilisation factor for gains using Table 9a	culate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 0.94 0.9 0.84 0.72 0.57 0.41 0.3 0.33 0.55 0.79 0.91 0.94		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 514.95   581.57   634.67   636.74   552.2   393.99   268.54   279.45   405.85   492.22   491.67   491.15		(95)
Monthly average external temperature from Table 8	I	(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 x [(93)m- (96)m ] (97)m= 1033.71 1011.86 930.71 784.81 607.97 407.44 271.74 284.3 440.22 657.94 856.6 1023.39		(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$		(01)
(98)m= 385.96 289.16 220.25 106.61 41.49 0 0 0 123.3 262.75 395.99		
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	1825.5	(98)
Space heating requirement in kWh/m²/year	20.56	(99)
9b. Energy requirements – Community heating scheme		J
This part is used for space heating, space cooling or water heating provided by a community scheme.		l,,,,,
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; t includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	he latter	
Fraction of heat from Community heat pump	0.5	(303a)
Fraction of community heat from heat source 2	0.5	(303b)
Fraction of total space heat from Community heat pump (302) x (303a) =	0.5	(304a)
Fraction of total space heat from community heat source 2 (302) x (303b) =	0.5	(304b)
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	i
Annual space heating requirement	1825.5	

		_		_
Space heat from Community heat pump	(98) x (304a	n) x (305) x (306) =	958.39	(307a)
Space heat from heat source 2	(98) x (304b	o) x (305) x (306) =	958.39	(307b)
Efficiency of secondary/supplementary heating s	ystem in % (from Table 4a or App	endix E)	0	(308
Space heating requirement from secondary/supp	lementary system (98) x (301)	x 100 ÷ (308) =	0	(309)
Water heating		_		
Annual water heating requirement		L	2163.79	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a	a) x (305) x (306) =	1135.99	(310a)
Water heat from heat source 2	(64) x (303b	o) x (305) x (306) =	1135.99	(310b)
Electricity used for heat distribution	0.01 × [(307a)(	307e) + (310a)(310e)] =	41.89	(313)
Cooling System Energy Efficiency Ratio		Ī	0	(314)
Space cooling (if there is a fixed cooling system,	if not enter 0) = $(107) \div (3)$	14) =	0	(315)
Electricity for pumps and fans within dwelling (Tamechanical ventilation - balanced, extract or positions)		Γ	290.04	(330a)
warm air heating system fans	•		0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (3	330b) + (330g) =	290.04	(331)
Energy for lighting (calculated in Appendix L)			372.88	(332)
Electricity generated by PVs (Appendix M) (nega	tive quantity)		-541.76	(333)
Electricity generated by wind turbine (Appendix N			0	(334)
12b. CO2 Emissions – Community heating scher	me	L		
j	Energy kWh/year	Emission factor E	Emissions cg CO2/year	
CO2 from other sources of space and water heat	•		.g ,	
	there is CHP using two fuels repeat (363)	to (366) for the second fuel	425	(367a)
Efficiency of heat source 2 (%)	there is CHP using two fuels repeat (363)	to (366) for the second fuel	91	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b)	x 0.52 =	255.76	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b)	x 0.22 =	497.13	(368)
Electrical energy for heat distribution	[(313) x	0.52	21.74	(372)
Total CO2 associated with community systems	(363)(366) + (368)(	372) =	774.63	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater	er or instantaneous heater (312)	x 0.52 =	0	(375)
Total CO2 associated with space and water heat	ing (373) + (374) + (375) =		774.63	(376)
CO2 associated with electricity for pumps and fa	ns within dwelling (331)) x	0.52	150.53	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	193.52	(379)
Energy saving/generation technologies (333) to ( Item 1	334) as applicable	0.52 x 0.01 =	-281.18	(380)

Total CO2, kg/year sum of (376)...(382) = Dwelling CO2 Emission Rate  $(383) \div (4) =$  El rating (section 14)

837.51	(383)
9.43	(384)
91.61	(385)

			User D	etails:						
Assessor Name:	Joseph Trean	or		Strom	a Num	ber:		STRO	032062	
Software Name:	Stroma FSAP	2012		Softwa	re Ve	rsion:		Versio	n: 1.0.4.14	
		Р	roperty .	Address	A10					
Address :	, Gondar Garde	ens, London,	NW6 1F	HG						
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m	<sup>3</sup> )
Ground floor			8	3.09	(1a) x	2	2.55	(2a) =	211.88	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)	+(1e)+(1r	1) 8	3.09	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	211.88	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hoι	ır
Number of chimneys		+ 0	+ [	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0	+ 0	ī + Ē	0	і - Г	0	x	20 =	0	(6b)
Number of intermittent fa	ans				J	0	x	10 =	0	(7a)
					Ļ		=	10 =		= ``
Number of passive vents					Ļ	0			0	(7b)
Number of flueless gas f	ires					0	X	40 =	0	(7c)
								Air ch	anges per h	our
Infiltration due to chimne	eys, flues and fans	= (6a)+(6b)+(7a)	'a)+(7b)+(	7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has	•				ontinue fr	-		` '		``
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel or tim	ber frame or	0.35 for	r masonr	y constr	uction			0	(11)
if both types of wall are p deducting areas of open			the great	er wall are	a (after					
If suspended wooden			.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	•	•	`	,					0	(13)
Percentage of window									0	(14)
Window infiltration	J			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	s per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, then (18)	$= [(17) \div 20] + (8)$	B), otherwi	se (18) = (	16)				0.15	(18)
Air permeability value appli	es if a pressurisation te	st has been dor	ne or a deg	gree air pe	meability	is being u	sed			
Number of sides shelter	ed								2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	[9)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind s	peed		,					•	
Jan Feb	Mar Apr N	<i>l</i> lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4	.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m - (2	22\m · 4									
Wind Factor $(22a)m = (2a)m =$	<del></del>	00 005	0.05				1		1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.16	ation rat	e (allowi <sub>0.16</sub>	ng for sr 0.14	0.14	a wina s	0.12	(21a) X 0.12	(22a)m 0.13	0.14	0.14	0.15		
Calculate effe	l		-	_	l -	_	0.12	0.13	0.14	0.14	0.15		
If mechanica	al ventila	ition:										0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (from	Table 4h	) =			[	68.85	(230
a) If balance	d mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (	23b) × [	1 - (23c)	÷ 100]	
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(24
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (N	/IV) (24b	)m = (22	2b)m + (2	23b)	1 1		
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r				•	re input v o); otherv				5 × (23b	)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r				•	erwise (2				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25
3. Heat losse	s and he	at loss r	aramete	or.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	IE	AXU		k-value	Δ Δ	Χk
ELEIVIEINI	area		m		A ,n		W/m2		(W/I	<)	kJ/m²-k		J/K
Windows Type	e 1				4.92	x1,	/[1/( 1.2 )+	0.04] =	5.63				(27
Windows Type	2				4.92	x1,	/[1/( 1.2 )+	0.04] =	5.63				(27
Windows Type	3				2.39	x1,	/[1/( 1.2 )+	0.04] =	2.74				(27
Floor					93.36	x	0.13	=	12.1368	<u> </u>		7	(28
Walls Type1	74.7	77	12.23	3	62.54	x	0.18	<u> </u>	11.26			ī	(29
Walls Type2	12.3	35	0		12.35	x	0.23	<u> </u>	2.79	T i		ī	(29
Total area of e	lements	, m²			180.4	8							(31
Party wall					36.38	x	0	=	0	$\neg$		<b>¬</b>	(32
* for windows and	roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	<b></b> ated using	formula 1	L /[(1/U-valu	e)+0.04] a	ıs given in	paragraph	3.2	
** include the area				ls and pan	titions								
Fabric heat los		•	U)				(26)(30)	+ (32) =			إ	40.19	(33
Heat capacity		,							.(30) + (32		(32e) =	16400.1	(34)
Thermal mass	•	•		•					tive Value:			100	(35
For design assess can be used inste				construct	ion are not	known pr	ecisely the	indicative	values of	TMP in T	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix k	(						13.95	(36
if details of therma Total fabric he		are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) =		[	54.14	(37
Ventilation hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × (	25)m x (5	)		
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan						40.00	10.14	10.0	20.47	20.00	04.07		(38
(38)m= 22.26	22.03	21.81	20.7	20.47	19.36	19.36	19.14	19.8	20.47	20.92	21.37		(00)
	<u> </u>	<u> </u>	20.7	20.47	19.36	19.36	19.14		= (37) + (37)		21.37		(00
(38)m= 22.26	<u> </u>	<u> </u>	74.83	74.61	73.5	73.5	73.27				75.5		(00

Heat lo	oss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.92	0.92	0.91	0.9	0.9	0.88	0.88	0.88	0.89	0.9	0.9	0.91		
						!	!	<u>.                                    </u>		Average =	Sum(40) <sub>1</sub> .	12 /12=	0.9	(40)
Numbe			nth (Tabl						-	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. Wa	ater heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
if TF	ned occu FA > 13.9 FA £ 13.9	9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		52		(42)
Reduce	the annua	al average	ater usag hot water person per	usage by	5% if the a	lwelling is	designed t			se target o		.02		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat			day for ea		,				1 225		1	_ = **		
(44)m=	103.43	99.66	95.9	92.14	88.38	84.62	84.62	88.38	92.14	95.9	99.66	103.43		
						<u> </u>	<u> </u>			Total = Su	m(44) <sub>112</sub> =		1128.28	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	153.38	134.14	138.43	120.68	115.8	99.92	92.6	106.25	107.52	125.31	136.78	148.54		
				. ,						Total = Su	m(45) <sub>112</sub> =	-	1479.35	(45)
It ınstan	taneous w	ater heatıı	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)	to (61)	1	1	11		
(46)m=	1	20.12	20.76	18.1	17.37	14.99	13.89	15.94	16.13	18.8	20.52	22.28		(46)
	storage e volum		) includin	na anv sa	olar or W	/WHRS	storane	within sa	ame ves	ല		0		(47)
•		` ,	and no ta	•			Ū		a	001		<u> </u>		(41)
	-	_	hot wate		-			' '	ers) ente	er '0' in (	47)			
Water	storage	loss:		`					,	·	,			
a) If m	nanufacti	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
٠.	•		storage	•				(48) x (49)	) =		1	10		(50)
•			eclared o	-								1		(54)
		-	factor fr see section		e∠(KVV	n/litre/da	ly)				0.	02		(51)
	e factor	_		JII 4.5							1.	03		(52)
Tempe	erature fa	actor fro	m Table	2b							-	.6		(53)
Energy	y lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
	(50) or (		_									03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (	(55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
		dedicate	d solar sto	L rage, (57)ı	n = (56)m		<u>I</u> H11)] ÷ (5	<u>l</u> 0), else (5	<u>I</u> 7)m = (56)	m where (	H11) is fro	m Appendi	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)
Drimo	ry circuit	loss (or	nnual) fro	m Table	. 3	!	!	<u>I</u>	!	!		0		(58)
	y Circuit	`	,	יווו ומטונ								<u> </u>		(/
	rv circuit	loss cal	culated t	for each	month (	59)m = 0	$(58) \div 36$	65 × (41)	m					
Primar	ry circuit dified by		culated f rom Tabl		,	•	` '	, ,		r thermo	stat)			

0 1 - 1		la latad		. 1.		(04)	(00)	0.	05 (44)								
_		lculated	1	ch i		,	<u>`</u>		<u> </u>	·		0			Ι ,	1	(61)
(61)m=	0	0	0		0	0		0	0	(22)		0	0	0 (10)	0	(50)	(61)
				_			_			È	_		<del>`                                    </del>	<del>`                                    </del>	<del>r` ´                                     </del>	(59)m + (61)m 1	(00)
` '	208.65	184.07	193.7		174.18	171.07		3.42	147.87	161.		161.02	180.58	190.28	203.81	J	(62)
			_					-					r contribu	tion to wate	er heating)		
· · —		al lines if		SE			<del></del>		·	<del>.</del>					Ι ,	1	(62)
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0	J	(63)
· -		ater hea												1		1	
(64)m=	208.65	184.07	193.7		174.18	171.07	153	3.42	147.87	161		161.02	180.58	190.28	203.81	0400.40	7(64)
									1					er (annual) <sub>1</sub>		2130.19	(64)
_		1	r	$\overline{}$			_		T T				r	ı + (57)m	1	1] 1	(0=)
` '	95.22	84.55	90.25		82.92	82.72		.02	75.01	79.		78.55	85.89	88.28	93.61		(65)
includ	le (57)	m in calc	culation	n of	f (65)m	only if c	ylind	der i	s in the o	llewb	ing	or hot w	ater is f	rom com	munity h	neating	
5. Inte	rnal ga	ains (see	Table	5	and 5a)	):											
Metab <u>ol</u>	ic gair	ns (Table	5), W	atts	S											•	
	Jan	Feb	Ma	r	Apr	May	J	un	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(66)m=	125.94	125.94	125.9	4	125.94	125.94	125	5.94	125.94	125	.94	125.94	125.94	125.94	125.94	]	(66)
Lighting	gains	(calculat	ted in .	App	pendix I	L, equat	ion l	_9 o	r L9a), a	lso s	ee T	Table 5				_	
(67)m=	21.36	18.97	15.43		11.68	8.73	7.3	37	7.97	10.3	35	13.9	17.65	20.6	21.96		(67)
Applianc	ces ga	ins (calc	ulated	in	Append	dix L, eq	uatio	on L	13 or L1	3a), a	also	see Ta	ble 5			_	
(68)m=	225.78	228.12	222.2	2	209.65	193.78	178	3.87	168.91	166	.57	172.47	185.04	200.9	215.82	]	(68)
Cooking	gains	(calcula	ted in	Aр	pendix	L, equat	tion	L15	or L15a)	, als	o se	e Table	5	-	-	-	
(69)m=	35.59	35.59	35.59	T	35.59	35.59	35	.59	35.59	35.	59	35.59	35.59	35.59	35.59	]	(69)
Pumps a	and fa	ns gains	(Table	e 5a	a)								•			•	
(70)m=	0	0	0		0	0		0	0	0		0	0	0	0	]	(70)
Losses	e.g. e\	/aporatio	n (neg	jati	ve valu	es) (Tab	le 5	)	•	•			•	•	•	•	
(71)m= -	100.76	-100.76	-100.7	6	-100.76	-100.76	-100	0.76	-100.76	-100	.76	-100.76	-100.76	-100.76	-100.76	]	(71)
Water he	eating	gains (T	able 5	 5)												•	
_	127.98	125.81	121.3	<del>-</del> -	115.17	111.19	105	5.58	100.82	106	.92	109.09	115.44	122.6	125.82	1	(72)
Total in	ternal	gains =						(66)	)m + (67)m	ı + (68	3)m +	- (69)m + (	(70)m + (	71)m + (72)	)m		
_	435.91	433.69	419.7	3	397.28	374.49	352	2.61	338.48	344	.63	356.24	378.91	404.89	424.38	1	(73)
6. Sola	ır gain:	s:															
			using so	olar	flux from	Table 6a	and a	assoc	iated equa	tions	to co	nvert to th	e applica	ble orienta	tion.		
Orientat	ion: /	Access F	actor		Area			Flu				g_		FF		Gains	
	-	Table 6d			m²			Tal	ble 6a		Т	able 6b	٦	able 6c		(W)	
East	0.9x	1		x	4.9	2	х	1	9.64	X		0.5	x	0.7	=	23.44	(76)
East	0.9x	1		x	4.9	2	x $\lceil$	3	38.42	x		0.5	_ x	0.7	_ =	45.85	(76)
East	0.9x	1		x	4.9	2	x [	6	3.27	x		0.5	×	0.7	=	75.51	(76)
East	0.9x	1	一	x	4.9	2	хГ	9	92.28	x		0.5	_ x [	0.7	=	110.12	(76)
East				- 1			=			; ;			=		==		(76)

Foot	F					1			1			, r		_	г		7(70)
East	0.9x	1	_	X	4.92	J X 1		15.77	X	0.5		]	0.7	╡ ٔ	= [ -	138.15	<b> (76) −−−</b>
East	0.9x	1		X	4.92	X	1	10.22	X	0.5	5	]	0.7	╡ :	= [ -	131.53	<u></u> (76)
East	0.9x	1		X	4.92	J X	9	4.68	X	0.5	5	]	0.7	╡	֓֞֞֞֜֞֞֜֞֜֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֡֡֡֡֓֓֓֡֡֡֡֡֡֡֡	112.98	<b> 1</b> (76)
East	0.9x	1		X	4.92	X	7	3.59	X	0.5	5	] × [	0.7	_ :	֓֡֞֞֞֞֜֞֞֜֞֜֞֜֞֜֞֜֞֜֞֜֞֜֡֡֡֡֡֡֡֡֡֡֡	87.82	<u> </u> (76)
East	0.9x	1		X	4.92	X	4	5.59	X	0.5	5	X	0.7	•	= <u>[</u>	54.4	(76)
East	0.9x	1		X	4.92	X	2	4.49	X	0.5	5	×	0.7	:	= <u>[</u>	29.22	(76)
East	0.9x	1		X	4.92	X	1	6.15	X	0.5	5	x	0.7		= <u>[</u>	19.27	(76)
West	0.9x	0.77		X	4.92	X	1	9.64	X	0.5	5	x [	0.7	:	= [	23.44	(80)
West	0.9x	0.77		X	2.39	X	1	9.64	X	0.5	5	x_[	0.7	=	= [	11.39	(80)
West	0.9x	0.77		X	4.92	X	3	8.42	X	0.5	5	x_[	0.7	-	= [	45.85	(80)
West	0.9x	0.77		X	2.39	X	3	8.42	X	0.5	5	x [	0.7	-	= [	22.27	(80)
West	0.9x	0.77		X	4.92	X	6	3.27	X	0.5	5	] x [	0.7	=	= [	75.51	(80)
West	0.9x	0.77		x	2.39	x	6	3.27	x	0.5	5	] x [	0.7	:	= [	36.68	(80)
West	0.9x	0.77		x	4.92	X	9	2.28	X	0.5	5	x_[	0.7		- [	110.12	(80)
West	0.9x	0.77		x	2.39	X	9	2.28	X	0.5	5	x_[	0.7	-	= [	53.49	(80)
West	0.9x	0.77		x	4.92	x	1	13.09	x	0.5	5	x	0.7		<u> </u>	134.96	(80)
West	0.9x	0.77		x	2.39	x	1	13.09	x	0.5	5	x	0.7		<u> </u>	65.56	(80)
West	0.9x	0.77		x	4.92	x	1	15.77	X	0.5	5	x	0.7	-	= [	138.15	(80)
West	0.9x	0.77		x	2.39	x	1	15.77	x	0.5	5	×	0.7		<u> </u>	67.11	(80)
West	0.9x	0.77		x	4.92	×	1	10.22	x	0.5	5	×	0.7	一.	<u> </u>	131.53	(80)
West	0.9x	0.77		x	2.39	x	1	10.22	x	0.5	5	×	0.7	一:	- [	63.89	(80)
West	0.9x	0.77		x	4.92	x	9	4.68	x	0.5	5	ĪxĪ	0.7	╡:	- [	112.98	(80)
West	0.9x	0.77		x	2.39	x	9	4.68	X	0.5	5	Ī×Ī	0.7	<u> </u>	<u> </u>	54.88	(80)
West	0.9x	0.77		x	4.92	x	7	3.59	X	0.5	5	Ī×Ī	0.7	<u> </u>	<u> </u>	87.82	(80)
West	0.9x	0.77		x	2.39	x	7	3.59	x	0.5	5	֓֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֓֞֞֓֞֞֞֓֞	0.7		<u> </u>	42.66	(80)
West	0.9x	0.77		x	4.92	x	4	5.59	X	0.5	5	Ī×Ī	0.7	<u> </u>	<u> </u>	54.4	(80)
West	0.9x	0.77		x	2.39	x	4	5.59	X	0.5	5	Ī×Ī	0.7	<u> </u>	<u> </u>	26.43	(80)
West	0.9x	0.77		x	4.92	x	2	4.49	x	0.5	5	֓֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֓֞֞֓֞֞֞֓֞	0.7		<u> </u>	29.22	(80)
West	0.9x	0.77		x	2.39	x	2	4.49	x	0.5	5	ĪxĪ	0.7		<u> </u>	14.2	(80)
West	0.9x	0.77		x	4.92	x	1	6.15	x	0.5	5	Ī×Ī	0.7		<u>-</u> ןֿ	19.27	(80)
West	0.9x	0.77		x	2.39	x	1	6.15	x	0.5	5	Ī×Ī	0.7		<u>ַ</u>	9.36	(80)
	_			,		-									_		_
Solar ga	ains in	watts, ca	lculat	ed	for each mon	th			(83)m	= Sum(7	4)m	(82)m					
(83)m=	58.26	113.97	187.6	9	273.74 335.4	8 3	43.42	326.95	280	.85 218	3.29	135.24	72.64	47.91			(83)
Total ga	ains – ir	nternal a	nd so	lar	(84)m = $(73)$ r	n + (	83)m	, watts									
(84)m=	494.17	547.66	607.4	2	671.02 709.9	6 6	96.03	665.43	625	.47 574	1.54	514.14	477.53	472.2	9		(84)
7. Mea	ın inter	nal temp	eratu	re (	heating seaso	on)											
Tempe	erature	during h	eating	g pe	riods in the li	ving	area	from Tab	ole 9,	Th1 (°0	C)					21	(85)
Utilisat	ion fac	tor for ga	ains fo	or li	ving area, h1	,m (s	ee Ta	ble 9a)									_
	Jan	Feb	Ма	ır	Apr Ma	у	Jun	Jul	A	ug S	Бер	Oct	Nov	Dec	С		
(86)m=	0.96	0.95	0.92		0.85 0.75		0.59	0.46	0.9	5 0.	71	0.88	0.95	0.97			(86)
Mean i	internal	tempera	ature	in li	ving area T1	(follo	w ste	ps 3 to 7	in T	able 9c	)				_		
(87)m=	19.13	19.35	19.7	_	20.22 20.61		20.87	20.96	20.		.76	20.24	19.61	19.1	$\Box$		(87)
L		!							•					•			

Temn	oraturo	during h	neating p	ariade ir	rest of	dwelling	from Ta	hla 0 T	h2 (°C)					
(88)m=	20.15	20.15	20.16	20.17	20.17	20.18	20.18	20.18	20.18	20.17	20.16	20.16		(88)
` '		ļ	ains for				ļ	<u> </u>			20.10			, ,
(89)m=	0.96	0.94	0.91	0.83	0.71	0.54	0.38	0.42	0.66	0.86	0.94	0.96		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 1	r in Tabl	e 9c)				
(90)m=	17.63	17.94	18.49	19.18	19.72	20.05	20.15	20.14	19.93	19.23	18.33	17.58		(90)
				•					1	LA = Livin	g area ÷ (4	1) =	0.42	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	.A) × T2			•		_
(92)m=	18.25	18.53	19	19.61	20.09	20.39	20.48	20.47	20.27	19.65	18.86	18.21		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.25	18.53	19	19.61	20.09	20.39	20.48	20.47	20.27	19.65	18.86	18.21		(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=	0.94	0.93	0.89	0.82	0.7	0.55	0.41	0.45	0.66	0.85	0.92	0.95		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m		r	i	i	î	i			
(95)m=	466.79	507.03	539.57	547.5	500.29	383.89	273.17	281.83	380.52	434.65	440.85	448.82		(95)
	•	<u> </u>	ernal tem	i –			400	1 40 4		400				(06)
(96)m=	4.3	4.9	6.5 an intern	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
(97)m=		1037.86		801.67	626.18	425.54	285.44	298.35	456.25	675.34	882.95	1057.93		(97)
` '		l	ement fo						ı <u> </u>					, ,
(98)m=	445.76	356.72	305.05	183.01	93.67	0	0	0	0	179.07	318.31	453.17		
l								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2334.76	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year							į	28.1	(99)
9b. En	ergy red	quiremer	nts – Cor	mmunity	heating	scheme								
			ace hea	• .		_		<b>.</b>	•		unity sch	neme.		٦
Fractio	n of spa	ace heat	from se	condary,	/supplen	nentary I	neating (	(Table 1	1) '0' if n	one		إ	0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
includes	boilers, h	eat pump	s, geotheri	mal and wa	aste heat f					up to four (	other heat	sources; th		7,
			Commun		•								0.5	(303a)
Fractio	n of cor	nmunity	heat fro	m heat s	source 2							إ	0.5	(303b)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	a) =	0.5	(304a)
Fractio	n of tota	al space	heat fro	m comm	unity he	at sourc	e 2			(3	02) x (303	b) =	0.5	(304b)
Factor	for cont	rol 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					1.05	(306)
-	heating	-											kWh/year	_
Annua	space	heating	requiren	nent									2334.76	

Space heat from Community heat pump		(98) x (304a) x	(305) x (306) =	1225.75	(307a)
Space heat from heat source 2		(98) x (304b) x	(305) x (306) =	1225.75	(307b)
Efficiency of secondary/supplementary heating	system in % (from Table	e 4a or Appen	idix E)	0	(308
Space heating requirement from secondary/su	pplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating					_
Annual water heating requirement				2130.19	
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x	(305) x (306) =	1118.35	(310a)
Water heat from heat source 2		(64) x (303b) x	(305) x (306) =	1118.35	(310b)
Electricity used for heat distribution	0.01	× [(307a)(307	'e) + (310a)(310e)] =	46.88	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system	n, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (mechanical ventilation - balanced, extract or po	,			271.42	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =	271.42	(331)
Energy for lighting (calculated in Appendix L)				377.27	(332)
Electricity generated by PVs (Appendix M) (ne	gative quantity)			-507.18	(333)
Electricity generated by wind turbine (Appendix	(M) (negative quantity)			0	(334)
12b. CO2 Emissions – Community heating sch	eme				
		ergy h/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water he Efficiency of heat source 1 (%)	eating (not CHP) If there is CHP using two fuels	s repeat (363) to	(366) for the second fue	425	(367a)
Efficiency of heat source 2 (%)	If there is CHP using two fuels	s repeat (363) to	(366) for the second fue	91	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x	0.52	286.26	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x	100 ÷ (367b) x	0.22	556.4	(368)
Electrical energy for heat distribution	[(313) x		0.52	24.33	(372)
Total CO2 associated with community systems	(363)(3	66) + (368)(372	2) =	866.99	(373)
CO2 associated with space heating (secondary	(309) x		0 =	0	(374)
CO2 associated with water from immersion hea	ater or instantaneous hea	ater (312) x	0.52	0	(375)
Total CO2 associated with space and water he	ating (373) + (3	74) + (375) =		866.99	(376)
CO2 associated with electricity for pumps and	fans within dwelling (331	1)) x	0.52	140.87	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	195.8	(379)
Energy saving/generation technologies (333) to Item 1	o (334) as applicable		0.52 x 0.01 =	-263.23	(380)

 Total CO2, kg/year
 sum of (376)...(382) = 940.43 (383)

 Dwelling CO2 Emission Rate
  $(383) \div (4) =$  11.32 (384)

 El rating (section 14)
 90.16 (385)

		User Details:					
Annagan			NI	la a s	OTDO	000000	
Assessor Name:	Joseph Treanor Stroma FSAP 2012		na Num			032062 n: 1.0.4.14	
Software Name:		Softwo operty Address	are Ve	rsion:	versio	11. 1.0.4.14	
Address :	, Gondar Gardens, London, N	·	5. 111				
Overall dwelling dimen							
J		Area(m²)		Av. Height	(m)	Volume(m³)	)
Ground floor		88.81	(1a) x	2.55	(2a) =	226.47	(3a)
First floor		64.98	(1b) x	3	(2b) =	194.94	(3b)
Second floor		42.74	(1c) x	3	(2c) =	128.22	(3c)
Third floor		31.59	(1d) x	3	(2d) =	94.77	(3d)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1e)+(1n)	228.12	(4)				
Dwelling volume			(3a)+(3b	)+(3c)+(3d)+(3e	e)+(3n) =	644.4	(5)
2. Ventilation rate:							
	main secondary heating heating	other		total		m³ per hou	٢
Number of chimneys		+ 0	= [	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	<b>=</b> [	0	x 20 =	0	(6b)
Number of intermittent fan	s			0	x 10 =	0	(7a)
Number of passive vents			Ī	0	x 10 =	0	(7b)
Number of flueless gas fire	es		Ī	0	x 40 =	0	(7c)
					Δir ch	anges per ho	ur
Infiltration due to chimney	o fluor and fano (62)+(6b)+(73)	)+(7b)+(7c) =	Г				_
•	s, flues and fans = $(6a)+(6b)+(7a)$ en carried out or is intended, proceed in		continue f	0 rom (9) to (16)	÷ (5) =	0	(8)
Number of storeys in the		( , , , , , , , , , , , , , , , , , ,		o (o) to (10)		0	(9)
Additional infiltration					[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timber frame or 0	.35 for masor	nry const	ruction	İ	0	(11)
	sent, use the value corresponding to the	he greater wall ar	rea (after		•		
deducting areas of opening	oor, enter 0.2 (unsealed) or 0.1	(sealed) else	e enter 0		i	0	(12)
If no draught lobby, ente	· · ·	(000,00), 0.00	<i>o</i>			0	(13)
• • • • • • • • • • • • • • • • • • • •	and doors draught stripped					0	(14)
Window infiltration	and doore arangmentppen	0.25 - [0.	.2 x (14) ÷ 1	100] =		0	(15)
Infiltration rate		(8) + (10	) + (11) + (	12) + (13) + (15)	) =	0	(16)
	50, expressed in cubic metres	per hour per s	square m	etre of enve	lope area	3	(17)
· · · · · · · · · · · · · · · · · · ·	y value, then (18) = [(17) ÷ 20]+(8),		•		'	0.15	(18)
Air permeability value applies	if a pressurisation test has been done	or a degree air p	ermeability	is being used	l		<b>」</b> ` ′
Number of sides sheltered	I					2	(19)
Shelter factor		(20) = 1	- [0.075 x (	19)] =		0.85	(20)
Infiltration rate incorporatir	ng shelter factor	(21) = (1	8) x (20) =			0.13	(21)
Infiltration rate modified fo	r monthly wind speed						

Jul

Sep

Aug

Oct

Nov

Dec

Mar

Apr

May

Jun

Feb

Jan

Monthly avera	ge wind	speed fr	om Tabl	e 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		
		(00)	_						•				
Wind Factor (2 (22a)m= 1.27	$\frac{22a)m}{1.25}$	(22)m ÷	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
(22d)III= 1.21	1.25	1.23	1.1	1.00	0.93	0.93	0.92		1.00	1.12	1.10		
Adjusted infiltr		<u>`</u>				<del>`                                    </del>	<del>`´</del>	<del>` ´</del>					
0.16 Calculate effe	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
If mechanic		•	ale for t	пс арріі	cabic ca	30					[	0.5	(23a)
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)		ĺ	0.5	(23b)
If balanced wit	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h	) =			ĺ	68.85	(23c)
a) If balance	ed mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	n)m = (22)	2b)m + (2	23b) × [1	1 – (23c)	÷ 100]	_
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat rec	overy (N	/IV) (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 h					•				F (00)	`			
(24c)m = 0	n < 0.5 >	(230), t	nen (24)	c) = (230)	o); otnerv	vise (24)	c) = (220)	o) m + 0.	.5 × (23b	0	0		(24c)
d) If natural									0	0			(240)
,		on or wn en (24d)			•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25)
3. Heat losse	es and he	eat loss r	paramet	er:									
ELEMENT	Gros	SS	Openin	gs	Net Ar		U-val		AXU		k-value		
	area	(m²)	m	l <sup>2</sup>	A ,n		W/m2		(W/ł	<u>()</u>	kJ/m²-k	K kJ/k	
Windows Type					2.39		/[1/( 1.2 )+	0.04] =	2.74	_			(27)
Windows Type					4.92	x1,	/[4// 4 つ \ .						(27)
Windows Type	e 3					_		0.04] =	5.63	_			
Windows Type					5.08	x1,	/[1/( 1.2 )+	0.04] =	5.63 5.82				(27)
					5.08	x1/	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] =					(27) (27)
Windows Type	e 5					x1/ x1/ x1/	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$	5.82				(27)
Windows Type	e 5 e 6				2.22	x1/ x1/ x1/ x1/	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$	5.82 2.54				(27) (27)
Windows Type Windows Type Windows Type	e 5 e 6 e 7				2.22	x1/ x1/ x1/ x1/	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$	5.82 2.54 2.62				(27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	e 5 e 6 e 7 e 8				2.22 2.29 4.72	x10 x10 x10 x10 x10 x10 x10	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04 \end{bmatrix}$ =	5.82 2.54 2.62 5.4				(27) (27) (27) (27)
Windows Type Windows Type Windows Type	e 5 e 6 e 7 e 8				2.22 2.29 4.72 5.08	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$	5.82 2.54 2.62 5.4 5.82				<ul><li>(27)</li><li>(27)</li><li>(27)</li><li>(27)</li><li>(27)</li></ul>
Windows Type Windows Type Windows Type Windows Type	e 5 e 6 e 7 e 8 e 9				2.22 2.29 4.72 5.08 2.13	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$	5.82 2.54 2.62 5.4 5.82 2.44				(27) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type	e 5 e 6 e 7 e 8 e 9 e 10				2.22 2.29 4.72 5.08 2.13 3.63	x10 x10 x10 x10 x10 x10 x10 x10 x10 x10	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ $0.04$ ] = [ $0.04$ ] = [ $0.04$ ] = [ $0.04$ ] = [ $0.04$ ] = [ $0.04$ ] = [ $0.04$ ] = [ $0.04$ ] = [	5.82 2.54 2.62 5.4 5.82 2.44 4.16				(27) (27) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	e 5 e 6 e 7 e 8 e 9 e 10 e 11				2.22 2.29 4.72 5.08 2.13 3.63 4.72	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$	5.82 2.54 2.62 5.4 5.82 2.44 4.16 5.4				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12				2.22 2.29 4.72 5.08 2.13 3.63 4.72 4.76	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$0.04] = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix}$	5.82 2.54 2.62 5.4 5.82 2.44 4.16 5.4 5.45				(27) (27) (27) (27) (27) (27) (27) (27)

DER WOIN	Jilooti Itow	awoning a	Joigii Stage	•		
Windows Type 15	2.26 X	1/[1/( 1.2 )+ 0.04] =	2.59			(27)
Windows Type 16	3.68 ×	1/[1/( 1.2 )+ 0.04] =	4.21			(27)
Windows Type 17	4.93 ×	1/[1/( 1.2 )+ 0.04] =	5.65			(27)
Floor	88.81 ×	0.13 =	11.5453			(28)
Walls 321.77 100.46	221.31 ×	0.18 =	39.84			(29)
Roof Type1 23.96 0	23.96 ×	0.13 =	3.11			(30)
Roof Type2 22.13 0	22.13 ×	0.13 =	2.88			(30)
Roof Type3 9.98 0	9.98 ×	0.13 =	1.3			(30)
Roof Type4 31.59 0	31.59 ×	0.13 =	4.11			(30)
Total area of elements, m <sup>2</sup>	498.24					(31)
Party wall	65.06 ×	0 =	0			(32)
* for windows and roof windows, use effective window U-v		g formula 1/[(1/U-valu	ue)+0.04] as given in	n paragraph	3.2	_
** include the areas on both sides of internal walls and partial Fabric heat loss, W/K = S (A x U)	rtitions	(26)(30) + (32) =		Γ	477.04	(33)
Heat capacity $Cm = S(A \times k)$			(30) + (32) + (32a)	(32e) =	177.81 26764.34	(34)
Thermal mass parameter (TMP = $Cm \div TFA$ ) i	n kJ/m²K		ative Value: Low	(020) = [	100	(35)
For design assessments where the details of the construct				L able 1f	100	(00)
can be used instead of a detailed calculation.				_		
Thermal bridges: S (L x Y) calculated using A	-				53.31	(36)
if details of thermal bridging are not known (36) = $0.15 x$ (5) Total fabric heat loss	31)	(33) +	- (36) =	Г	231.12	(37)
Ventilation heat loss calculated monthly			$x = 0.33 \times (25) \text{m} \times (5)$	L )	231.12	
Jan Feb Mar Apr May	Jun Jul	Aug Sep	Oct Nov	Dec		
(38)m= 67.69 67.01 66.33 62.94 62.27	58.88 58.88	58.2 60.23	62.27 63.62	64.98		(38)
Heat transfer coefficient, W/K	•	(39)m	ı = (37) + (38)m			
(39)m= 298.81 298.13 297.45 294.06 293.39	290 290	289.32 291.35	293.39 294.74	296.1		
Harthan and the All D. W. 214			Average = Sum(39)	112 /12=	293.9	(39)
Heat loss parameter (HLP), W/m <sup>2</sup> K (40)m= 1.31 1.31 1.3 1.29 1.29	1.27 1.27	1.27 1.28	$1 = (39)m \div (4)$ $1.29$ $1.29$	1.3		
(40)111= 1.31 1.31 1.3 1.29 1.29	1.21		Average = Sum(40)	-	1.29	(40)
Number of days in month (Table 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 heating energy requirement:				kWh/ye	ear:	
Assumed occupancy, N			3	.04		(42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000	349 x (TFA -13.9	9)2)] + 0.0013 x (	TFA -13.9)			
if TFA £ 13.9, N = 1 Annual average hot water usage in litres per d	av Vd.average =	= (25 x N) + 36	10	06.36		(43)
Reduce the annual average hot water usage by 5% if the	dwelling is designed			,0.00		(10)
not more that 125 litres per person per day (all water use,	<del></del>	1.1-				
Jan Feb Mar Apr May  Hot water usage in litres per day for each month Vd,m = fa		Aug Sep	Oct Nov	Dec		
	95.73 95.73	99.98 104.24	108.49 112.75	117		
(44)m= 117 112.75 108.49 104.24 99.98	95.73	<u> </u>	Total = Sum(44) <sub>112</sub>	-	1276.37	(44)
				L	.2.0.01	``

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) 173.51 151.75 156.59 136.52 113.04 104.75 120.2 121.64 141.75 154.74 168.03 (45)m =Total =  $Sum(45)_{1...12}$  = 1673.52 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)26.03 22.76 23.49 20.48 19.65 16.96 15.71 18.25 21.26 23.21 25.21 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (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): (48)Temperature factor from Table 2b 0 (49)Energy lost from water storage, kWh/year  $(48) \times (49) =$ 110 (50)b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) (51)0.02 If community heating see section 4.3 Volume factor from Table 2a 1.03 (52)Temperature factor from Table 2b 0.6 (53)Energy lost from water storage, kWh/year  $(47) \times (51) \times (52) \times (53) =$ 1.03 (54)Enter (50) or (54) in (55) 1.03 (55)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 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 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)(57)m =(58)Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58)  $\div$  365 x (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)(59)m =23.26 21.01 23.26 23.26 22.51 23.26 23.26 22.51 23.26 22.51 23.26 Combi loss calculated for each month (61)m = (60)  $\div$  365 x (41)m 0 0 0 0 0 0 (61)(61)m =0 0 0 Total heat required for water heating calculated for each month  $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$ 201.68 211.87 190.02 175.48 175.13 197.03 (62)228.79 186.27 166.53 160.02 208.23 223.31 (62)m =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)(63)m =0 0 0 0 0 0 0 0 Output from water heater 228.79 201.68 211.87 190.02 160.02 (64)m =186.27 166.53 175.48 175.13 197.03 208.23 223.31 (64)Output from water heater (annual) 1...12 2324.36 Heat gains from water heating, kWh/month  $0.25 (0.85 \times (45)) + (61) + 0.8 \times ((46)) + (57) + (59) +$ 84.19 (65)(65)m =101.91 96.29 88.19 87.78 80.38 79.05 83.24 91.35 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=	151.92	151.92	151.92	151.92	151.92	151.92	151.92	151.92	151.92	151.92	151.92	151.92		(66)	
Lightin	g gains	(calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				_		
(67)m=	35.4	31.44	25.57	19.36	14.47	12.22	13.2	17.16	23.03	29.24	34.13	36.38		(67)	
Appliar	nces gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Tal	ole 5			_		
(68)m=	397.04	401.16	390.78	368.68	340.78	314.55	297.04	292.92	303.3	325.4	353.3	379.53		(68)	
Cookin	Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
(69)m=	38.19	38.19	38.19	38.19	38.19	38.19	38.19	38.19	38.19	38.19	38.19	38.19		(69)	
Pumps	Pumps and fans gains (Table 5a)														
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)	
Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)							_		
(71)m=	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54	-121.54		(71)	
Water	heating	gains (T	able 5)												
(72)m=	136.98	134.52	129.42	122.48	117.98	111.64	106.25	113.16	115.61	122.79	130.9	134.53		(72)	
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m			
(73)m=	638	635.7	614.35	579.1	541.8	506.99	485.06	491.81	510.51	546.01	586.9	619.02		(73)	
6. Sol	ar gains	S:													

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

Orienta		ccess Facto able 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	1	x	8.78	x	19.64	x	0.5	x	0.7	=	41.83	(76)
East	0.9x	4	x	2.26	X	19.64	x	0.5	x	0.7	=	43.06	(76)
East	0.9x	2	x	3.68	x	19.64	x	0.5	x	0.7	=	35.06	(76)
East	0.9x	1	x	4.93	x	19.64	x	0.5	x	0.7	=	23.49	(76)
East	0.9x	1	x	8.78	x	38.42	X	0.5	x	0.7	=	81.82	(76)
East	0.9x	4	x	2.26	x	38.42	X	0.5	x	0.7	=	84.24	(76)
East	0.9x	2	x	3.68	x	38.42	x	0.5	x	0.7	=	68.59	(76)
East	0.9x	1	x	4.93	x	38.42	X	0.5	x	0.7	=	45.94	(76)
East	0.9x	1	x	8.78	x	63.27	X	0.5	x	0.7	=	134.75	(76)
East	0.9x	4	x	2.26	x	63.27	X	0.5	x	0.7	=	138.74	(76)
East	0.9x	2	x	3.68	x	63.27	X	0.5	x	0.7	=	112.95	(76)
East	0.9x	1	x	4.93	x	63.27	X	0.5	x	0.7	=	75.66	(76)
East	0.9x	1	x	8.78	x	92.28	X	0.5	x	0.7	=	196.52	(76)
East	0.9x	4	x	2.26	X	92.28	X	0.5	x	0.7	=	202.34	(76)
East	0.9x	2	x	3.68	x	92.28	x	0.5	x	0.7	=	164.74	(76)
East	0.9x	1	x	4.93	x	92.28	x	0.5	x	0.7	=	110.35	(76)
East	0.9x	1	x	8.78	x	113.09	x	0.5	x	0.7	=	240.84	(76)
East	0.9x	4	x	2.26	x	113.09	x	0.5	x	0.7	=	247.97	(76)
East	0.9x	2	x	3.68	x	113.09	x	0.5	x	0.7	=	201.89	(76)
East	0.9x	1	x	4.93	x	113.09	x	0.5	x	0.7	=	135.23	(76)
East	0.9x	1	X	8.78	x	115.77	x	0.5	x	0.7	=	246.54	(76)

	_		_		_		_				_		_
East	0.9x	4	X	2.26	X	115.77	X	0.5	X	0.7	=	253.84	(76)
East	0.9x	2	X	3.68	X	115.77	X	0.5	X	0.7	=	206.67	(76)
East	0.9x	1	X	4.93	x	115.77	X	0.5	x	0.7	=	138.44	(76)
East	0.9x	1	X	8.78	x	110.22	X	0.5	x	0.7	=	234.72	(76)
East	0.9x	4	X	2.26	X	110.22	X	0.5	X	0.7	=	241.67	(76)
East	0.9x	2	X	3.68	X	110.22	X	0.5	X	0.7	=	196.76	(76)
East	0.9x	1	X	4.93	x	110.22	X	0.5	X	0.7	=	131.8	(76)
East	0.9x	1	X	8.78	X	94.68	X	0.5	X	0.7	=	201.62	(76)
East	0.9x	4	X	2.26	x	94.68	X	0.5	x	0.7	=	207.59	(76)
East	0.9x	2	X	3.68	X	94.68	X	0.5	X	0.7	=	169.01	(76)
East	0.9x	1	X	4.93	X	94.68	X	0.5	x	0.7	=	113.21	(76)
East	0.9x	1	X	8.78	x	73.59	X	0.5	x	0.7	=	156.71	(76)
East	0.9x	4	X	2.26	x	73.59	X	0.5	X	0.7	=	161.36	(76)
East	0.9x	2	X	3.68	X	73.59	X	0.5	X	0.7	=	131.37	(76)
East	0.9x	1	X	4.93	x	73.59	X	0.5	x	0.7	=	88	(76)
East	0.9x	1	X	8.78	x	45.59	X	0.5	X	0.7	=	97.09	(76)
East	0.9x	4	X	2.26	X	45.59	x	0.5	x	0.7	=	99.96	(76)
East	0.9x	2	X	3.68	x	45.59	X	0.5	x	0.7	=	81.38	(76)
East	0.9x	1	X	4.93	x	45.59	x	0.5	x	0.7	=	54.51	(76)
East	0.9x	1	X	8.78	X	24.49	X	0.5	X	0.7	=	52.15	(76)
East	0.9x	4	X	2.26	X	24.49	X	0.5	x	0.7	=	53.7	(76)
East	0.9x	2	X	3.68	X	24.49	X	0.5	X	0.7	=	43.72	(76)
East	0.9x	1	X	4.93	X	24.49	X	0.5	X	0.7	=	29.28	(76)
East	0.9x	1	X	8.78	X	16.15	X	0.5	X	0.7	=	34.4	(76)
East	0.9x	4	X	2.26	X	16.15	X	0.5	X	0.7	=	35.41	(76)
East	0.9x	2	X	3.68	X	16.15	X	0.5	X	0.7	=	28.83	(76)
East	0.9x	1	X	4.93	X	16.15	X	0.5	X	0.7	=	19.31	(76)
Southeas	t <sub>0.9x</sub>	0.77	X	4.79	X	36.79	X	0.5	x	0.7	=	42.75	(77)
Southeas	t <sub>0.9x</sub>	0.77	X	4.79	X	62.67	X	0.5	X	0.7	=	72.81	(77)
Southeas	t 0.9x	0.77	X	4.79	x	85.75	X	0.5	X	0.7	=	99.63	(77)
Southeas	t 0.9x	0.77	X	4.79	X	106.25	X	0.5	x	0.7	=	123.44	(77)
Southeas	t <sub>0.9x</sub>	0.77	X	4.79	X	119.01	X	0.5	X	0.7	=	138.27	(77)
Southeas	t 0.9x	0.77	X	4.79	X	118.15	X	0.5	X	0.7	=	137.27	(77)
Southeas	t <sub>0.9x</sub>	0.77	X	4.79	X	113.91	X	0.5	X	0.7	=	132.34	(77)
Southeas	t <sub>0.9x</sub>	0.77	X	4.79	x	104.39	X	0.5	x	0.7	=	121.28	(77)
Southeas	t <sub>0.9x</sub>	0.77	x	4.79	x	92.85	x	0.5	x	0.7	=	107.88	(77)
Southeas	t <sub>0.9x</sub>	0.77	X	4.79	x	69.27	X	0.5	x	0.7	=	80.48	(77)
Southeas	t 0.9x	0.77	x	4.79	x	44.07	x	0.5	x	0.7	=	51.2	(77)
Southeas	t 0.9x	0.77	x	4.79	x	31.49	x	0.5	x	0.7	=	36.58	(77)
South	0.9x	0.77	x	2.22	x	46.75	x	0.5	x	0.7	=	25.17	(78)
South	0.9x	0.77	X	2.13	x	46.75	X	0.5	x	0.7	=	24.15	(78)

	_		_		_		_				_		_
South	0.9x	0.77	X	4.72	X	46.75	X	0.5	X	0.7	=	53.52	(78)
South	0.9x	0.77	X	4.76	x	46.75	X	0.5	x	0.7	=	53.98	(78)
South	0.9x	0.77	X	5.06	X	46.75	X	0.5	X	0.7	=	57.38	(78)
South	0.9x	0.77	X	2.22	x	76.57	X	0.5	X	0.7	=	41.23	(78)
South	0.9x	0.77	X	2.13	x	76.57	X	0.5	x	0.7	=	39.56	(78)
South	0.9x	0.77	X	4.72	x	76.57	X	0.5	x	0.7	] =	87.66	(78)
South	0.9x	0.77	X	4.76	x	76.57	x	0.5	x	0.7	=	88.4	(78)
South	0.9x	0.77	X	5.06	x	76.57	x	0.5	x	0.7	=	93.97	(78)
South	0.9x	0.77	X	2.22	x	97.53	x	0.5	x	0.7	=	52.52	(78)
South	0.9x	0.77	X	2.13	x	97.53	X	0.5	X	0.7	=	50.39	(78)
South	0.9x	0.77	X	4.72	x	97.53	X	0.5	x	0.7	] =	111.66	(78)
South	0.9x	0.77	X	4.76	X	97.53	X	0.5	x	0.7	] =	112.61	(78)
South	0.9x	0.77	X	5.06	x	97.53	x	0.5	x	0.7	=	119.7	(78)
South	0.9x	0.77	X	2.22	x	110.23	x	0.5	x	0.7	=	59.36	(78)
South	0.9x	0.77	X	2.13	x	110.23	x	0.5	x	0.7	=	56.95	(78)
South	0.9x	0.77	X	4.72	x	110.23	X	0.5	x	0.7	=	126.2	(78)
South	0.9x	0.77	X	4.76	x	110.23	x	0.5	x	0.7	=	127.27	(78)
South	0.9x	0.77	X	5.06	x	110.23	x	0.5	x	0.7	=	135.29	(78)
South	0.9x	0.77	X	2.22	x	114.87	x	0.5	x	0.7	=	61.85	(78)
South	0.9x	0.77	X	2.13	x	114.87	X	0.5	x	0.7	] =	59.35	(78)
South	0.9x	0.77	X	4.72	x	114.87	x	0.5	x	0.7	=	131.51	(78)
South	0.9x	0.77	X	4.76	x	114.87	X	0.5	x	0.7	=	132.62	(78)
South	0.9x	0.77	X	5.06	x	114.87	X	0.5	X	0.7	=	140.98	(78)
South	0.9x	0.77	X	2.22	x	110.55	x	0.5	x	0.7	=	59.53	(78)
South	0.9x	0.77	X	2.13	x	110.55	x	0.5	x	0.7	=	57.11	(78)
South	0.9x	0.77	X	4.72	x	110.55	x	0.5	x	0.7	] =	126.56	(78)
South	0.9x	0.77	X	4.76	x	110.55	x	0.5	x	0.7	] =	127.63	(78)
South	0.9x	0.77	X	5.06	x	110.55	x	0.5	x	0.7	=	135.68	(78)
South	0.9x	0.77	X	2.22	x	108.01	x	0.5	x	0.7	=	58.16	(78)
South	0.9x	0.77	X	2.13	x	108.01	x	0.5	x	0.7	] =	55.8	(78)
South	0.9x	0.77	X	4.72	x	108.01	X	0.5	x	0.7	] =	123.66	(78)
South	0.9x	0.77	X	4.76	x	108.01	X	0.5	x	0.7	] =	124.7	(78)
South	0.9x	0.77	X	5.06	x	108.01	X	0.5	x	0.7	] =	132.56	(78)
South	0.9x	0.77	X	2.22	x	104.89	X	0.5	x	0.7	=	56.48	(78)
South	0.9x	0.77	X	2.13	x	104.89	x	0.5	x	0.7	=	54.19	(78)
South	0.9x	0.77	X	4.72	x	104.89	X	0.5	x	0.7	=	120.09	(78)
South	0.9x	0.77	X	4.76	x	104.89	x	0.5	x	0.7	=	121.1	(78)
South	0.9x	0.77	X	5.06	x	104.89	x	0.5	x	0.7	=	128.74	(78)
South	0.9x	0.77	X	2.22	x	101.89	x	0.5	x	0.7	] =	54.86	(78)
South	0.9x	0.77	X	2.13	x	101.89	x	0.5	x	0.7	=	52.64	(78)
South	0.9x	0.77	×	4.72	x	101.89	x	0.5	X	0.7	=	116.64	(78)

			_		_		_		_		_		
South	0.9x	0.77	X	4.76	X	101.89	X	0.5	X	0.7	=	117.63	(78)
South	0.9x	0.77	X	5.06	x	101.89	x	0.5	X	0.7	=	125.04	(78)
South	0.9x	0.77	X	2.22	x	82.59	X	0.5	X	0.7	=	44.47	(78)
South	0.9x	0.77	X	2.13	X	82.59	X	0.5	X	0.7	=	42.67	(78)
South	0.9x	0.77	X	4.72	x	82.59	x	0.5	X	0.7	=	94.55	(78)
South	0.9x	0.77	X	4.76	x	82.59	X	0.5	X	0.7	=	95.35	(78)
South	0.9x	0.77	X	5.06	x	82.59	x	0.5	X	0.7	=	101.36	(78)
South	0.9x	0.77	X	2.22	x	55.42	x	0.5	X	0.7	=	29.84	(78)
South	0.9x	0.77	X	2.13	x	55.42	X	0.5	x	0.7	=	28.63	(78)
South	0.9x	0.77	X	4.72	X	55.42	X	0.5	X	0.7	=	63.44	(78)
South	0.9x	0.77	X	4.76	x	55.42	x	0.5	X	0.7	=	63.98	(78)
South	0.9x	0.77	X	5.06	x	55.42	X	0.5	X	0.7	=	68.01	(78)
South	0.9x	0.77	X	2.22	x	40.4	x	0.5	X	0.7	=	21.75	(78)
South	0.9x	0.77	X	2.13	x	40.4	x	0.5	X	0.7	=	20.87	(78)
South	0.9x	0.77	X	4.72	x	40.4	X	0.5	X	0.7	=	46.25	(78)
South	0.9x	0.77	X	4.76	x	40.4	x	0.5	X	0.7	=	46.64	(78)
South	0.9x	0.77	X	5.06	x	40.4	x	0.5	X	0.7	=	49.58	(78)
West	0.9x	0.77	X	2.39	X	19.64	X	0.5	x	0.7	=	22.77	(80)
West	0.9x	0.77	X	4.92	x	19.64	X	0.5	X	0.7	=	23.44	(80)
West	0.9x	0.77	X	5.08	x	19.64	X	0.5	X	0.7	=	24.2	(80)
West	0.9x	0.77	X	2.29	X	19.64	X	0.5	x	0.7	=	65.45	(80)
West	0.9x	0.77	X	4.72	x	19.64	x	0.5	X	0.7	=	44.97	(80)
West	0.9x	0.77	X	5.08	x	19.64	X	0.5	X	0.7	=	24.2	(80)
West	0.9x	0.77	X	3.63	x	19.64	x	0.5	X	0.7	=	17.29	(80)
West	0.9x	0.77	X	2.39	x	38.42	X	0.5	X	0.7	=	44.54	(80)
West	0.9x	0.77	X	4.92	X	38.42	X	0.5	X	0.7	=	45.85	(80)
West	0.9x	0.77	X	5.08	x	38.42	x	0.5	X	0.7	=	47.34	(80)
West	0.9x	0.77	X	2.29	X	38.42	X	0.5	X	0.7	=	128.04	(80)
West	0.9x	0.77	X	4.72	x	38.42	X	0.5	X	0.7	=	87.97	(80)
West	0.9x	0.77	X	5.08	x	38.42	X	0.5	X	0.7	=	47.34	(80)
West	0.9x	0.77	X	3.63	x	38.42	x	0.5	X	0.7	=	33.83	(80)
West	0.9x	0.77	X	2.39	x	63.27	X	0.5	X	0.7	=	73.36	(80)
West	0.9x	0.77	X	4.92	x	63.27	X	0.5	X	0.7	] =	75.51	(80)
West	0.9x	0.77	X	5.08	x	63.27	X	0.5	X	0.7	=	77.96	(80)
West	0.9x	0.77	X	2.29	x	63.27	X	0.5	x	0.7	=	210.87	(80)
West	0.9x	0.77	X	4.72	x	63.27	x	0.5	x	0.7	=	144.87	(80)
West	0.9x	0.77	X	5.08	x	63.27	x	0.5	x	0.7	=	77.96	(80)
West	0.9x	0.77	X	3.63	x	63.27	x	0.5	x	0.7	=	55.71	(80)
West	0.9x	0.77	X	2.39	x	92.28	x	0.5	x	0.7	=	106.99	(80)
West	0.9x	0.77	X	4.92	x	92.28	x	0.5	X	0.7	=	110.12	(80)
West	0.9x	0.77	X	5.08	X	92.28	X	0.5	X	0.7	=	113.7	(80)

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West	0.9x	0.77	X	2.29	X	92.28	X	0.5	X	0.7	=	307.54	(80)
West	0.9x	0.77	X	4.72	x	92.28	X	0.5	X	0.7	=	211.29	(80)
West	0.9x	0.77	X	5.08	X	92.28	X	0.5	X	0.7	=	113.7	(80)
West	0.9x	0.77	X	3.63	X	92.28	X	0.5	X	0.7	=	81.25	(80)
West	0.9x	0.77	X	2.39	X	113.09	х	0.5	X	0.7	=	131.12	(80)
West	0.9x	0.77	X	4.92	X	113.09	X	0.5	X	0.7	=	134.96	(80)
West	0.9x	0.77	X	5.08	X	113.09	X	0.5	X	0.7	=	139.35	(80)
West	0.9x	0.77	X	2.29	x	113.09	X	0.5	X	0.7	=	376.9	(80)
West	0.9x	0.77	X	4.72	x	113.09	X	0.5	x	0.7	=	258.95	(80)
West	0.9x	0.77	X	5.08	X	113.09	X	0.5	x	0.7	=	139.35	(80)
West	0.9x	0.77	X	3.63	x	113.09	X	0.5	X	0.7	=	99.57	(80)
West	0.9x	0.77	X	2.39	x	115.77	X	0.5	x	0.7	=	134.22	(80)
West	0.9x	0.77	X	4.92	x	115.77	x	0.5	X	0.7	=	138.15	(80)
West	0.9x	0.77	X	5.08	X	115.77	X	0.5	X	0.7	=	142.65	(80)
West	0.9x	0.77	X	2.29	x	115.77	X	0.5	X	0.7	=	385.82	(80)
West	0.9x	0.77	X	4.72	x	115.77	x	0.5	X	0.7	=	265.08	(80)
West	0.9x	0.77	X	5.08	x	115.77	x	0.5	X	0.7	=	142.65	(80)
West	0.9x	0.77	X	3.63	X	115.77	X	0.5	x	0.7	=	101.93	(80)
West	0.9x	0.77	X	2.39	x	110.22	X	0.5	X	0.7	=	127.79	(80)
West	0.9x	0.77	X	4.92	x	110.22	x	0.5	X	0.7	=	131.53	(80)
West	0.9x	0.77	X	5.08	X	110.22	X	0.5	X	0.7	=	135.81	(80)
West	0.9x	0.77	X	2.29	x	110.22	X	0.5	X	0.7	=	367.32	(80)
West	0.9x	0.77	X	4.72	X	110.22	х	0.5	X	0.7	=	252.36	(80)
West	0.9x	0.77	X	5.08	X	110.22	х	0.5	X	0.7	=	135.81	(80)
West	0.9x	0.77	X	3.63	x	110.22	X	0.5	X	0.7	=	97.04	(80)
West	0.9x	0.77	X	2.39	x	94.68	X	0.5	x	0.7	=	109.77	(80)
West	0.9x	0.77	X	4.92	X	94.68	X	0.5	x	0.7	=	112.98	(80)
West	0.9x	0.77	X	5.08	X	94.68	x	0.5	X	0.7	=	116.66	(80)
West	0.9x	0.77	X	2.29	X	94.68	X	0.5	X	0.7	=	315.52	(80)
West	0.9x	0.77	X	4.72	x	94.68	X	0.5	X	0.7	=	216.78	(80)
West	0.9x	0.77	X	5.08	x	94.68	x	0.5	X	0.7	=	116.66	(80)
West	0.9x	0.77	X	3.63	x	94.68	X	0.5	X	0.7	=	83.36	(80)
West	0.9x	0.77	X	2.39	X	73.59	X	0.5	X	0.7	=	85.32	(80)
West	0.9x	0.77	X	4.92	X	73.59	x	0.5	X	0.7	=	87.82	(80)
West	0.9x	0.77	X	5.08	X	73.59	X	0.5	X	0.7	=	90.67	(80)
West	0.9x	0.77	X	2.29	X	73.59	X	0.5	X	0.7	=	245.25	(80)
West	0.9x	0.77	X	4.72	x	73.59	x	0.5	x	0.7	=	168.5	(80)
West	0.9x	0.77	X	5.08	x	73.59	x	0.5	x	0.7	=	90.67	(80)
West	0.9x	0.77	X	3.63	x	73.59	x	0.5	x	0.7	=	64.79	(80)
West	0.9x	0.77	X	2.39	x	45.59	x	0.5	X	0.7	=	52.86	(80)
West	0.9x	0.77	X	4.92	X	45.59	x	0.5	X	0.7	=	54.4	(80)

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West	0.9x	0.77	X	5.0	8	X	4	5.59	X	0.5	X	0.7	=	56.17	(80)
West	0.9x	0.77	X	2.2	29	X	4	5.59	X	0.5	X	0.7	=	151.93	(80)
West	0.9x	0.77	X	4.7	'2	X	4	5.59	X	0.5	X	0.7	=	104.38	(80)
West	0.9x	0.77	X	5.0	)8	X	4	5.59	X	0.5	X	0.7	=	56.17	(80)
West	0.9x	0.77	X	3.6	3	X	4	5.59	X	0.5	X	0.7	=	40.14	(80)
West	0.9x	0.77	X	2.3	39	X	2	4.49	X	0.5	X	0.7	=	28.39	(80)
West	0.9x	0.77	X	4.9	)2	X	2	4.49	X	0.5	X	0.7	=	29.22	(80)
West	0.9x	0.77	X	5.0	)8	x	2	4.49	X	0.5	x	0.7	=	30.17	(80)
West	0.9x	0.77	X	2.2	29	X	2	4.49	X	0.5	x	0.7	=	81.61	(80)
West	0.9x	0.77	X	4.7	'2	X	2	4.49	X	0.5	x	0.7	=	56.07	(80)
West	0.9x	0.77	X	5.0	)8	x	2	4.49	x	0.5	×	0.7	=	30.17	(80)
West	0.9x	0.77	x	3.6	33	x	2	4.49	x	0.5	x	0.7	=	21.56	(80)
West	0.9x	0.77	x	2.3	39	x	1	6.15	x	0.5	x	0.7		18.73	(80)
West	0.9x	0.77	x	4.9	)2	x	1	6.15	X	0.5	x	0.7	=	19.27	(80)
West	0.9x	0.77	x	5.0	)8	X	1	6.15	x	0.5	x	0.7	=	19.9	(80)
West	0.9x	0.77	x	2.2	29	x	1	6.15	x	0.5	×	0.7	=	53.83	(80)
West	0.9x	0.77	x	4.7	<u>'2</u>	x	1	6.15	x	0.5	x	0.7	=	36.98	(80)
West	0.9x	0.77	x	5.0	)8	X	1	6.15	x	0.5	x	0.7	=	19.9	(80)
West	0.9x	0.77	x	3.6	3	X	1	6.15	x	0.5	x	0.7	=	14.22	(80)
	-														
Solar g	ains in	watts, ca	alculated	for eac	h month	)			(83)m	ı = Sum(74)m .	(82)m				
(83)m=	622.72	1139.14	1724.84	2347.04	2770.71	27	99.77	2679.82	2365	5.03 1945.15	1307.8	761.17	522.46		(83)
Total g	ains – i	nternal a	nd sola	(84)m =	= (73)m	+ (8	33)m	, watts						_	
(84)m=	1260.71	1774.84	2339.19	2926.14	3312.51	33	06.75	3164.88	2856	3.84 2455.66	1853.8	1348.07	1141.48		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	n)									
Temp	erature	during h	eating p	eriods ir	the livi	ng :	area	from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisa	tion fac	tor for g	ains for	living are	ea, h1,m	า (ร	ee Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug Sep	Oct	Nov	Dec		
(86)m=	0.97	0.94	0.88	0.77	0.64	(	0.49	0.38	0.4	2 0.64	0.86	0.95	0.98		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	in T	able 9c)			-	-	
(87)m=	18.21	18.68	19.33	20.03	20.54	$\overline{}$	0.83	20.94	20.	1	19.91	18.9	18.13	]	(87)
Temn	oraturo	during h	eating r	ariode in	rest of	- dw	مااام	from Ta	عامه	), Th2 (°C)			<u> </u>	J	
(88)m=	19.83	19.84	19.84	19.85	19.85	1	9.86	19.86	19.		19.85	19.85	19.84	]	(88)
				<u> </u>								1		J	, ,
Ī		tor for g		ì		1			r –	0.57	0.03	0.05	0.07	1	(89)
(89)m=	0.97	0.93	0.86	0.74	0.59	Γ,	0.42	0.29	0.3	3 0.57	0.83	0.95	0.97		(09)
Ī		· ·		i e	1	Ť		1	i –	to 7 in Tabl			ı	1	
(90)m=	16.12	16.79	17.72	18.7	19.36	1	9.72	19.83	19.		18.56		16		(90)
										f	LA = Liv	ving area ÷ (	4) =	0.29	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	elling	g) = fl	_A × T1	+ (1	– fLA) × T2				_	
(92)m=	16.72	17.34	18.18	19.09	19.7	2	0.04	20.15	20.	13 19.87	18.95	17.64	16.62		(92)
				l										1	(- /

(93)m= 16.72 17.34 18.18 19.09 19.7 20.04 20.1	5 20.13	19.87	18.95	17.64	16.62		(93)			
8. Space heating requirement										
Set Ti to the mean internal temperature obtained at step 11	of Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	culate				
the utilisation factor for gains using Table 9a			0.1	NI.						
Jan Feb Mar Apr May Jun Jul	l Aug	Sep	Oct	Nov	Dec					
Utilisation factor for gains, hm:  (94)m= 0.95 0.9 0.83 0.72 0.58 0.43 0.31	0.36	0.57	0.8	0.92	0.96		(94)			
Useful gains, hmGm , W = (94)m x (84)m	0.30	0.57	0.0	0.92	0.90		(01)			
$(95) \text{m} = \begin{cases} 1197.68 & 1605.2 & 1943.63 & 2098.93 & 1922.59 & 1432.24 & 983.63 & 1943.63 & 19$	64 1015.39	1393.57	1483.45	1242.04	1094.56		(95)			
Monthly average external temperature from Table 8	71 1010.00	1000.01	1 100.10	1212.01	1001.00		()			
(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)		Į					, ,			
(97)m= 3711.24 3707.46 3474.79 2995.78 2348.15 1577.33 1028.	<del></del>	<del>- `                                   </del>		3107.9	3676.51		(97)			
Space heating requirement for each month, kWh/month = 0	 .024 x [(97	)m – (95	)m] x (4	1)m	Į					
(98)m= 1870.09 1412.72 1139.19 645.73 316.62 0 0	0	0	719.13	1343.42	1920.97					
	Tota	al per year	ı (kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	9367.87	(98)			
Space heating requirement in kWh/m²/year					,	41.07	] (99)			
, , ,						41.07				
9b. Energy requirements – Community heating scheme  This part is used for space heating, space cooling or water he	oating prov	idad by	a comm	unity ook	omo					
Fraction of space heat from secondary/supplementary heating	• .	-		urnity Sci	ienie.	0	(301)			
Fraction of space heat from community system $1 - (301) =$						1	(302)			
The community scheme may obtain heat from several sources. The procedu	ure allows for	CHP and	up to four	other heat	sources; ti	he latter	_			
includes boilers, heat pumps, geothermal and waste heat from power station			•		_		_			
Fraction of heat from Community heat pump						0.5	(303a)			
Fraction of community heat from heat source 2						0.5	(303b)			
Fraction of total space heat from Community heat pump			(3	02) x (303	a) =	0.5	(304a)			
Fraction of total space heat from community heat source 2			(3	02) x (303	b) =	0.5	(304b)			
Factor for control and charging method (Table 4c(3)) for com-	munity hea	ating sys	tem			1	(305)			
Distribution loss factor (Table 12c) for community heating sys	stem					1.05	(306)			
Space heating						kWh/year				
Annual space heating requirement						9367.87				
Space heat from Community heat pump		(98) x (30	04a) x (30	5) x (306)	=	4918.13	(307a)			
Space heat from heat source 2		(98) x (30	04b) x (30	5) x (306)	=	4918.13	(307b)			
Efficiency of secondary/supplementary heating system in %	(from Table	e 4a or A	ppendix	E)		0	(308			
Space heating requirement from secondary/supplementary s	ystem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)			
Water heating							_			
Annual water heating requirement						2324.36				
If DHW from community scheme: Water heat from Community heat pump		(64) x (30	03a) x (30	5) x (306) :	=	1220.29	(310a)			
Water heat from heat source 2		(64) x (30	03b) x (30	5) x (306)	=	1220.29	(310b)			
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = 122.77$ (31										
							_			

Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling syst	em if not enter (1)	= (107) ÷ (314)	=	H	0	(315)
Electricity for pumps and fans within dwelling	•	- (101) : (011)				](0.0)
mechanical ventilation - balanced, extract or	, ,	utside			825.47	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b	b) + (330g) =		825.47	(331)
Energy for lighting (calculated in Appendix L)	)				625.12	(332)
Electricity generated by PVs (Appendix M) (r	negative quantity)			Ī	-1392.28	(333)
Electricity generated by wind turbine (Appen	dix M) (negative qua	ntity)		Ē	0	(334)
12b. CO2 Emissions – Community heating s	cheme					_
		Energy kWh/year	Emission facto		nissions J CO2/year	
CO2 from other sources of space and water Efficiency of heat source 1 (%)		two fuels repeat (363) to	(366) for the second f	uel	425	(367a)
Efficiency of heat source 2 (%)	If there is CHP using t	two fuels repeat (363) to	(366) for the second f	uel	91	(367b)
CO2 associated with heat source 1	[(307b)+(3	10b)] x 100 ÷ (367b) x	0.52	=	749.61	(367)
CO2 associated with heat source 2	[(307b)+(3	10b)] x 100 ÷ (367b) x	0.22	=	1457.03	(368)
Electrical energy for heat distribution	[(3	313) x	0.52	=	63.72	(372)
Total CO2 associated with community system	ms (3	63)(366) + (368)(372	2)	=	2270.36	(373)
CO2 associated with space heating (second	ary) (3	09) x	0	=	0	(374)
CO2 associated with water from immersion h	neater or instantaneo	us heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water	heating (3	73) + (374) + (375) =			2270.36	(376)
CO2 associated with electricity for pumps an	d fans within dwelling	g (331)) x	0.52	=	428.42	(378)
CO2 associated with electricity for lighting	(3	32))) x	0.52	=	324.44	(379)
Energy saving/generation technologies (333) Item 1	to (334) as applicab	ole	0.52 x 0.01	=	-722.6	(380)
Total CO2, kg/year sum	of (376)(382) =		<u></u>	F	2300.62	(383)
	) ÷ (4) =				10.09	(384)
El rating (section 14)					88.71	(385)

		User Details:					
					OTDO		
Assessor Name:	Joseph Treanor Stroma FSAP 2012		na Num			032062 n: 1.0.4.14	
Software Name:		Softwo operty Address	are Ve	rsion:	versio	11. 1.0.4.14	
Address :	, Gondar Gardens, London, N	·	5. I IZ				
Overall dwelling dimen							
, and the second		Area(m²)		Av. Height	(m)	Volume(m³	)
Ground floor		71.45	(1a) x	2.55	(2a) =	182.2	(3a)
First floor		71.77	(1b) x	3	(2b) =	215.31	(3b)
Second floor		36.89	(1c) x	3	(2c) =	110.67	(3c)
Third floor		35.72	(1d) x	3	(2d) =	107.16	(3d)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1e)+(1n)	215.83	(4)				_
Dwelling volume			(3a)+(3b	)+(3c)+(3d)+(3e	e)+(3n) =	615.34	(5)
2. Ventilation rate:							
	main secondary heating heating	other		total		m³ per hou	r
Number of chimneys		+ 0	= [	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	<b>-</b>	0	x 20 =	0	(6b)
Number of intermittent fan	s			0	x 10 =	0	(7a)
Number of passive vents			Ī	0	x 10 =	0	(7b)
Number of flueless gas fire	es		Ī	0	x 40 =	0	(7c)
			_		Air ch	anges per ho	
Lefter for the continue	(Co) (Ch) (70	\	_				_
•	s, flues and fans = (6a)+(6b)+(7a en carried out or is intended, proceed		continue fi	0 rom (9) to (16)	÷ (5) =	0	(8)
Number of storeys in the		to (11), otherwide	oonanao n	om (0) to (10)	Ī	0	(9)
Additional infiltration	<b>5</b> \ ,				[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timber frame or (	0.35 for masor	ry const	ruction		0	(11)
	esent, use the value corresponding to t	he greater wall ar	ea (after		•		_
deducting areas of opening	gs); if equal user 0.35 Dor, enter 0.2 (unsealed) or 0.1	(sealed) else	enter ()		i	0	(12)
If no draught lobby, ente	,	(Scalca), cisc	, criter o		[	0	(13)
• • • • • • • • • • • • • • • • • • • •	and doors draught stripped					0	(14)
Window infiltration	and doors arangin surppen	0.25 - [0.	2 x (14) ÷ 1	100] =		0	(15)
Infiltration rate		(8) + (10	) + (11) + (	12) + (13) + (15)	) =	0	(16)
	50, expressed in cubic metres	per hour per s	square m	etre of enve	lope area	3	(17)
	y value, then $(18) = [(17) \div 20] + (8)$		•			0.15	(18)
•	if a pressurisation test has been done			is being used		0.10	(```
Number of sides sheltered	I					2	(19)
Shelter factor		(20) = 1	- [0.075 x (	19)] =		0.85	(20)
Infiltration rate incorporatir	ng shelter factor	(21) = (1	8) x (20) =		İ	0.13	(21)
Infiltration rate modified fo	r monthly wind speed				•		_

Jul

Sep

Aug

Oct

Nov

Dec

Mar

Apr

May

Jun

Feb

Jan

22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	
L													
г	<u> </u>	22a)m =	<del>`</del>			T						1 1	
22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	
Adjuste	d infiltr	ation rat	e (allow	ing for sl	nelter an	nd 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	
		<i>ctive air e</i> al ventila	-	rate for t	he appli	cable ca	se						0.5
_				endix N, (2	(23a) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	o) = (23a)		l I	0.5 (2
						for in-use f				, , ,		[	68.85 (2
a) If b	alance	d mecha	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (2	2b)m + (	23b) × [	ا (23c) – 1	
24a)m=	0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	(2
b) If b	alance	d mecha	anical ve	entilation	without	heat red	overy (N	ЛV) (24t	m = (2)	2b)m + (2	23b)		
24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(2
c) If v	vhole h	ouse ex	tract ver	ntilation o	or positiv	e input v	entilation	n from o	outside				
if	(22b)n	n < 0.5 ×	(23b), t	then (24	c) = (23k	o); other	vise (24	c) = (22l	o) m + 0	.5 × (23b	)		
24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(2
,					•	ve input				0.51			
اا 24d)m=	0	0	0	0	0	erwise (2	4u)III =	$\frac{0.5 + [(2)]}{0}$	0	0.5]	0	0	(2
L					or (24)	o) or (24			x (25)				`
25)m=	0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	(2
						l		l .	l				
		s and he Gros		paramet Openin		Net Ar	00	U-val		AXU		k-value	e AXk
ELEM	EIN I	area	-	r		A,r		W/m2		(W/I	<b>K</b> )	kJ/m <sup>2</sup> ·ł	
Vindow	s Type	1				2.52	х1	/[1/( 1.2 )+	0.04] =	2.89			(2
/indow	s Type	2				4.72	x1	/[1/( 1.2 )+	0.04] =	5.4			(2
Vindow	s Type	3				2.39	х1	/[1/( 1.2 )+	0.04] =	2.74			(2
Vindow	s Type	4				2.29	x1	/[1/( 1.2 )+	0.04] =	2.62			(2
Vindow	s Type	5				2.26	x1	/[1/( 1.2 )+	0.04] =	2.59			(2
Vindow	s Type	6				1.73	x1	/[1/( 1.2 )+	0.04] =	1.98	$\equiv$		(2
Vindow	s Type	e 7				2.53	x1	/[1/( 1.2 )+	0.04] =	2.9	$\equiv$		(2
Vindow	s Type	8 :				2.26	x1	/[1/( 1.2 )+	0.04] =	2.59	=		(2
Vindow	s Type	9				4.5	x1	/[1/( 1.2 )+	0.04] =	5.15			(2
Vindow	/ѕ Туре	10				8.82	x1	/[1/( 1.2 )+	0.04] =	10.1	Ħ		(2
loor						71.45	, x	0.13	=	9.28849	9		(2
							<u></u>		<b>=</b> =	24.00	≓ i		] [](2
		187.	.5	70.3	8	117.1	2 X	0.18	-	21.08			
Valls Roof T	ype1	35.2	_	70.3	8	35.25	_	0.18		4.58	<b>-</b>		

Total area of elements, m<sup>2</sup> (31)329.92 Party wall (32)190.02 \* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions (26)...(30) + (32) =Fabric heat loss,  $W/K = S(A \times U)$ (33)120.18 Heat capacity  $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)24076.33 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Low (35)100 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)40.41 if details of thermal bridging are not known (36) =  $0.15 \times (31)$ Total fabric heat loss (33) + (36) =(37)160.59 Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)$ m x (5)Feb May Jun Jul Jan Mar Apr Aug Sep Oct Nov Dec 64.64 62.05 (38)63.99 63.34 60.11 59.46 56.22 56.22 55.58 57.52 59.46 60.75 (38)m =Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =225.23 224.58 223.94 220.7 220.05 216.82 216.82 216.17 218.11 220.05 221.35 222.64 (39)Average =  $Sum(39)_{1...12}/12=$ 220.54 Heat loss parameter (HLP), W/m2K (40)m = (39)m  $\div$  (4)1.04 (40)m =1.04 1.02 1 1 1 1.01 1.02 1.03 1.03 (40)Average =  $Sum(40)_{1...12}/12=$ 1.02 Number of days in month (Table 1a) Jan Feb Mar Apr Mav Jun Jul Aug Sen Oct Nov Dec (41)m =31 28 31 30 31 30 31 31 30 31 30 31 (41)4. Water heating energy requirement kWh/year: Assumed occupancy, N 3.02 (42)if TFA > 13.9, N = 1 + 1.76 x [1 -  $\exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 105.98 (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 Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m =116.58 112.34 108.1 103.86 99.63 95.39 95.39 99.63 103.86 108.1 112.34 116.58 (44)Total =  $Sum(44)_{1...12}$  = 1271.81 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 =172.89 151.21 156.04 136.04 130.53 112.64 104.37 119.77 121.2 141.25 154.18 167.43 Total =  $Sum(45)_{1...12}$  = 1667.55 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)(46)m =25.93 22.68 23.41 20.41 19.58 16.9 15.66 17.97 18.18 21.19 23.13 25.12 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (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):  Temperature factor from Table 2b  (48)													
,		0	) 1										
·		0	(49)										
Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not know	$(48) \times (49) =$	110	(50)										
Hot water storage loss factor from Table 2 (kWh/litre/day)	1.	0.02	(51)										
If community heating see section 4.3		0.02	, ,										
Volume factor from Table 2a		1.03	(52)										
Temperature factor from Table 2b		0.6	(53)										
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	1.03	(54)										
Enter (50) or (54) in (55)		1.03	(55)										
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	(56)										
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m where (	H11) is from 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 loss (annual) from Table 3		0	(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 hea	ating and a cylinder thermo	stat)											
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	3 23.26 22.51 23.26	22.51 23.26	(59)										
Combi loss calculated for each month (61)m = (60) $\div$ 365 x (4	l1)m												
(61)m= 0 0 0 0 0 0	0 0 0	0 0	(61)										
Total heat required for water heating calculated for each mon	th $(62)$ m = $0.85 \times (45)$ m +	(46)m + (57)m +	(59)m + (61)m										
(62)m= 228.17 201.14 211.31 189.53 185.81 166.13 159.6	5 175.05 174.7 196.53	207.68 222.71	(62)										
Solar DHW input calculated using Appendix G or Appendix H (negative quar	tity) (enter '0' if no solar contribut	ion to water heating)											
/- I I - I I'' I I' 'C FOUDO I/ W/W/UDO I'													
(add additional lines if FGHRS and/or WWHRS applies, see A	Appendix G)												
(add additional lines if FGHRS and/or WWHRS applies, see $\frac{1}{2}$ ) (63)m= $\frac{1}{2}$ 0 0 0 0 0 0	Appendix G) 0 0	0 0	(63)										
	<del>'i '' '</del>	0 0	(63)										
(63)m= 0 0 0 0 0 0	0 0 0	0 0 207.68 222.71	(63)										
(63)m= 0 0 0 0 0 0 0  Output from water heater	0 0 0	207.68 222.71	(63)										
(63)m= 0 0 0 0 0 0 0  Output from water heater	0 0 0 5 175.05 174.7 196.53 Output from water heate	207.68 222.71 r (annual) <sub>112</sub>	2318.39 (64)										
(63)m= 0 0 0 0 0 0 0 0  Output from water heater (64)m= 228.17 201.14 211.31 189.53 185.81 166.13 159.6	0 0 0 5 175.05 174.7 196.53 Output from water heate om + (61)m] + 0.8 x [(46)m	207.68 222.71 r (annual) <sub>112</sub>	2318.39 (64)										
(63)m= 0 0 0 0 0 0 0 0  Output from water heater (64)m= 228.17 201.14 211.31 189.53 185.81 166.13 159.64  Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)]	0 0 0 5 175.05 174.7 196.53 Output from water heate 1m + (61)m] + 0.8 x [(46)m 8 84.05 83.09 91.19	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89	2318.39 (64)										
(63)m= 0 0 0 0 0 0 0 0  Output from water heater (64)m= 228.17 201.14 211.31 189.53 185.81 166.13 159.6  Heat gains from water heating, kWh/month 0.25 [0.85 × (45) (65)m= 101.71 90.22 96.1 88.03 87.62 80.25 78.93 include (57)m in calculation of (65)m only if cylinder is in the	0 0 0 5 175.05 174.7 196.53 Output from water heate 1m + (61)m] + 0.8 x [(46)m 8 84.05 83.09 91.19	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89	2318.39 (64)										
(63)m= 0 0 0 0 0 0 0 0  Output from water heater (64)m= 228.17 201.14 211.31 189.53 185.81 166.13 159.6  Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45 (65)m= 101.71 90.22 96.1 88.03 87.62 80.25 78.93 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):	0 0 0 5 175.05 174.7 196.53 Output from water heate 1m + (61)m] + 0.8 x [(46)m 8 84.05 83.09 91.19	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89	2318.39 (64)										
(63)m= 0 0 0 0 0 0 0 0  Output from water heater (64)m= 228.17 201.14 211.31 189.53 185.81 166.13 159.64  Heat gains from water heating, kWh/month 0.25 [0.85 × (45) (65)m= 101.71 90.22 96.1 88.03 87.62 80.25 78.93 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):	0 0 0 5 175.05 174.7 196.53 Output from water heate om + (61)m] + 0.8 x [(46)m 3 84.05 83.09 91.19 e dwelling or hot water is fi	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89	2318.39 (64)										
(63)m= 0 0 0 0 0 0 0 0  Output from water heater  (64)m= 228.17 201.14 211.31 189.53 185.81 166.13 159.64  Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 101.71 90.22 96.1 88.03 87.62 80.25 78.93 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	0 0 0  5 175.05 174.7 196.53  Output from water heate  m + (61)m] + 0.8 x [(46)m  8 84.05 83.09 91.19  e dwelling or hot water is fi	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89 rom community h	2318.39 (64)										
(63)m=       0       0       0       0       0       0       0         Output from water heater       (64)m=       228.17       201.14       211.31       189.53       185.81       166.13       159.60         Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45.65)m=       101.71       90.22       96.1       88.03       87.62       80.25       78.93         include (57)m in calculation of (65)m only if cylinder is in the standard gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul         (66)m=       151.13       151.13       151.13       151.13       151.13       151.13       151.13	0 0 0  5 175.05 174.7 196.53  Output from water heate  m + (61)m] + 0.8 x [(46)m  8 84.05 83.09 91.19  e dwelling or hot water is fine  Aug Sep Oct  3 151.13 151.13 151.13	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89 rom community h	2318.39 (64) ] (65) neating										
(63)m=       0       0       0       0       0       0       0         Output from water heater       (64)m=       228.17       201.14       211.31       189.53       185.81       166.13       159.60         Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)       (65)m=       101.71       90.22       96.1       88.03       87.62       80.25       78.93         include (57)m in calculation of (65)m only if cylinder is in the standard gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul         (66)m=       151.13       151.13       151.13       151.13       151.13       151.13       151.13       151.13         Lighting gains (calculated in Appendix L, equation L9 or L9a)	0 0 0  5 175.05 174.7 196.53  Output from water heate  m + (61)m] + 0.8 x [(46)m]  8 84.05 83.09 91.19  e dwelling or hot water is for the second of the sec	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89 rom community h	2318.39 (64) ] (65) neating										
(63)m=       0       0       0       0       0       0       0         Output from water heater       (64)m=       228.17       201.14       211.31       189.53       185.81       166.13       159.6         Heat gains from water heating, kWh/month 0.25 ′ [0.85 x (45)m]       (45)m]       (65)m=       101.71       90.22       96.1       88.03       87.62       80.25       78.93         include (57)m in calculation of (65)m only if cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the standard of the cylinder is in the cylinder is in the standard of the cylinder is in the cylinder is in the cylinder is in the cylinder is in the cylinder is in the cylinder of the cylinder is in the cy	0 0 0  5 175.05 174.7 196.53  Output from water heate  m + (61)m] + 0.8 x [(46)m  8 84.05 83.09 91.19  e dwelling or hot water is from the discrepancy of the discrep	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89 rom community h  Nov Dec 151.13 151.13	2318.39 (64) ] (65) neating (66)										
(63)m=       0       0       0       0       0       0       0         Output from water heater       (64)m=       228.17       201.14       211.31       189.53       185.81       166.13       159.60         Heat gains from water heating, kWh/month 0.25 ′ [0.85 x (45)         (65)m=       101.71       90.22       96.1       88.03       87.62       80.25       78.93         include (57)m in calculation of (65)m only if cylinder is in th         5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul         (66)m=       151.13       151.13       151.13       151.13       151.13       151.13       151.13         Lighting gains (calculated in Appendix L, equation L9 or L9a)         (67)m=       34.4       30.55       24.85       18.81       14.06       11.87       12.83         Appliances gains (calculated in Appendix L, equation L13 or lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral materials in the lateral	0 0 0  5 175.05 174.7 196.53  Output from water heate  m + (61)m] + 0.8 x [(46)m  8 84.05 83.09 91.19  e dwelling or hot water is from the second of the sec	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89 rom community h  Nov Dec 151.13 151.13	2318.39 (64) ] (65) neating (66)										
(63)m=       0       0       0       0       0       0       0         Output from water heater       (64)m=       228.17       201.14       211.31       189.53       185.81       166.13       159.69         Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)m]       (45)m       (65)m=       101.71       90.22       96.1       88.03       87.62       80.25       78.93         include (57)m in calculation of (65)m only if cylinder is in the standard of the stan	0 0 0  5 175.05 174.7 196.53  Output from water heate  m + (61)m] + 0.8 x [(46)m  8 84.05 83.09 91.19  e dwelling or hot water is from the second of the sec	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89 rom community h  Nov Dec 151.13 151.13  33.16 35.36	2318.39 (64) ] (65) neating (66) (67)										
(63)m=       0       0       0       0       0       0         Output from water heater       (64)m=       228.17       201.14       211.31       189.53       185.81       166.13       159.66         Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)       (65)m=       101.71       90.22       96.1       88.03       87.62       80.25       78.93         include (57)m in calculation of (65)m only if cylinder is in them.         5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul         (66)m=       151.13       151.13       151.13       151.13       151.13       151.13       151.13         Lighting gains (calculated in Appendix L, equation L9 or L9a)       (67)m=       34.4       30.55       24.85       18.81       14.06       11.87       12.83         Appliances gains (calculated in Appendix L, equation L13 or L68)m=       385.85       389.86       379.77       358.29       331.17       305.69       288.68         Cooking gains (calculated in Appendix L, equation L15 or L15	0 0 0  5 175.05 174.7 196.53  Output from water heate  m + (61)m] + 0.8 x [(46)m  8 84.05 83.09 91.19  e dwelling or hot water is find  Aug Sep Oct  3 151.13 151.13 151.13  also see Table 5  6 16.67 22.38 28.42  13a), also see Table 5  6 284.66 294.75 316.23  5a), also see Table 5	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89 rom community h  Nov Dec 151.13 151.13  33.16 35.36  343.34 368.83	2318.39 (64) ] (65) neating (66) (67)										
(63)m=       0       0       0       0       0       0         Output from water heater       (64)m=       228.17       201.14       211.31       189.53       185.81       166.13       159.66         Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45.65)m=       101.71       90.22       96.1       88.03       87.62       80.25       78.93         include (57)m in calculation of (65)m only if cylinder is in the standard part of the st	0 0 0  5 175.05 174.7 196.53  Output from water heate  m + (61)m] + 0.8 x [(46)m  8 84.05 83.09 91.19  e dwelling or hot water is find  Aug Sep Oct  3 151.13 151.13 151.13  also see Table 5  6 16.67 22.38 28.42  13a), also see Table 5  6 284.66 294.75 316.23  5a), also see Table 5	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89 rom community h  Nov Dec 151.13 151.13  33.16 35.36	2318.39 (64) ] (65) neating (66) [ (67)										
(63)m=       0       0       0       0       0       0         Output from water heater       (64)m=       228.17       201.14       211.31       189.53       185.81       166.13       159.66         Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)       (65)m=       101.71       90.22       96.1       88.03       87.62       80.25       78.93         include (57)m in calculation of (65)m only if cylinder is in them.         5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul         (66)m=       151.13       151.13       151.13       151.13       151.13       151.13       151.13         Lighting gains (calculated in Appendix L, equation L9 or L9a)       (67)m=       34.4       30.55       24.85       18.81       14.06       11.87       12.83         Appliances gains (calculated in Appendix L, equation L13 or L68)m=       385.85       389.86       379.77       358.29       331.17       305.69       288.68         Cooking gains (calculated in Appendix L, equation L15 or L15	0 0 0  5 175.05 174.7 196.53  Output from water heate  m + (61)m] + 0.8 x [(46)m  8 84.05 83.09 91.19  e dwelling or hot water is find  Aug Sep Oct  3 151.13 151.13 151.13  also see Table 5  6 16.67 22.38 28.42  13a), also see Table 5  6 284.66 294.75 316.23  5a), also see Table 5	207.68 222.71 r (annual) <sub>112</sub> + (57)m + (59)m 94.06 99.89 rom community h  Nov Dec 151.13 151.13  33.16 35.36  343.34 368.83	2318.39 (64) ] (65) neating (66) [ (67)										

Losses e.g. evaporation (negative values) (Table 5)														
(71)m=	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9	-120.9		(71)
Water	heating	gains (T	able 5)											
(72)m=	136.7	134.25	129.17	122.26	117.77	111.45	106.08	112.96	115.41	122.56	130.64	134.27		(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	- (69)m + (	70)m + (7	1)m + (72)	m	·	
(73)m=	625.29	623	602.12	567.69	531.34	497.35	475.91	482.63	500.87	535.54	575.49	606.79		(73)
6. Solar gains:														

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

_		Access Facto Table 6d	r Area m²		a ana	Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	1	x	2.53	x	19.64	x	0.5	x	0.7	=	12.05	(76)
East	0.9x	3	x	2.26	x	19.64	x	0.5	x	0.7	=	32.3	(76)
East	0.9x	3	x	4.5	x	19.64	x	0.5	X	0.7	=	64.31	(76)
East	0.9x	1	x	2.53	x	38.42	x	0.5	x	0.7	=	23.58	(76)
East	0.9x	3	x	2.26	x	38.42	x	0.5	x	0.7	=	63.18	(76)
East	0.9x	3	x	4.5	x	38.42	x	0.5	x	0.7	=	125.81	(76)
East	0.9x	1	x	2.53	x	63.27	x	0.5	x	0.7	=	38.83	(76)
East	0.9x	3	x	2.26	x	63.27	X	0.5	x	0.7	=	104.05	(76)
East	0.9x	3	X	4.5	X	63.27	X	0.5	X	0.7	=	207.18	(76)
East	0.9x	1	x	2.53	x	92.28	x	0.5	x	0.7	=	56.63	(76)
East	0.9x	3	X	2.26	X	92.28	X	0.5	X	0.7	=	151.75	(76)
East	0.9x	3	X	4.5	X	92.28	X	0.5	X	0.7	=	302.16	(76)
East	0.9x	1	X	2.53	X	113.09	X	0.5	X	0.7	=	69.4	(76)
East	0.9x	3	X	2.26	X	113.09	X	0.5	X	0.7	=	185.98	(76)
East	0.9x	3	X	4.5	x	113.09	X	0.5	X	0.7	=	370.31	(76)
East	0.9x	1	X	2.53	X	115.77	X	0.5	X	0.7	=	71.04	(76)
East	0.9x	3	X	2.26	X	115.77	X	0.5	X	0.7	=	190.38	(76)
East	0.9x	3	X	4.5	x	115.77	X	0.5	X	0.7	=	379.08	(76)
East	0.9x	1	X	2.53	x	110.22	X	0.5	X	0.7	=	67.64	(76)
East	0.9x	3	X	2.26	x	110.22	x	0.5	X	0.7	=	181.25	(76)
East	0.9x	3	x	4.5	x	110.22	x	0.5	X	0.7	=	360.9	(76)
East	0.9x	1	X	2.53	X	94.68	X	0.5	X	0.7	=	58.1	(76)
East	0.9x	3	X	2.26	x	94.68	x	0.5	X	0.7	=	155.69	(76)
East	0.9x	3	X	4.5	X	94.68	X	0.5	X	0.7	=	310.01	(76)
East	0.9x	1	X	2.53	x	73.59	X	0.5	X	0.7	=	45.16	(76)
East	0.9x	3	x	2.26	x	73.59	x	0.5	x	0.7	=	121.02	(76)
East	0.9x	3	X	4.5	x	73.59	X	0.5	X	0.7	=	240.96	(76)
East	0.9x	1	x	2.53	x	45.59	X	0.5	X	0.7	=	27.98	(76)
East	0.9x	3	x	2.26	x	45.59	x	0.5	X	0.7	=	74.97	(76)
East	0.9x	3	X	4.5	X	45.59	X	0.5	X	0.7	=	149.28	(76)

East	0.9x	1	X	2.53	x	24.49	X	0.5	X	0.7	=	15.03	(76)
East	0.9x	3	X	2.26	x	24.49	x	0.5	X	0.7	] =	40.27	(76)
East	0.9x	3	X	4.5	x	24.49	x	0.5	X	0.7	=	80.19	(76)
East	0.9x	1	X	2.53	x	16.15	x	0.5	X	0.7	=	9.91	(76)
East	0.9x	3	X	2.26	x	16.15	x	0.5	x	0.7	] =	26.56	(76)
East	0.9x	3	X	4.5	x	16.15	X	0.5	X	0.7	=	52.89	(76)
South	0.9x	0.77	X	2.26	x	46.75	X	0.5	X	0.7	=	25.63	(78)
South	0.9x	0.77	X	1.73	x	46.75	X	0.5	X	0.7	=	19.62	(78)
South	0.9x	0.77	X	8.82	X	46.75	X	0.5	X	0.7	=	200.03	(78)
South	0.9x	0.77	X	2.26	x	76.57	X	0.5	X	0.7	=	41.97	(78)
South	0.9x	0.77	X	1.73	x	76.57	X	0.5	X	0.7	=	32.13	(78)
South	0.9x	0.77	X	8.82	X	76.57	X	0.5	X	0.7	=	327.6	(78)
South	0.9x	0.77	X	2.26	x	97.53	x	0.5	x	0.7	=	53.46	(78)
South	0.9x	0.77	X	1.73	x	97.53	X	0.5	X	0.7	=	40.93	(78)
South	0.9x	0.77	X	8.82	x	97.53	X	0.5	X	0.7	=	417.31	(78)
South	0.9x	0.77	X	2.26	x	110.23	x	0.5	x	0.7	] =	60.43	(78)
South	0.9x	0.77	X	1.73	X	110.23	X	0.5	X	0.7	=	46.26	(78)
South	0.9x	0.77	X	8.82	x	110.23	X	0.5	X	0.7	=	471.65	(78)
South	0.9x	0.77	X	2.26	x	114.87	X	0.5	X	0.7	=	62.97	(78)
South	0.9x	0.77	X	1.73	x	114.87	x	0.5	X	0.7	=	48.2	(78)
South	0.9x	0.77	X	8.82	X	114.87	X	0.5	x	0.7	=	491.49	(78)
South	0.9x	0.77	X	2.26	x	110.55	x	0.5	x	0.7	=	60.6	(78)
South	0.9x	0.77	X	1.73	x	110.55	x	0.5	x	0.7	=	46.39	(78)
South	0.9x	0.77	X	8.82	X	110.55	X	0.5	X	0.7	=	472.99	(78)
South	0.9x	0.77	X	2.26	x	108.01	X	0.5	X	0.7	] =	59.21	(78)
South	0.9x	0.77	X	1.73	x	108.01	X	0.5	x	0.7	] =	45.32	(78)
South	0.9x	0.77	X	8.82	X	108.01	X	0.5	X	0.7	=	462.14	(78)
South	0.9x	0.77	X	2.26	x	104.89	x	0.5	x	0.7	=	57.5	(78)
South	0.9x	0.77	X	1.73	x	104.89	X	0.5	X	0.7	] =	44.01	(78)
South	0.9x	0.77	X	8.82	X	104.89	X	0.5	X	0.7	=	448.8	(78)
South	0.9x	0.77	X	2.26	X	101.89	X	0.5	X	0.7	] =	55.85	(78)
South	0.9x	0.77	X	1.73	x	101.89	X	0.5	X	0.7	=	42.75	(78)
South	0.9x	0.77	X	8.82	X	101.89	X	0.5	X	0.7	=	435.93	(78)
South	0.9x	0.77	X	2.26	X	82.59	X	0.5	X	0.7	] =	45.27	(78)
South	0.9x	0.77	X	1.73	x	82.59	X	0.5	X	0.7	=	34.65	(78)
South	0.9x	0.77	X	8.82	x	82.59	X	0.5	x	0.7	] =	353.35	(78)
South	0.9x	0.77	X	2.26	x	55.42	x	0.5	x	0.7	] =	30.38	(78)
South	0.9x	0.77	X	1.73	x	55.42	X	0.5	X	0.7	] =	23.25	(78)
South	0.9x	0.77	X	8.82	x	55.42	X	0.5	x	0.7	] =	237.11	(78)
South	0.9x	0.77	X	2.26	x	40.4	X	0.5	X	0.7	] =	22.14	(78)
South	0.9x	0.77	X	1.73	x	40.4	X	0.5	X	0.7	] =	16.95	(78)

	_		_										_
South	0.9x	0.77	X	8.82	X	40.4	X	0.5	X	0.7	=	172.85	(78)
West	0.9x	0.77	X	2.52	X	19.64	X	0.5	X	0.7	=	12	(80)
West	0.9x	0.77	X	4.72	X	19.64	X	0.5	X	0.7	=	67.45	(80)
West	0.9x	0.77	X	2.39	X	19.64	X	0.5	X	0.7	=	11.39	(80)
West	0.9x	0.77	X	2.29	X	19.64	X	0.5	X	0.7	=	32.73	(80)
West	0.9x	0.77	X	2.52	X	38.42	X	0.5	x	0.7	=	23.48	(80)
West	0.9x	0.77	X	4.72	X	38.42	X	0.5	X	0.7	] =	131.96	(80)
West	0.9x	0.77	X	2.39	X	38.42	х	0.5	X	0.7	=	22.27	(80)
West	0.9x	0.77	X	2.29	X	38.42	X	0.5	X	0.7	=	64.02	(80)
West	0.9x	0.77	X	2.52	X	63.27	х	0.5	X	0.7	=	38.67	(80)
West	0.9x	0.77	X	4.72	X	63.27	x	0.5	X	0.7	=	217.31	(80)
West	0.9x	0.77	X	2.39	X	63.27	X	0.5	X	0.7	=	36.68	(80)
West	0.9x	0.77	X	2.29	X	63.27	x	0.5	X	0.7	=	105.43	(80)
West	0.9x	0.77	X	2.52	X	92.28	X	0.5	X	0.7	=	56.4	(80)
West	0.9x	0.77	X	4.72	X	92.28	X	0.5	X	0.7	=	316.94	(80)
West	0.9x	0.77	X	2.39	X	92.28	x	0.5	X	0.7	=	53.49	(80)
West	0.9x	0.77	X	2.29	X	92.28	x	0.5	X	0.7	=	153.77	(80)
West	0.9x	0.77	X	2.52	X	113.09	X	0.5	x	0.7	=	69.13	(80)
West	0.9x	0.77	X	4.72	X	113.09	X	0.5	X	0.7	=	388.42	(80)
West	0.9x	0.77	X	2.39	X	113.09	X	0.5	X	0.7	=	65.56	(80)
West	0.9x	0.77	X	2.29	X	113.09	X	0.5	x	0.7	=	188.45	(80)
West	0.9x	0.77	X	2.52	X	115.77	x	0.5	X	0.7	=	70.76	(80)
West	0.9x	0.77	X	4.72	X	115.77	X	0.5	X	0.7	=	397.61	(80)
West	0.9x	0.77	X	2.39	X	115.77	x	0.5	X	0.7	=	67.11	(80)
West	0.9x	0.77	X	2.29	X	115.77	X	0.5	X	0.7	=	192.91	(80)
West	0.9x	0.77	X	2.52	X	110.22	X	0.5	X	0.7	=	67.37	(80)
West	0.9x	0.77	X	4.72	X	110.22	x	0.5	X	0.7	=	378.55	(80)
West	0.9x	0.77	X	2.39	X	110.22	x	0.5	X	0.7	=	63.89	(80)
West	0.9x	0.77	X	2.29	X	110.22	X	0.5	X	0.7	=	183.66	(80)
West	0.9x	0.77	X	2.52	X	94.68	X	0.5	X	0.7	] =	57.87	(80)
West	0.9x	0.77	X	4.72	X	94.68	x	0.5	X	0.7	=	325.16	(80)
West	0.9x	0.77	X	2.39	X	94.68	X	0.5	X	0.7	=	54.88	(80)
West	0.9x	0.77	X	2.29	X	94.68	X	0.5	X	0.7	] =	157.76	(80)
West	0.9x	0.77	X	2.52	X	73.59	X	0.5	X	0.7	=	44.98	(80)
West	0.9x	0.77	X	4.72	X	73.59	X	0.5	x	0.7	=	252.74	(80)
West	0.9x	0.77	x	2.39	x	73.59	x	0.5	x	0.7	=	42.66	(80)
West	0.9x	0.77	x	2.29	X	73.59	x	0.5	X	0.7	] =	122.62	(80)
West	0.9x	0.77	x	2.52	x	45.59	x	0.5	x	0.7	=	27.87	(80)
West	0.9x	0.77	x	4.72	x	45.59	x	0.5	x	0.7	] =	156.58	(80)
West	0.9x	0.77	x	2.39	X	45.59	x	0.5	X	0.7	] =	26.43	(80)
West	0.9x	0.77	X	2.29	X	45.59	X	0.5	X	0.7	=	75.97	(80)

West	0.9x	0.77	X	2.5	52	x	2	4.49	x		0.5	×	0.7	=	14.97	(80)
West	0.9x	0.77	X	4.7	<b>7</b> 2	x	2	4.49	x		0.5	x	0.7	=	84.11	(80)
West	0.9x	0.77	X	2.3	39	x	2	4.49	X		0.5	x	0.7	=	14.2	(80)
West	0.9x	0.77	х	2.2	29	x	2	4.49	x		0.5	x	0.7	=	40.81	(80)
West	0.9x	0.77	X	2.5	52	x	1	6.15	x		0.5	x	0.7	=	9.87	(80)
West	0.9x	0.77	X	4.7	<b>7</b> 2	x	1	6.15	x		0.5	x	0.7	=	55.47	(80)
West	0.9x	0.77	X	2.3	39	x	1	6.15	x		0.5	x	0.7	=	9.36	(80)
West	0.9x	0.77	x	2.2	29	x	1	6.15	x		0.5	x [	0.7		26.91	(80)
	_								•							
Solar g	ains in	watts, ca	alculated	d for eac	h month	l			(83)m	n = Sı	um(74)m .	(82)m				
(83)m=	477.51	856	1259.86	1669.48	1939.9	19	48.88	1869.92	1669	9.79	1404.67	972.33	580.3	402.92	7	(83)
Total g	ains – iı	nternal a	nd sola	r (84)m =	= (73)m	+ (8	33)m	, watts								
(84)m=	1102.8	1479	1861.98	2237.17	2471.24	24	46.23	2345.84	2152	2.43	1905.55	1507.88	1155.79	1009.7		(84)
7. Me	an inter	nal temp	erature	(heating	season	)										
				eriods in		<i>'</i>	area f	from Tab	ole 9	. Th	1 (°C)				21	(85)
•		_	•	living are		-				,	. ( -)					` ′
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	7	
(86)m=	0.98	0.95	0.9	0.8	0.67	+	0.51	0.39	0.4	_	0.65	0.87	0.96	0.98	┥	(86)
` ′ [			ļ	<u> </u>	ļ				<u> </u>	!			1		_	` '
Г			1	living ar	· `	_				$\neg$			T		7	(07)
(87)m=	18.69	19.1	19.64	20.24	20.65	2	0.88	20.96	20.	95	20.76	20.15	19.3	18.63	_	(87)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	9, Tr	n2 (°C)				_	
(88)m=	20.05	20.05	20.05	20.06	20.07	2	80.0	20.08	20.	.08	20.07	20.07	20.06	20.06		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)							
(89)m=	0.97	0.94	0.88	0.77	0.62	(	0.45	0.31	0.3	36	0.59	0.84	0.95	0.98	7	(89)
Mean	interna	l temper	ature in	the rest	of dwell	ina	T2 (fd	ollow ste	ns 3	to 7	in Tahl	e 9c)	•	•	<b>-</b>	
(90)m=	16.93	17.52	18.3	19.13	19.68	Ť	9.97	20.05	20.		19.84	19.04	17.82	16.84	7	(90)
` ′ [			<u> </u>	<u> </u>	<u> </u>	<u> </u>			<u> </u>	!			ng area ÷ (4		0.14	(91)
									,,							` ′
r			<del>- `</del>	r the wh	r				<del>`</del>	$\overline{}$		40.0	1 40 00	174	7	(00)
(92)m=	17.19	17.74	18.49	19.29	19.82	<u> </u>	20.1	20.18	20.		19.97	19.2	18.03	17.1	_	(92)
	17.19	17.74	18.49	interna 19.29	19.82	_	20.1	20.18	20.	$\overline{}$	19.97	19.2	18.03	17.1	7	(93)
(93)m=		ting requ	l		19.02	L	20.1	20.10	20.	17	19.97	19.2	16.03	17.1		(55)
•		· ·			ro obtoir	204	ot ot	on 11 of	Tobl	la Oh	oo tha	t Ti m	(76)m an	d ro ool	ouloto	
				using Ta		ieu	al Sit	ър птог	ıabı	ie ar	), 50 iiia	t 11,111=	(10)III aII	u ie-cai	Culate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	7	
ا Utilisa		tor for g		<u> </u>		_			<u> </u>	<u> </u>	•		1	ļ	_	
(94)m=	0.96	0.92	0.85	0.75	0.61	(	0.45	0.32	0.3	36	0.58	0.81	0.93	0.96	7	(94)
Usefu	l gains,	hmGm ,	, W = (9	4)m x (8	4)m								•		_	
(95)m=	1054.9	1356.66	1587.28	1670.25	1507.21	11	08.46	754.17	782	.89	1106.66	1228.92	1075	973.77	1	(95)
Month	nly avera	age exte	rnal ten	perature	from T	abl	e 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	loss rate	for mea	an interr	al temp	erature,	Lm	, W =	=[(39)m	x [(9:	3)m-	– (96)m	]			_ _	
(97)m=	2902.15	2884.5	2684.8	2292.78	1786.93	1	193.2	776.94	815	.58	1281.08	1891.58	2419.9	2871.7		(97)
•																

Space heating requirement for each month, kWh/month = 0.024	4 x [(97	')m – (9!	5)ml x (4 <sup>,</sup>	1)m		
(98)m= 1374.36 1026.71 816.56 448.23 208.11 0 0	0	0	493.02	968.33 1412.06		
	Tota	al per year	(kWh/year	) = Sum(98) <sub>15,912</sub> =	6747.38	(98)
Space heating requirement in kWh/m²/year					31.26	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating. Fraction of space heat from secondary/supplementary heating (T				unity scheme.	0	(301)
Fraction of space heat from community system 1 – (301) =		,		[	1	(302)
The community scheme may obtain heat from several sources. The procedure a	llows for	CHP and	up to four	L other heat sources; th	e latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. S	ee Appe	ndix C.		Γ	0.5	(303a)
Fraction of heat from Community heat pump  Fraction of community heat from heat source 2				<u>[</u>	0.5	(303b)
·			(2)	02) x (202a) -	0.5	╡`
Fraction of total space heat from Community heat pump				02) x (303a) =	0.5	(304a)
Fraction of total space heat from community heat source 2				02) x (303b) =	0.5	(304b)
Factor for control and charging method (Table 4c(3)) for commun	-	ating sys	stem	Ĺ	1	(305)
Distribution loss factor (Table 12c) for community heating system	n			L	1.05	(306)
Space heating Annual space heating requirement				Γ	<b>kWh/yea</b> 6747.38	<u>r</u> 
Space heat from Community heat pump		(98) x (3	804a) x (305	5) x (306) =	3542.37	(307a)
Space heat from heat source 2		(98) x (3	804b) x (305	5) x (306) =	3542.37	(307b)
Efficiency of secondary/supplementary heating system in % (from	n Table	e 4a or A	Appendix	E) [	0	(308
Space heating requirement from secondary/supplementary systematics	em	(98) x (3	801) x 100 ÷	- (308) =	0	(309)
Water heating				-		_
Annual water heating requirement					2318.39	
If DHW from community scheme: Water heat from Community heat pump		(64) x (3	803a) x (305	5) x (306) =	1217.15	(310a)
Water heat from heat source 2		(64) x (3	803b) x (305	5) x (306) =	1217.15	(310b)
Electricity used for heat distribution	0.01	× [(307a)	)(307e) +	(310a)(310e)] =	95.19	(313)
Cooling System Energy Efficiency Ratio				Ī	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)		= (107)	÷ (314) =	Ī	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):				-		_ 
mechanical ventilation - balanced, extract or positive input from o	outside			Ĺ	788.25	(330a)
warm air heating system fans				Ĺ	0	(330b)
pump for solar water heating				Į	0	(330g)
Total electricity for the above, kWh/year		=(330a)	+ (330b) +	(330g) =	788.25	(331)
Energy for lighting (calculated in Appendix L)				<u></u>	607.5	(332)
Electricity generated by PVs (Appendix M) (negative quantity)					-1317.36	(333)

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 (%) 425 (367a) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 2 (%) (367b) 91 CO2 associated with heat source 1  $[(307b)+(310b)] \times 100 \div (367b) \times$ (367)0.52 581.22 CO2 associated with heat source 2  $[(307b)+(310b)] \times 100 \div (367b) \times$ (368)0.22 1129.73 Electrical energy for heat distribution [(313) x (372)0.52 49.4 Total CO2 associated with community systems (363)...(366) + (368)...(372)1760.36 (373)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 (376)(373) + (374) + (375) =1760.36 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378)0.52 409.1 CO2 associated with electricity for lighting (379)(332))) x 0.52 315.29 Energy saving/generation technologies (333) to (334) as applicable x 0.01 =Item 1 (380) 0.52 -683.71 sum of (376)...(382) = Total CO2, kg/year 1801.04 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)8.34

El rating (section 14)

90.75

(385)

			I loo <del>r D</del>	otoile. –						
Access Name	Japanh Transas		User D		- NI	L		CTDC	2022000	
Assessor Name: Software Name:	Joseph Treanor Stroma FSAP 2012	2		Stroma Softwa					0032062 on: 1.0.4.14	
Software Name.	Stroma i SAF 2012			Address:		51011.		VEISIC	JII. 1.0.4.14	
Address :	, Gondar Gardens, L		· í							
1. Overall dwelling dime		-0114011, 1	1000							
<u> </u>			Area	a(m²)		Av. He	ight(m)		Volume(m	3)
Basement				<u> </u>	(1a) x		2.55	(2a) =	305.06	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1e)	)+(1n)	) 11	19.63	(4)			_		_
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	305.06	(5)
2. Ventilation rate:										
		condary	/	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0	] = [	0	X ·	40 =	0	(6a)
Number of open flues	0 +	0	ī + Ē	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans				' F	0	x	10 =	0	(7a)
Number of passive vents	S				F	0	x	10 =	0	(7b)
Number of flueless gas t					F	0	x	40 =	0	(7c)
Number of fideless gas i					L					(70)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (68	a)+(6b)+(7a	a)+(7b)+(7	7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intende	d, proceed	l to (17), c	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel or timber f	rame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are p deducting areas of open	present, use the value corresp	oonding to	the greate	er wall are	a (after					
•	floor, enter 0.2 (unseale	ed) or 0.1	1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, er	•	ou, o. o.	. (000.0	, 0, 0,00	011101 0				0	(13)
•	s and doors draught str	ripped							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 cubi	ic metres	s per ho	our per so	guare m	etre of e	envelope	area	3	(17)
If based on air permeabi	• • •		•	•	•				0.15	(18)
·	es if a pressurisation test has					is being u	sed			` ′
Number of sides shelter	ed								2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting 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 sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a) = (2	)(2)m · 4									
Wind Factor $(22a)m = (2(22a)m = 1.27)$ 1.25	22)m ÷ 4 1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(220)111- 1.21 1.20	1.20 1.1 1.00	0.93	ს.ჟა	0.92	ı	1.00	1.12	1.10	J	

0.16	0.16	0.16	0.14		d wind s	<del>` `</del>	<del>`</del>	<del>ì ´</del>	044	0.44	0.45	1	
Calculate effec	l ' '			0.14 he appli	0.12 Cable ca	0.12 S <b>e</b>	0.12	0.13	0.14	0.14	0.15		
If mechanica	al ventila	ition:										0.5	(23
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0.5	(2:
If balanced with	heat reco	overy: effici	iency in %	allowing for	or in-use f	actor (from	n Table 4h	) =				68.85	(23
a) If balance		anical ve	ntilation		at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(24
b) If balance	d mech	anical ve	ntilation	without	heat rec	covery (N	ЛV) (24b	p)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	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)		-			
25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(2
3. Heat losse	s and he	eat loss r	paramete	żt.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ue	AXU		k-value	e A	Χk
	area	_	m		A ,r		W/m2		(W/		kJ/m²-l		J/K
Vindows Type	<u>.</u> 1												
					4.92	χ1,	/[1/( 1.2 )+	[0.04] =	5.63				(2
Vindows Type					4.92	= .	/[1/( 1.2 )+ /[1/( 1.2 )+	l l	5.63				(2
	2					x1/		0.04] =					•
Vindows Type	2				4.92	x1/	/[1/( 1.2 )+	0.04] =	5.63	9 [			(2
Vindows Type Vindows Type Floor Valls Type1	2	77	12.23	3	4.92	x1/ x1/ 3 x	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] =	5.63 2.74	9 [			(2
Vindows Type Floor Valls Type1	e 2 e 3		12.23	3	4.92 2.39 119.6	x1/ x1/ 3 x	/[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	0.04] = [	5.63 2.74 15.551	9 [			(2
Vindows Type Floor Valls Type1 Valls Type2	74.7	35		3	4.92 2.39 119.6 62.54	x1/2 x1/3 x x x x x x x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.18	0.04] = [ 0.04] = [	5.63 2.74 15.551 11.26	9 [			(2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (
Vindows Type Floor	74.7	35		3	4.92 2.39 119.6 62.54 12.35	x1/2 x1/3 x x x x x x x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.18	0.04] = [ 0.04] = [	5.63 2.74 15.551 11.26	9 [			(2
Vindows Type Floor Valls Type1 Valls Type2 Total area of e Party wall	74.7 12.3 lements	, m²	0	ndow U-va	4.92 2.39 119.6 62.54 12.35 206.7 36.38	x1/2 x1/3 x x x x x x x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.18 0.23	0.04] = [ 0.04] = [	5.63 2.74 15.551 11.26 2.79		paragraph	13.2	(2 (2 (2 (3 (3
Vindows Type Floor Valls Type1 Valls Type2 Total area of e Party wall for windows and include the area	74.7 12.3 1 roof winders on both	ows, use e	0  Iffective winternal wall	ndow U-va	4.92 2.39 119.6 62.54 12.35 206.7 36.38	x1/x3 x x x x x x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [	5.63 2.74 15.551 11.26 2.79		paragraph		(2 (2 (2 (3 (3 (3
Vindows Type Floor Valls Type1 Valls Type2 Total area of e Party wall for windows and * include the area Fabric heat los	74.7 12.3 llements roof winders on both	ows, use e sides of in	0  Iffective winternal wall	ndow U-va	4.92 2.39 119.6 62.54 12.35 206.7 36.38	x1/x3 x x x x x x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.18 0.23	0.04] = [ 0.04] = [	5.63 2.74 15.5519 11.26 2.79 0 1e)+0.04] a	as given in		43.6	(2 (2 (2 (2 (2 (3 (3 (3
Vindows Types Floor Valls Type1 Valls Type2 Fotal area of e Party wall for windows and * include the area Fabric heat los Heat capacity	74.7  12.3  12.3  I roof winder as on both as, W/K = Cm = S(	ows, use e sides of in S (A x k)	0 Iffective winternal wall	ndow U-va	4.92 2.39 119.6 62.54 12.35 206.7 36.38 alue calculations	x1/3 x x x x x x x x x x x x x x x x x x x	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = [ 0.04] = [	5.63 2.74 15.5519 11.26 2.79 0 1e)+0.04] &	as given in 2) + (32a).			(2 (2 (2 (2 (3 (3 (3 (3
Vindows Type Floor Valls Type1 Valls Type2 Total area of e Party wall for windows and * include the area Fabric heat los Heat capacity	74.7 12.3 lements roof winders on both ss, W/K: Cm = S( parame	ows, use e sides of in S (A x k)	offective winternal wall U) $P = Cm \div$	ndow U-va ls and part	4.92 2.39 119.6 62.54 12.35 206.7 36.38 alue calculations	x1/x3 x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23 0 formula 1	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04$	5.63  2.74  15.5519  11.26  2.79  0  re)+0.04] a  tive Value	as given in 2) + (32a).	(32e) =	43.6	(2 (2 (2 (2 (3 (3 (3 (3
Vindows Types Floor Valls Type1 Valls Type2 Fotal area of e Party wall for windows and include the area Fabric heat los Heat capacity Thermal mass	74.7  12.3  lements  roof winders on both ss, W/K = Cm = S( parame	ows, use e sides of in = S (A x (A x k) ster (TMF	offective winternal wall U) $P = Cm \div tails of the$	ndow U-va ls and part	4.92 2.39 119.6 62.54 12.35 206.7 36.38 alue calculations	x1/x3 x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23 0 formula 1	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04$	5.63  2.74  15.5519  11.26  2.79  0  re)+0.04] a  tive Value	as given in 2) + (32a).	(32e) =	43.6 19289.8	(2 (2 (2 (2 (3 (3 (3 (3
Vindows Types Floor Valls Type1 Valls Type2 Fotal area of every wall for windows and include the area Fabric heat lose Heat capacity Thermal mass For design assess an be used instead	74.7  12.3  17.0  12.3  1 roof winder as on both as on both as on both as on both as on both as on both as on both as on both ad of a deciments when ad of a deciment.	ows, use e sides of in = S (A x (A x k ) ster (TMF ere the de tailed calcu	offective winternal wall U)  P = Cm ÷ tails of the ulation.	ndow U-ve ls and part - TFA) in constructi	4.92 2.39 119.6 62.54 12.35 206.7: 36.38 alue calculations kJ/m²K	x1/x1/33 x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23 0 formula 1	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04$	5.63  2.74  15.5519  11.26  2.79  0  re)+0.04] a  tive Value	as given in 2) + (32a).	(32e) =	43.6 19289.8	(2 (2 (2 (2 (3 (3 (3 (3 (3
Vindows Types Floor Valls Type1 Valls Type2 Fotal area of e Party wall for windows and include the area Fabric heat loss Heat capacity Thermal mass for design assess an be used instea	74.7  12.3  12.3  I roof winddas on both as on both Cm = S( parame sments wh ad of a deces : S (L	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calc	offective winternal wall U) $P = Cm \div tails of the ulation.$ culated t	ndow U-vals and part - TFA) in constructi	4.92 2.39 119.6 62.54 12.35 206.7 36.38 alue calculations kJ/m²K ion are not	x1/x1/33 x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23 0 formula 1	$0.04$ ] = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04$	5.63  2.74  15.5519  11.26  2.79  0  re)+0.04] a  tive Value	as given in 2) + (32a).	(32e) =	43.6 19289.8 100	(2 (2 (2 (2 (3 (3 (3 (3 (3
Vindows Types Floor Valls Type1 Valls Type2 Fotal area of exparity wall for windows and include the area Fabric heat loss fleat capacity Thermal mass for design assess an be used instea Thermal bridge details of thermal	74.7  12.3  12.3  I roof winder as on both as, W/K = Cm = S( paramets wheat of a decrease is S (Leaf bridging)	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calc	offective winternal wall U) $P = Cm \div tails of the ulation.$ culated t	ndow U-vals and part - TFA) in constructi	4.92 2.39 119.6 62.54 12.35 206.7 36.38 alue calculations kJ/m²K ion are not	x1/x1/33 x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23 0 formula 1	0.04] = [ 0.04] = [ 0.04] = [	5.63  2.74  15.5519  11.26  2.79  0  re)+0.04] a  tive Value	as given in 2) + (32a).	(32e) =	43.6 19289.8 100	(2 (2 (2 (2 (2 (3 (3 (3 (3 (3 (3 (3
Vindows Types Floor Valls Type1 Valls Type2 Fotal area of e Party wall for windows and * include the area Fabric heat los Heat capacity	74.7 12.3 12.3 1 roof winddens on both 1 roof windens on both 2 ss, W/K: 2 Cm = S( 2 parame 2 sments whe 3 ad of a decense is S (L 3 al bridging 3 at loss	ows, use e sides of in S (A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn	offective winternal wall U)  P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) in constructi using Ap	4.92 2.39 119.6 62.54 12.35 206.7 36.38 alue calculations kJ/m²K ion are not	x1/x1/33 x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23 0 formula 1	0.04] = [ 0.04] = [ 0.04] = [	5.63  2.74  15.5519  11.26  2.79  0  1e)+0.04] & tive Value & values of the evalu	as given in 2) + (32a).	(32e) =	43.6 19289.8 100	(2 (2 (2 (2 (3 (3 (3
Vindows Types Floor Valls Type1 Valls Type2 Total area of exparty wall for windows and include the area Fabric heat loss Heat capacity Thermal mass For design assess an be used instea Thermal bridge details of thermal Total fabric hea Ventilation hea  Jan	74.7 12.3 12.3 1 roof winddens on both 1 roof windens on both 2 ss, W/K: 2 Cm = S( 2 parame 2 sments whe 3 ad of a decense is S (L 3 al bridging 3 at loss	ows, use e sides of in = S (A x (A x k ) ter (TMF ere the de tailed calcu x Y) calcu are not kn	offective winternal wall U)  P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) in constructi using Ap	4.92 2.39 119.6 62.54 12.35 206.7: 36.38 alue calculations a kJ/m²K fon are not spendix k 1) Jun	x1/x1/33 x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23 0 0 formula 1 (26)(30)	0.04] = [ 0.04] = [ 0.04] = [	5.63  2.74  15.5519  11.26  2.79  0  10)+0.04] a  tive Values of values of (36) =  = 0.33 × (  Oct	2) + (32a).: Low: TMP in Ta	(32e) =	43.6 19289.8 100	(2 (2 (2 (2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Vindows Types Floor Valls Type1 Valls Type2 Total area of exparity wall for windows and include the area Fabric heat los Heat capacity Thermal mass For design assess an be used instea Thermal bridge f details of thermal Total fabric head Ventilation head	74.7  12.3  12.3  I roof winder as on both as on both and of a decrease is S (Lab bridging at loss at loss catalos catalos	ows, use e sides of in = S (A x k) eter (TMF) ere the de tailed calculated are not kn	offective winternal wall U)  P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vels and part - TFA) in constructi using Ap	4.92 2.39 119.6 62.54 12.35 206.7 36.38 alue calculations a kJ/m²K fon are not	x1/x1/33 x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23 0 of formula 1 (26)(30)	0.04] = [ 0.04] = [ 0.04] = [	5.63  2.74  15.5519  11.26  2.79  0  10) + 0.04] a  tive Value  a values of  (36) =  = 0.33 × (	2) + (32a).: Low: TMP in Ta	(32e) = able 1f	43.6 19289.8 100	(2 (2 (2 (2 (2 (3 (3 (3 (3 (3 (3 (3
Vindows Types Floor Valls Type1 Valls Type2 Total area of exparty wall for windows and include the area Fabric heat loss Heat capacity Thermal mass For design assess an be used instea Thermal bridge details of thermal Total fabric hea Ventilation hea  Jan	74.7  12.3  12.3  Ilements  I roof winder as on both as, W/K: Cm = S( parame ad of a decess: S (L al bridging at loss at loss ca Feb 31.72	ows, use e sides of in = S (A x (A x k ) ster (TMF ere the de tailed calcu x Y) calcu are not kn alculated Mar 31.4	offective winternal wall U)  P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	ndow U-vels and part - TFA) in constructi using Ap = 0.15 x (3	4.92 2.39 119.6 62.54 12.35 206.7: 36.38 alue calculations a kJ/m²K fon are not spendix k 1) Jun	x1/x1/3 x x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23 0 0 formula 1 (26)(30)	0.04] = [ 0.04] = [ 0.04] = [	5.63  2.74  15.5519  11.26  2.79  0  10)+0.04] a  tive Values of values of (36) =  = 0.33 × (  Oct	2) + (32a).: Low: TMP in Ta	(32e) = able 1f  Dec	43.6 19289.8 100	(2 (2 (2 (2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.75	0.75	0.74	0.73	0.73	0.71	0.71	0.71	0.72	0.73	0.73	0.74		
	Į.	!	Į.	Į.		ļ	<u> </u>	'	Average =	Sum(40) <sub>1</sub> .	12 /12=	0.73	(40)
Number of day	ys 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	iting 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.		86		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed t	,		se target o		2.17		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage				,									
(44)m= 112.39	108.3	104.21	100.13	96.04	91.95	91.95	96.04	100.13	104.21	108.3	112.39		
						l	l		rotal = Su	m(44) <sub>112</sub> =	=	1226.03	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 166.67	145.77	150.42	131.14	125.83	108.58	100.62	115.46	116.84	136.16	148.63	161.41		
	•	•		•		•	•		Total = Su	m(45) <sub>112</sub> =	=	1607.52	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46	to (61)	_				
(46)m= 25	21.87	22.56	19.67	18.87	16.29	15.09	17.32	17.53	20.42	22.3	24.21		(46)
Water storage							*** *						
Storage volum						_		ame ves	sei		0		(47)
If community h	-			-			, ,	ora) onto	or 'O' in /	(17)			
Otherwise if no Water storage		not wate	וו פוווט) ול	iciuues i	nstantai	ieous co	ווטט וטווונ	ers) erite	ei O III (	47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
Temperature f					(	, , .					0		(49)
Energy lost fro				ar			(48) x (49)	) =					(50)
b) If manufac		•			or is not		(40) X (40)	, –			10		(30)
Hot water stor			-							0.	02		(51)
If community h	_		on 4.3										
Volume factor										1.	03		(52)
Temperature f	factor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/y	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (	55)								1.	03		(55)
Water storage	loss cal	culated f	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	хН	
(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	m Table	e 3							0		(58)
Primary circuit	t loss ca	culated t	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by		rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss o	calculated	for each	month (	(61)m =	(60) ÷ 3	65 × (41	)m							
(61)m= 0	0	0	0	0	0	0	) 	)	0	0	0	0	1	(61)
	 auired for	water h	eating ca	L	L I for eac	:h month	(62)	—— m =	0 85 x (	 ′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 221.9	<del></del>	205.7	184.63	181.11	162.08	155.89	170	_	170.33	191.44	202.13	216.68	]	(62)
Solar DHW inpu	ut calculated	using App	endix G oı	· Appendix	: H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	J	
(add addition												-		
(63)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(63)
Output from	water hea	ter				•					•	!	•	
(64)m= 221.9	4 195.69	205.7	184.63	181.11	162.08	155.89	170	.74	170.33	191.44	202.13	216.68	]	
	•			•	•	•		Outp	out from wa	ater heate	er (annual)	12	2258.36	(64)
Heat gains for	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	]	
(65)m= 99.64	88.41	94.24	86.4	86.06	78.9	77.68	82.	61	81.64	89.5	92.22	97.89	]	(65)
include (5	7)m in cald	culation of	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	gains (see	Table 5	and 5a	):										
Metabolic ga	ins (Table	e 5), Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	]	
(66)m= 143.0	9 143.09	143.09	143.09	143.09	143.09	143.09	143	.09	143.09	143.09	143.09	143.09		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso s	ee -	Table 5				-	
(67)m= 29.18	3 25.91	21.07	15.95	11.93	10.07	10.88	14.	14	18.98	24.1	28.13	29.99	]	(67)
Appliances of	gains (calc	ulated ir	Append	dix L, eq	uation L	.13 or L1	3a),	also	see Tal	ble 5		_		
(68)m= 284.7	3 287.69	280.24	264.39	244.38	225.58	213.01	210	.06	217.5	233.35	253.36	272.17	]	(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), als	o se	e Table	5	-	-		
(69)m= 37.31	37.31	37.31	37.31	37.31	37.31	37.31	37.	31	37.31	37.31	37.31	37.31	]	(69)
Pumps and f	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= -114.4	7 -114.47	-114.47	-114.47	-114.47	-114.47	-114.47	-114	.47	-114.47	-114.47	-114.47	-114.47		(71)
Water heating	ng gains (T	able 5)											_	
(72)m= 133.9	2 131.56	126.66	120	115.67	109.58	104.4	111	.04	113.39	120.29	128.08	131.57		(72)
Total intern	al gains =				(66	5)m + (67)m	n + (68	3)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	_	
(73)m= 513.7	6 511.09	493.9	466.27	437.91	411.15	394.22	401	.16	415.81	443.67	475.5	499.65		(73)
6. Solar gai	ns:													
Solar gains ar		_					ations	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ıble 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
F4							1							1
East 0.9		X	4.9			19.64	X		0.5	_  ×	0.7	=	23.44	(76)
East 0.9		X	4.9			38.42	X		0.5		0.7	=	45.85	(76)
East 0.9		X	4.9			63.27	X		0.5		0.7	_  =	75.51	(76)
East 0.9		X	4.9		-	92.28	X		0.5	×	0.7	=	110.12	(76)
East 0.9	· 1	X	4.9	92	X _	13.09	X		0.5	X	0.7	=	134.96	(76)

	_															
East	0.9x	1	х	4.9	92	X	1	15.77	X		0.5	X	0.7	=	138.15	(76)
East	0.9x	1	X	4.9	92	x	1	10.22	X	(	0.5	x	0.7	=	131.53	(76)
East	0.9x	1	X	4.9	92	x	9	4.68	x	(	0.5	x	0.7	=	112.98	(76)
East	0.9x	1	X	4.9	92	x	7	'3.59	x	(	0.5	x	0.7	=	87.82	(76)
East	0.9x	1	х	4.9	92	x	4	5.59	x	(	0.5	x [	0.7	=	54.4	(76)
East	0.9x	1	х	4.9	92	x	2	4.49	x	(	0.5	x [	0.7	=	29.22	(76)
East	0.9x	1	х	4.9	92	x	1	6.15	x	(	0.5	x [	0.7	=	19.27	(76)
West	0.9x	0.77	х	4.9	92	x	1	9.64	x	(	0.5	x [	0.7	=	23.44	(80)
West	0.9x	0.77	X	2.3	39	x	1	9.64	x	(	0.5	x [	0.7	=	11.39	(80)
West	0.9x	0.77	х	4.9	92	x	3	8.42	x		0.5	x	0.7	=	45.85	(80)
West	0.9x	0.77	X	2.3	39	x	3	8.42	x	(	0.5	×	0.7	=	22.27	(80)
West	0.9x	0.77	х	4.9	92	x	6	3.27	x	(	0.5	x [	0.7	=	75.51	(80)
West	0.9x	0.77	X	2.3	39	x	6	3.27	x		0.5	x	0.7	=	36.68	(80)
West	0.9x	0.77	X	4.9	92	x	9	2.28	x	(	0.5	×	0.7	=	110.12	(80)
West	0.9x	0.77	X	2.3	39	x	9	2.28	x	(	0.5	x	0.7	=	53.49	(80)
West	0.9x	0.77	X	4.9	92	x	1	13.09	x		0.5	×	0.7	=	134.96	(80)
West	0.9x	0.77	X	2.3	39	x	1	13.09	x	(	0.5	×	0.7	=	65.56	(80)
West	0.9x	0.77	X	4.9	92	x	1	15.77	x	(	0.5	x	0.7	=	138.15	(80)
West	0.9x	0.77	X	2.3	39	x	1	15.77	x		0.5	×	0.7	=	67.11	(80)
West	0.9x	0.77	X	4.9	92	x	1	10.22	x	(	0.5	×	0.7	=	131.53	(80)
West	0.9x	0.77	X	2.3	39	x	1	10.22	x	(	0.5	×	0.7	=	63.89	(80)
West	0.9x	0.77	X	4.9	92	x	9	4.68	x		0.5	×	0.7	=	112.98	(80)
West	0.9x	0.77	X	2.3	39	x	9	4.68	x	(	0.5	×	0.7	=	54.88	(80)
West	0.9x	0.77	X	4.9	92	x	7	'3.59	x	(	0.5	×	0.7	=	87.82	(80)
West	0.9x	0.77	X	2.3	39	x	7	'3.59	x	(	0.5	×	0.7	=	42.66	(80)
West	0.9x	0.77	X	4.9	92	x	4	5.59	x	(	0.5	x	0.7	=	54.4	(80)
West	0.9x	0.77	×	2.3	39	x	4	5.59	x	(	0.5	×	0.7	=	26.43	(80)
West	0.9x	0.77	X	4.9	92	x	2	4.49	x	(	0.5	×	0.7	=	29.22	(80)
West	0.9x	0.77	X	2.3	39	x	2	4.49	x	(	0.5	x	0.7	=	14.2	(80)
West	0.9x	0.77	X	4.9	92	x	1	6.15	x	(	0.5	x	0.7	=	19.27	(80)
West	0.9x	0.77	×	2.3	39	x	1	6.15	x	(	0.5	x	0.7	<del>=</del>	9.36	(80)
	_								_							
Solar (	ains in	watts, ca	alculate	d for eac	h mont	h_			(83)m	n = Sum	ı(74)m	.(82)m			•	
(83)m=	58.26	113.97	187.69	273.74	335.48		43.42	326.95	280	.85 2	218.29	135.24	72.64	47.91		(83)
_				r (84)m :	<u> </u>	<del>- `</del>					i		1		1	
(84)m=	572.02	625.06	681.6	740.01	773.38	3 7	54.57	721.17	682	.01	634.1	578.91	548.14	547.56		(84)
7. Me	an inter	nal temp	erature	(heating	seasc	n)										
Temp	erature	during h	neating <sub>l</sub>	periods i	n the liv	ving	area 1	from Tal	ole 9	, Th1	(°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living ar	ea, h1,	m (s	ee Ta	ble 9a)							1	
	Jan	Feb	Mar	Apr	May	4	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	0.98	0.97	0.95	0.89	0.8		0.64	0.5	0.5	54	0.76	0.91	0.97	0.98		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (	follo	w ste	ps 3 to 7	7 in T	able 9	9c)					
(87)m=	19.37	19.56	19.88	20.31	20.66	2	20.89	20.97	20.	96	20.8	20.34	19.8	19.35		(87)

Tomno	roturo	durina h	ooting n	oriodo in	root of	طبير الله م	from To	bla O. Ti	h2 (°C\					
(88)m=	20.3	20.3	20.3	20.31	20.32	20.33	from Ta 20.33	20.33	20.32	20.32	20.31	20.31		(88)
` ' _	!		<u> </u>	<u> </u>		!	ee Table	<u> </u>	20.32	20.32	20.31	20.31		(00)
(89)m=	0.97	0.96	0.94	0.88	0.77	0.59	0.43	0.47	0.71	0.9	0.96	0.98		(89)
∟ Mean i	nternal	temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ns 3 to <sup>.</sup>	L 7 in Tahl	e 9c)	ļ			
(90)m=	18.07	18.34	18.81	19.43	19.92	20.22	20.3	20.3	20.11	19.48	18.7	18.04		(90)
(11)			<u> </u>	<u> </u>			<u> </u>		!	!	g area ÷ (4		0.26	(91)
Mean i	nternal	l temper	ature (fo	or the wh	ole dwel	lling) = f	LA × T1	+ (1 – fL	.A) × T2			l		<b>_</b> 1
(92)m=	18.41	18.66	19.09	19.66	20.11	20.4	20.48	20.47	20.29	19.71	18.99	18.39		(92)
Apply a	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.41	18.66	19.09	19.66	20.11	20.4	20.48	20.47	20.29	19.71	18.99	18.39		(93)
8. Spa	ce hea	ting requ	uirement											
				mperatur using Ta		ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisat	ion fac	tor for g	ains, hm	<u></u> 1:	,		ļ.		•		ļ.			
(94)m=	0.96	0.95	0.92	0.86	0.76	0.6	0.44	0.49	0.71	0.88	0.95	0.97		(94)
Useful	gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	551.5	594.33	628.75	637.9	586.34	451.37	320.01	330.79	449.43	511.55	519.63	530.26		(95)
				perature		ı								
(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)
_				·	732.13		=[(39)m :			<del> </del>	4040.00	4050.0		(07)
` '			1119.67	939.73		495.16	331.26	346.3	532.55	792.81	1042.03	1252.9		(97)
	530.56	425.86	365.25	217.32	108.47	0	th = 0.02	0	0	209.26	376.13	537.65		
(50)111	000.00	420.00	000.20	217.02	100.47		L Č	<u> </u>		!	r) = Sum(9		2770.49	(98)
Space	heating	g require	ement in	kWh/m²	/year			1010	ii poi youi	(KVVIII) y Cai	) = Gam(o	O)15,912 —	23.16	](99)
9b. Ene		• •			•	scheme	7					L		
This par	rt is use	ed for sp	ace hea	iting, spa	ace cooli	ing or wa	ater heat				unity sch	neme.		,
Fraction	of spa	ce heat	from se	condary/	supplen/	nentary l	heating (	Table 1	1) '0' if n	one			0	(301)
Fraction	of spa	ce heat	from co	mmunity	system	1 – (30	1) =						1	(302)
	-						procedure r stations.			up to four (	other heat	sources; th	ne latter	
Fraction	of hea	at from C	Commun	ity heat <sub>l</sub>	oump								0.5	(303a)
Fraction	of con	nmunity	heat fro	m heat s	ource 2								0.5	(303b)
Fraction	of tota	al space	heat fro	m Comn	nunity he	eat pump	0			(3	02) x (303	a) =	0.5	(304a)
Fraction	of tota	al space	heat fro	m comm	unity he	at sourc	e 2			(3	02) x (303)	b) =	0.5	(304b)
Factor for	or cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribut	tion los	s factor	(Table 1	12c) for o	commun	ity heatii	ng syste	m				[	1.05	(306)
Space h		-											kWh/year	_
Annual	space I	heating	requiren	nent									2770.49	

Space heat from Community heat pump		(98) x (304a) x	(305) x (306) =	1454.5	(307a)
Space heat from heat source 2		(98) x (304b) x	(305) x (306) =	1454.5	(307b)
Efficiency of secondary/supplementary heating	system in % (from Table	4a or Appen	ndix E)	0	(308
Space heating requirement from secondary/sup	plementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating					
Annual water heating requirement				2258.36	
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x	(305) x (306) =	1185.64	(310a)
Water heat from heat source 2		(64) x (303b) x	(305) x (306) =	1185.64	(310b)
Electricity used for heat distribution	0.01	× [(307a)(307	'e) + (310a)(310e)] =	52.8	(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 (T mechanical ventilation - balanced, extract or pos	•			390.78	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =	390.78	(331)
Energy for lighting (calculated in Appendix L)				515.24	(332)
Electricity generated by PVs (Appendix M) (neg	ative quantity)			-730.31	(333)
Electricity generated by wind turbine (Appendix	M) (negative quantity)			0	(334)
12b. CO2 Emissions – Community heating sche	eme				
		ergy h/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water hea Efficiency of heat source 1 (%)	ating (not CHP)  If there is CHP using two fuels	s repeat (363) to	(366) for the second fue	el 425	(367a)
Efficiency of heat source 2 (%)	If there is CHP using two fuels	repeat (363) to	(366) for the second fue	el 91	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x 1	100 ÷ (367b) x	0.52	= 322.41	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x 1	100 ÷ (367b) x	0.22	= 626.67	(368)
Electrical energy for heat distribution	[(313) x		0.52	= 27.4	(372)
Total CO2 associated with community systems	(363)(36	66) + (368)(372	2)	976.49	(373)
CO2 associated with space heating (secondary)	(309) x		0 :	= 0	(374)
CO2 associated with water from immersion hea	ter or instantaneous hea	ater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water hea	ating (373) + (3	74) + (375) =		976.49	(376)
CO2 associated with electricity for pumps and fa	ans within dwelling (331	)) x	0.52	= 202.81	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	= 267.41	(379)
Energy saving/generation technologies (333) to					
Item 1			0.52 × 0.01 =	-379.03	(380)

Total CO2, kg/year sum of (376)...(382) = Dwelling CO2 Emission Rate  $(383) \div (4) =$  El rating (section 14)

1067.68	(383)
8.92	(384)
91.31	(385)

			User D	etails:						
Assessor Name:	Joseph Trean	or		Strom	a Num	ber:		STRO	032062	
Software Name:	Stroma FSAP	2012		Softwa	are Ve	rsion:		Versio	n: 1.0.4.14	
		Р	roperty	Address:	P2					
Address :	, Gondar Garde	ens, London,	NW6 1F	HG						
1. Overall dwelling dime	ensions:									
_			Area	a(m²)		Av. He	eight(m)	7	Volume(m	<u> </u>
Basement			1	07.83	(1a) x	2	2.55	(2a) =	274.97	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)	+(1e)+(1r	1) 1	07.83	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	274.97	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	ır
Number of chimneys		+ 0	7 + [	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0	+ 0	<b></b>	0	i	0	X	20 =	0	一 (6b)
Number of intermittent fa	ans				J	0	x	10 =	0	` ´ (7a)
					Ļ					= ``
Number of passive vents	5				L	0	X	10 =	0	(7b)
Number of flueless gas f	rires					0	X	40 =	0	(7c)
								Δir ch	nanges per h	our
Infiltration due to chimne	ove fluor and fanc	_ (6a)+(6b)+(7	7a)⊥(7h)⊥(	70) -	Г					_
If a pressurisation test has	•				continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in t		noriaca, proces	a 10 (11), 1	ourier wide c	orianao n	om (0) to	(10)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	).25 for steel or tim	ber frame or	0.35 fo	r masonr	y constr	uction	-, ,		0	(11)
if both types of wall are p	present, use the value o	corresponding to	the great	ter wall are	a (after				_	<b></b> `
deducting areas of open			4 / 1 -	1\ 1						<b>_</b>
If suspended wooden	•	,	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors draug	int stripped		0.05 10.0	(4.4)4	001			0	(14)
Window infiltration				0.25 - [0.2			. (45)		0	(15)
Infiltration rate	.50			(8) + (10)	, , ,	, , ,			0	(16)
Air permeability value			•	•	-	etre of e	envelope	area	3	(17)
If based on air permeabi	-					:- <i>h</i> - :			0.15	(18)
Air permeability value application. Number of sides sheltered	•	ist nas been dor	ie or a deg	gree air pei	теарицу	is being u	isea			7(10)
Shelter factor	eu			(20) = 1 -	0.075 x (1	19)] =			0.85	(19) (20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)		, <u>-</u>			0.83	(21)
Infiltration rate modified	-	peed		. , , , ,	. ,				0.13	(^_')
Jan Feb	1 1	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			I	1		1	1	1 - 55	I	
(22)m= 5.1 5	1	.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
· /···   •··   •	"'   "		L	I	· .	L		I	I	
Wind Factor (22a)m = (2	22)m ÷ 4									
(000) - 4.07 4.05	1 22   1 1   1	00 05	0.05	0.00	4	4.00	1 40	1.40	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	(22a)m <sub>0.13</sub>	0.14	0.14	0.15		
Calculate effe							0.12	0.10	0.14	0.14	0.10		
If mechanica												0.5	(23
If exhaust air h		0		, ,	, ,	. ,	,, .	,	) = (23a)			0.5	(23
If balanced with	h heat reco	very: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h	) =				68.85	(23
a) If balance	1					<del>- ` ` </del>	<del>- ` ` - </del>	<del>``</del>	<u> </u>	<del></del>	1 – (23c)	÷ 100]	
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(24
b) If balance						· · · · ·	r Ó Ì	ŕ	<u> </u>	<del>-                                    </del>		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				-	-				F (22h	. \			
$\frac{11 (220)f}{(24c)m=0}$	$n < 0.5 \times 10^{-6}$	(23b), t	nen (240	(23D) 0	o); otnerv	wise (24)	C) = (220)	) m + 0.	5 × (230	0	0	]	(24
(= 10/									U		J 0		(24
d) If natural if (22b)r	n = 1, the			•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	ıter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				ı	
(25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25
		4.1				'	•			•			
3. Heat losse		·											
ELEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l		X k I/K
Windows Type		(111)	•••		4.92		/[1/( 1.2 )+		5.63		10/111	110	(27
Windows Type					4.92	= .	-	L	5.63	$\dashv$			(27
Windows Type						= .			3.03				(21
VVIIIGOVVO I VDI						V1	/[1/( 1 2 )+	0.041 _	2.74				(27
• •					2.39	=	/[1/( 1.2 )+	— ;	2.74				
Floor			10.00	,	107.8	3 x	0.13	= [	14.0179	<u> </u>			(28
Floor Walls Type1	74.7		12.23	3	107.8 62.54	3 x	0.13	= [	14.0179	<b>∃</b> [			(28
Floor Walls Type1 Walls Type2	74.7	5	12.23	3	107.8 62.54 12.35	3 x x x 5 x	0.13	= [	14.0179	<ul><li>∃</li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> <li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><li> </li><l< td=""><td></td><td></td><td>(28</td></l<></li></ul>			(28
Floor Walls Type1 Walls Type2 Total area of e	74.7	5		3	107.8 62.54 12.35	3 x x x 5 x 5	0.13 0.18 0.23	= [	14.0179 11.26 2.79				(27 (28 (29 (29 (31
Floor Walls Type1 Walls Type2 Total area of e Party wall	74.7 12.3 elements	, m²	0		107.8 62.54 12.35 194.9 36.38	3 x x x 5 x 5 x	0.13 0.18 0.23	= [	14.0179 11.26 2.79				(28)
Floor Walls Type1 Walls Type2	74.7 12.3 elements	, m²	0	ndow U-va	107.8 62.54 12.35 194.9 36.38	3 x x x 5 x 5 x	0.13 0.18 0.23	= [	14.0179 11.26 2.79		paragraph	3.2	(28)
Floor Walls Type1 Walls Type2 Total area of e Party wall	74.7 12.3 elements	, m² ows, use e	0 ffective wi	ndow U-va	107.8 62.54 12.35 194.9 36.38	3 x x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23	= [ = [ = [ - [(1/U-value	14.0179 11.26 2.79		paragraph	3.2	(28
Floor Walls Type1 Walls Type2 Total area of e Party wall * for windows and ** include the area	74.7 12.3 elements froof windas on both ss, W/K =	5, m <sup>2</sup> Dws, use esides of interest S (A x	0 ffective wi	ndow U-va	107.8 62.54 12.35 194.9 36.38	3 x x x x x x x x x x x x x x x x x x x	0.13 0.18 0.23 0 formula 1	$= \begin{bmatrix} \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \\ \end{bmatrix}$ $+ (32) = \begin{bmatrix} \\ \\ \end{bmatrix}$	14.0179 11.26 2.79	as given in		42.07	(28 (29 (29 (31 (32
Floor  Walls Type1  Walls Type2  Fotal area of e  Party wall  for windows and  include the area  Fabric heat los  Heat capacity	12.3 elements froof winder as on both ss, W/K = Cm = S(	, m²  ows, use e sides of in = S (A x A x k)	0 ffective wi ternal wali	ndow U-va	107.8 62.54 12.35 194.9 36.38 alue calcul	3 × x x 5 × x 5 × ated using	0.13 0.18 0.23 0 formula 1		14.0179 11.26 2.79 0 re)+0.04] a	as given in (2) + (32a).			(28 (29 (32 (32 (32 (34
Floor  Walls Type1  Walls Type2  Fotal area of experty wall  for windows and include the area  Fabric heat lose  Heat capacity  Thermal mass	74.7  12.3  Pelements  I roof winder as on both as, W/K = Cm = S( aparame	ows, use esides of inest S (A x A x k)	ffective winternal walk U) $P = Cm \div$	ndow U-va s and part	107.8 62.54 12.35 194.9 36.38 alue calcul ititions	3 x x x 5 x 5 x ated using	0.13 0.18 0.23 0 1 formula 1 (26)(30)	= [ = [ = [ - [(1/U-value) + (32) = ((28)	14.0179 11.26 2.79 0 1e)+0.04] a	as given in 2) + (32a).	(32e) =	42.07 17991.8	(28 (29 (32 (32 (32 (34
Floor  Walls Type1  Walls Type2  Fotal area of e  Party wall  for windows and  include the area  Fabric heat los  Heat capacity  Thermal mass  For design assess  can be used inste	74.7  12.3  elements  d roof windows on both  ss, W/K =  Cm = S(  s parame  sments when  ead of a det	ows, use e sides of in = S (A x A x k ) ter (TMF ere the de tailed calcu	offective winternal walk  from the control of the c	ndow U-ve ls and part - TFA) ir constructi	107.8 62.54 12.35 194.9 36.38 alue calcultitions	3 × 4 × 5 × 5 × 5 ax dated using	0.13 0.18 0.23 0 1 formula 1 (26)(30)	= [ = [ = [ - [(1/U-value) + (32) = ((28)	14.0179 11.26 2.79 0 1e)+0.04] a	as given in 2) + (32a).	(32e) =	42.07 17991.8	(28 (29 (32 (32 (32 (34
Floor  Walls Type1  Walls Type2  Fotal area of experty wall  for windows and experty include the area  Fabric heat loss  Heat capacity  Thermal mass  For design assess  San be used insteen	74.7  12.3  Plements  Froof winder as on both as, W/K = Cm = S( a parame asments whead of a det es : S (L	ows, use esides of intermediate (TMF) ere the detailed calcurate (XY) calcurate (XY) calcurate (XY) calcurate (XY) calcurate (XY) calcurate (XY) calcurate (XY)	ffective winternal walk  U)  P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	107.8 62.54 12.35 194.9 36.38 alue calculations kJ/m²K ion are not	3 × 4 × 5 × 5 × 5 ax dated using	0.13 0.18 0.23 0 1 formula 1 (26)(30)	= [ = [ = [ - [(1/U-value) + (32) = ((28)	14.0179 11.26 2.79 0 1e)+0.04] a	as given in 2) + (32a).	(32e) =	42.07 17991.8	(28 (29 (31 (32 (33 (33 (34 (38
Floor  Walls Type1  Walls Type2  Fotal area of experty wall  For windows and experty include the area  Fabric heat loss  Heat capacity  Thermal mass  For design asses  For design asses	74.7  12.3  elements  froof winder as on both as, W/K = Cm = S( a parame and of a det es : S (L al bridging	ows, use esides of intermediate (TMF) ere the detailed calcurate (XY) calcurate (XY) calcurate (XY) calcurate (XY) calcurate (XY) calcurate (XY) calcurate (XY)	ffective winternal walk  U)  P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	107.8 62.54 12.35 194.9 36.38 alue calculations kJ/m²K ion are not	3 × 4 × 5 × 5 × 5 ax dated using	0.13 0.18 0.23 0 1 formula 1 (26)(30)	= [ = [ = [ ] = [ ] = [ /[(1/U-valu ) + (32) = ((28) Indica	14.0179 11.26 2.79 0 re)+0.04] a .(30) + (32 tive Values of	as given in 2) + (32a).	(32e) =	42.07 17991.8 100	(28 (29 (31 (32 (32 (34 (35) (36)
Floor  Walls Type1  Walls Type2  Total area of experty wall  for windows and experty include the area of the area	74.7  12.3  Pelements  I roof windo as on both as, W/K = Cm = S( a parame and of a det es : S (L al bridging eat loss	ows, use esides of intermediate (TMF) ere the detailed calculate (XY) calculate (not kn)	ffective winternal walk  U)  P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vals and part - TFA) ir construction	107.8 62.54 12.35 194.9 36.38 alue calculations kJ/m²K ion are not	3 × 4 × 5 × 5 × 5 ax dated using	0.13 0.18 0.23 0 1 formula 1 (26)(30)	= [ = [ = [ ] = [ ] = [ ] + (32) = ((28) Indicative	14.0179 11.26 2.79 0 1e)+0.04] a 1.(30) + (32) tive Value 1 values of	2) + (32a).: Low	(32e) =	42.07 17991.8 100	(28 (29 (31 (32 (32 (34 (35) (36)
Floor  Walls Type1  Walls Type2  Total area of experty wall  for windows and extended the area  Fabric heat loss  Heat capacity  Thermal mass  For design assess  Can be used instended the area  Thermal bridge  If details of thermal  Total fabric heave  Ventilation heave	74.7  12.3  elements  droof winder as on both as, W/K = Cm = S( aparame and of a det es : S (L al bridging eat loss at loss ca	ows, use e sides of in S (A x A x k ) ter (TMF ere the de tailed calcu x Y) calcu are not kn	ffective winternal walk  U)  P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vels and part - TFA) ir constructi	107.8 62.54 12.35 194.9 36.38 alue calculations A kJ/m²K fon are not opendix k	3 × 4 × 5 × 5 × 5 × dated using	0.13 0.18 0.23 0 formula 1 (26)(30)	= [ = [ = [ ] = [ ] = [ ] = [ ] + (32) = ((28) Indicative indicative (33) + (38)m	14.0179 11.26 2.79 0 12.(30) + (32) tive Value 1 values of (36) = = 0.33 × (	25)m x (5)	(32e) =	42.07 17991.8 100	(28 (29 (31 (32 (32 (34 (35) (36)
Floor Walls Type1 Walls Type2 Total area of exparty wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of therma Total fabric heav Ventilation heav	74.7  12.3  Plements  I roof winder as on both as on both ss, W/K = Cm = S( a parame sments whead of a det es : S (L al bridging eat loss at loss ca	ows, use esides of interpretation (TMF) ere the detailed calculated Mar	ffective winternal walk  U)  P = Cm ÷ tails of the valuation. culated to cown (36) =  I monthly	ndow U-vals and part - TFA) ir constructi using Ap	107.8 62.54 12.35 194.9 36.38 alue calcul ditions  kJ/m²K fon are not spendix H 1) Jun	3 × 4 × 5 × 5 × 5 ated using	0.13 0.18 0.23 0 formula 1 (26)(30)	= [ = [ = [ ] = [	14.0179  11.26  2.79  0  1e)+0.04] a  1:(30) + (32)  1:(ve Value of values of (36) =  0.33 × (  Oct	25)m x (5)	(32e) =	42.07 17991.8 100	(28 (29 (31 (32 (32 (34 (35) (36) (36)
Floor Walls Type1 Walls Type2 Total area of exparty wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge if details of therma Total fabric heav Ventilation heav  Jan (38)m= 28.88	74.7  12.3  Plements  I roof windo as on both as, W/K = Cm = S( a parame and of a det es : S (L al bridging eat loss at loss ca Feb 28.59	ows, use esides of interpretation (TMF) ere the detailed calculated Mar 28.3	ffective winternal walk  U)  P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vels and part - TFA) ir constructi	107.8 62.54 12.35 194.9 36.38 alue calculations A kJ/m²K fon are not opendix k	3 × 4 × 5 × 5 × 5 × dated using	0.13 0.18 0.23 0 formula 1 (26)(30)	= [ = [ = [ ] = [	14.0179  11.26  2.79  0  1e)+0.04] a  1:(30) + (32)	2) + (32a).: Low: TMP in To 25)m x (5) Nov 27.15	(32e) =	42.07 17991.8 100	(28 (29 (31 (32 (32 (32 (34 (35) (36)
Floor  Walls Type1  Walls Type2  Fotal area of experty wall  For windows and the include the area  Fabric heat loss  Heat capacity  Thermal mass  For design assess  Fan be used insternate  Thermal bridger  If details of therma  Fotal fabric heave  Ventilation heave	74.7  12.3  Plements  I roof windo as on both as, W/K = Cm = S( a parame and of a det es : S (L al bridging eat loss at loss ca Feb 28.59	ows, use esides of interpretation (TMF) ere the detailed calculated Mar 28.3	ffective winternal walk  U)  P = Cm ÷ tails of the valuation. culated to cown (36) =  I monthly	ndow U-vals and part - TFA) ir constructi using Ap	107.8 62.54 12.35 194.9 36.38 alue calcul ditions  kJ/m²K fon are not spendix H 1) Jun	3 × 4 × 5 × 5 × 5 ated using	0.13 0.18 0.23 0 formula 1 (26)(30)	= [ = [ = [ ] = [	14.0179  11.26  2.79  0  1e)+0.04] a  1:(30) + (32)  1:(ve Value of values of (36) =  0.33 × (  Oct	2) + (32a).: Low: TMP in To 25)m x (5) Nov 27.15	(32e) =	42.07 17991.8 100	(28 (29 (31 (32 (32 (32 (34 (35) (36) (37)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.79	0.78	0.78	0.77	0.77	0.75	0.75	0.75	0.76	0.77	0.77	0.78		
	!		Į.	ļ		<u> </u>	<u> </u>	'	Average =	Sum(40) <sub>1</sub>	12 /12=	0.77	(40)
Number of day	ys 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 occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	TFA -13.		.8		(42)
Annual average Reduce the annual not more that 125	, al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed i	,		se target o		0.73		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 110.8	106.77	102.74	98.71	94.68	90.65	90.65	94.68	98.71	102.74	106.77	110.8		
		!		ļ		ļ	<u> </u>		I Total = Su	M(44) <sub>112</sub> =	=	1208.73	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 164.31	143.71	148.3	129.29	124.05	107.05	99.2	113.83	115.19	134.24	146.54	159.13		
									Total = Su	m(45) <sub>112</sub> =	=	1584.83	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46	to (61)			•		
(46)m= 24.65	21.56	22.24	19.39	18.61	16.06	14.88	17.07	17.28	20.14	21.98	23.87		(46)
Water storage		•	•	•			•	•	•				
Storage volum	ne (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•			_			, ,			`			
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage a) If manufact		eclared I	nee farti	or is kno	wn (k\//k	n/day).							(48)
Temperature f				31 13 KHO	vvii (icvvi	i/day).					0		
•							(40) (40)	<b>、</b>			0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)	) =		1	10		(50)
Hot water stor			-							0.	02		(51)
If community h	•			`		,							, ,
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (	55)								1.	03		(55)
Water storage	loss cal	culated 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)	<u>I</u> m = (56)m	x [(50) – (	<u>I</u> H11)] ÷ (5	0), else (5	<u>I</u> 7)m = (56)	n where (	H11) is fro	m Appendi	хН	
(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				•	•	•		0		(58)
Primary circuit	,	,			59)m = (	(58) ± 36	35 × (41)	ım			-		(/
(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)
			<u> </u>										

0 111				(0.4)	(00)	05 (44)							
Combi loss o	1					<del>- ` ` `</del>		Ι.		Ι.		1	(04)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(61)
	<del>-</del>						<del>`</del>		<del>ì '</del>	<del>ì ´</del>	<del>`</del>	· (59)m + (61)m	
(62)m= 219.5		203.57	182.78	179.33	160.54	154.47	169.11	168.68	189.52	200.03	214.41	J	(62)
Solar DHW inpu									r contribut	ion to wate	er heating)		
(add addition						<del> </del>	<del></del>	<del> </del>				1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(63)
Output from	water hea	ter										-	
(64)m= 219.5	9 193.64	203.57	182.78	179.33	160.54	154.47	169.11	168.68	189.52	200.03	214.41		7
							Out	put from w	ater heate	r (annual) <sub>1</sub>	112	2235.67	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	<u>.</u> ]	
(65)m= 98.86	87.73	93.53	85.78	85.47	78.39	77.2	82.07	81.1	88.86	91.52	97.13	]	(65)
include (5	7)m in cald	culation c	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	Table 5	and 5a	):									
Metabolic ga	ins (Table	5). Watt	S										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m= 140.0	6 140.06	140.06	140.06	140.06	140.06	140.06	140.06	140.06	140.06	140.06	140.06	1	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				1	
(67)m= 26.89	23.88	19.42	14.71	10.99	9.28	10.03	13.03	17.49	22.21	25.93	27.64	]	(67)
Appliances of	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			1	
(68)m= 268.4	<u> </u>	264.17	249.23	230.36	212.64	200.8	198.01	205.03	219.97	238.83	256.56	1	(68)
Cooking gair	ns (calcula	ıted in Ar	pendix	L. eguat	ion L15	or L15a	). also s	ee Table	5	ļ	<u>I</u>	1	
(69)m= 37.01	<del>_`</del>	37.01	37.01	37.01	37.01	37.01	37.01	37.01	37.01	37.01	37.01	]	(69)
Pumps and f	 fans dains	(Table 5	ia)			l		1				1	
(70)m= 0	0		0	0	0	0	0	0	0	0	0	1	(70)
Losses e.g.								1 -				1	` ,
(71)m= -112.0	<del></del>	<del>`                                    </del>	-112.05	, <b>`</b>		-112.05	-112.05	-112.05	-112.05	-112.05	-112.05	1	(71)
` '			112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00	1	()
Water heatin (72)m= 132.8	<del>``</del>	125.71	119.14	114.88	108.87	103.77	110.31	112.63	119.43	127.11	130.55	1	(72)
` '		<u> </u>	119.14	114.00		l	<u> </u>	<u> </u>	l	<u> </u>	I	J	(12)
Total intern			440.00	404.05				+ (69)m +	· · · · · ·		1	1	(72)
(73)m= 493.1		474.32	448.09	421.25	395.81	379.61	386.37	400.17	426.63	456.88	479.77	J	(73)
6. Solar gains ar		usina solar	flux from	Table 6a	and accor	siated equa	itions to s	onwort to th	o applicat	alo orientas	tion		
Orientation:		•	Area		Flu	•	IIIONS IO C		іе арріісаі	FF	uori.	Gains	
Onemation.	Table 6d		Mea m²			ble 6a	-	g_ Fable 6b	Т	able 6c		(W)	
East 0.9				20		10.04	1	0.5			_		7(76)
		X	4.9	==		19.64	X	0.5		0.7	=	23.44	(76)
		X	4.9			38.42	X	0.5		0.7	=	45.85	[(76)
East 0.9		X	4.9			63.27	×	0.5	×	0.7	=	75.51	<b>」</b> (76)
East 0.93		X	4.9			92.28	x	0.5		0.7	=	110.12	<b>(76)</b>
East 0.9	1	X	4.9	)2	x 1	13.09	X	0.5	X	0.7	=	134.96	(76)

						_			_			_				
East	0.9x	1		X	4.92	X	1	15.77	X		0.5	X	0.7	=	138.15	(76)
East	0.9x	1		x	4.92	X	1	10.22	X		0.5	X	0.7	=	131.53	(76)
East	0.9x	1		X	4.92	X	Ś	94.68	X		0.5	X	0.7	=	112.98	(76)
East	0.9x	1		x	4.92	X	7	73.59	X		0.5	X	0.7	=	87.82	(76)
East	0.9x	1		x	4.92	X	4	15.59	X		0.5	X	0.7	=	54.4	(76)
East	0.9x	1		X	4.92	X	2	24.49	X		0.5	x	0.7	=	29.22	(76)
East	0.9x	1		x	4.92	x		6.15	X		0.5	X	0.7	=	19.27	(76)
West	0.9x	0.77		x	4.92	X		9.64	x		0.5	x	0.7	=	23.44	(80)
West	0.9x	0.77		x	2.39	X	1	9.64	X		0.5	X	0.7	=	11.39	(80)
West	0.9x	0.77		x	4.92	x	3	38.42	X		0.5	X	0.7	=	45.85	(80)
West	0.9x	0.77		x	2.39	X	3	38.42	X		0.5	x	0.7	=	22.27	(80)
West	0.9x	0.77		x	4.92	x	(	3.27	X		0.5	X	0.7	=	75.51	(80)
West	0.9x	0.77		x	2.39	X	6	3.27	X		0.5	x	0.7	=	36.68	(80)
West	0.9x	0.77		x	4.92	X	9	92.28	x		0.5	x	0.7	=	110.12	(80)
West	0.9x	0.77		x	2.39	×	9	2.28	x		0.5	×	0.7	=	53.49	(80)
West	0.9x	0.77		x	4.92	X	1	13.09	X		0.5	X	0.7	=	134.96	(80)
West	0.9x	0.77		x	2.39	×	1	13.09	x		0.5	x	0.7	=	65.56	(80)
West	0.9x	0.77		x	4.92	X	1	15.77	X		0.5	X	0.7	=	138.15	(80)
West	0.9x	0.77		x	2.39	X	1	15.77	X		0.5	X	0.7	=	67.11	(80)
West	0.9x	0.77		x	4.92	X	1	10.22	X		0.5	X	0.7	=	131.53	(80)
West	0.9x	0.77		x	2.39	X	1	10.22	X		0.5	X	0.7	=	63.89	(80)
West	0.9x	0.77		x	4.92	X	(	94.68	X		0.5	X	0.7	=	112.98	(80)
West	0.9x	0.77		x	2.39	X	(	94.68	X		0.5	X	0.7	=	54.88	(80)
West	0.9x	0.77		x	4.92	X	7	73.59	X		0.5	X	0.7	=	87.82	(80)
West	0.9x	0.77		x	2.39	X	7	73.59	X		0.5	X	0.7	=	42.66	(80)
West	0.9x	0.77		x	4.92	X	4	15.59	X		0.5	X	0.7	=	54.4	(80)
West	0.9x	0.77		x	2.39	X	4	15.59	X		0.5	X	0.7	=	26.43	(80)
West	0.9x	0.77		x	4.92	X	2	24.49	X		0.5	X	0.7	=	29.22	(80)
West	0.9x	0.77		X	2.39	X	2	24.49	X		0.5	X	0.7	=	14.2	(80)
West	0.9x	0.77		X	4.92	X		6.15	X		0.5	X	0.7	=	19.27	(80)
West	0.9x	0.77		x	2.39	X		6.15	X		0.5	X	0.7	=	9.36	(80)
Ť				_	for each mor	_		1		$\overline{}$	um(74)m .		_	1	1	(55)
(83)m=	58.26	113.97	187.69		273.74 335.4		343.42	326.95	280	).85	218.29	135.24	72.64	47.91	]	(83)
Ţ				_	$\frac{(84)m = (73)i}{734.00}$	_	• •				040.47	504.0	.   500 50		1	(0.4)
` ' L	551.44	604.6	662.0°	_	721.83 756.7		739.23	706.56	667	.22	618.47	561.87	7 529.53	527.68	J	(84)
					heating seas											
•		_	_	•	eriods in the I	_			ole 9	, Th	1 (°C)				21	(85)
Utilisat r		Ť		$\neg$	ving area, h1	Ť							1	<del>-</del>	1	
(00)	Jan	Feb	Mai	<u>.</u>	Apr Ma	<del>-  </del>	Jun	Jul	_	ug	Sep	Oct	+	Dec	4	(00)
(86)m=	0.97	0.96	0.94		0.88 0.78	<sup>5</sup> [	0.62	0.48	0.5	02	0.74	0.9	0.96	0.98	J	(86)
Г				$\overline{}$	ving area T1			i e						1	7	
(87)m=	19.33	19.52	19.86		20.3 20.6	6	20.89	20.97	20.	.96	20.79	20.33	19.77	19.3	]	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		
(88)m= 20.26 20.27 20.27 20.28 20.28 20.29 20.29 20.3 20.29	1 1 1	0.27 (88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		
(89)m= 0.97 0.96 0.93 0.86 0.75 0.57 0.41 0.45 0.69	0.89 0.95 0	.97 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Tal	ble 9c)	
(90)m= 17.99 18.26 18.75 19.39 19.88 20.19 20.27 20.26 20.07	<del> </del>	7.95 (90)
	fLA = Living area ÷ (4) =	0.29 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	2	
(92)m= 18.38 18.63 19.07 19.65 20.11 20.39 20.47 20.46 20.28	19.7 18.96 18	3.35 (92)
Apply adjustment to the mean internal temperature from Table 4e, where app	ropriate	
(93)m= 18.38 18.63 19.07 19.65 20.11 20.39 20.47 20.46 20.28	19.7 18.96 18	3.35 (93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so the the utilisation factor for gains using Table 9a	at Ti,m=(76)m and re	-calculate
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct Nov	Dec
Utilisation factor for gains, hm:	1 000   1101	200
(94)m= 0.96 0.94 0.91 0.85 0.74 0.58 0.43 0.47 0.69	0.87 0.94 0	.96 (94)
Useful gains, hmGm , W = (94)m x (84)m	1 1	
(95)m= 528.43 570.3 603.65 611.33 559.49 428.72 303.33 313.61 427.42	489.3 497.91 50	8.17 (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		1.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m–(96)n	<del>-i</del>	(07)
(97)m= 1195.28 1161.61 1060.15 891.12 694.45 469.84 314.19 328.51 505.13		84.74
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (98)m = 496.14 \mid 397.37 \mid 339.64 \mid 201.45 \mid 100.41 \mid 0 \mid 0 \mid 0 \mid 0$	i i i i i i i i i i i i i i i i i i i	3.37
	ur (kWh/year) = Sum(98) <sub>15</sub>	
	ii (kvvii/yeai) = 3uiii(30)is	
Space heating requirement in kWh/m²/year		23.97 (99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by Fraction of space heat from secondary/supplementary heating (Table 11) '0' if	•	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	d un to four other heat sou	
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	i up to tour other fleat sou	ces, the latter
Fraction of heat from Community heat pump		0.5 (303a)
Fraction of community heat from heat source 2		0.5 (303b)
Fraction of total space heat from Community heat pump	(302) x (303a) =	0.5 (304a)
Fraction of total space heat from community heat source 2	(302) x (303b) =	0.5 (304b)
Factor for control and charging method (Table 4c(3)) for community heating sy	stem	1 (305)
Distribution loss factor (Table 12c) for community heating system		1.05 (306)
Space heating		kWh/year
Annual space heating requirement		2585.06

Space heat from Community heat pump	(98) x (304a)	x (305) x (306) =	1357.16	(307a)
Space heat from heat source 2	(98) x (304b)	x (305) x (306) =	1357.16	(307b)
Efficiency of secondary/supplementary heating sys	tem in % (from Table 4a or Appe	endix E)	0	(308
Space heating requirement from secondary/supple	mentary system (98) x (301) x	(100 ÷ (308) =	0	(309)
Water heating				
Annual water heating requirement			2235.67	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a)	x (305) x (306) =	1173.73	(310a)
Water heat from heat source 2	(64) x (303b)	x (305) x (306) =	1173.73	(310b)
Electricity used for heat distribution	0.01 × [(307a)(30	07e) + (310a)(310e)] =	50.62	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if	not enter 0) = (107) ÷ (31	4) =	0	(315)
Electricity for pumps and fans within dwelling (Tablemechanical ventilation - balanced, extract or positive	,		352.23	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	30b) + (330g) =	352.23	(331)
Energy for lighting (calculated in Appendix L)			474.91	(332)
Electricity generated by PVs (Appendix M) (negative	re quantity)		-658.68	(333)
Electricity generated by wind turbine (Appendix M)	(negative quantity)		0	(334)
12b. CO2 Emissions – Community heating scheme	)			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating Efficiency of heat source 1 (%)	g (not CHP) ere is CHP using two fuels repeat (363) t	to (366) for the second fuel	425	(367a)
Efficiency of heat source 2 (%)	ere is CHP using two fuels repeat (363) t	to (366) for the second fuel	91	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	309.07	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	600.74	(368)
Electrical energy for heat distribution	[(313) x	0.52	26.27	(372)
Total CO2 associated with community systems	(363)(366) + (368)(3	72) =	936.07	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater	or instantaneous heater (312) x	0.52	0	(375)
Total CO2 associated with space and water heating	$g \qquad (373) + (374) + (375) =$		936.07	(376)
CO2 associated with electricity for pumps and fans	within dwelling (331)) x	0.52	182.81	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	246.48	(379)
Energy saving/generation technologies (333) to (33 Item 1	34) as applicable	0.52 x 0.01 =	-341.85	(380)

Total CO2, kg/year sum of (376)...(382) = Dwelling CO2 Emission Rate  $(383) \div (4) =$  El rating (section 14)

1023.51	(383)
9.49	(384)
91.03	(385)

			l loor F	Notoile:						
Assessor Name:	Joseph Treanor	140	User D	Strom					0032062	
Software Name:	Stroma FSAP 20		luonouti.	Softwa		rsion:		versio	on: 1.0.4.14	
A ddrago .	, Gondar Gardens			Address	P3					
Address: 1. Overall dwelling dim		, London,	INVVO II	IG						
Tr Overall aweiling all	10110101		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor					(1a) x		2.55	(2a) =	188.73	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	le)+(1r	n)	74.01	(4)			-		_
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	188.73	(5)
2. Ventilation rate:										
	main heating	secondai heating	у	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 t	fans					0	X	10 =	0	(7a)
Number of passive ven	ts				Ē	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	x -	40 =	0	(7c)
					L					
								Air ch	nanges per ho	our
Infiltration due to chimn	•					0		÷ (5) =	0	(8)
	been carried out or is inten	ded, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)		_	<b>—</b> (0)
Number of storeys in Additional infiltration	the dwelling (ris)						[(0)	-1]x0.1 =	0	(9) (10)
	0.25 for steel or timbe	r frame or	· 0 35 fo	r masoni	v conetr	ruction	[(9)]	-1]XU.1 =	0	(10)
if both types of wall are	present, use the value correnings); if equal user 0.35				•	dollori			0	(11)
If suspended wooder	n floor, enter 0.2 (unse	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	enter 0.05, else enter 0	)							0	(13)
Percentage of window	ws and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
	e, q50, expressed in cu		•	•	•	etre of e	envelope	area	3	(17)
If based on air permeat	•						1		0.15	(18)
Number of sides shelte	lies if a pressurisation test h	as been dor	ne or a de	gree air pe	теаршіу	is being u	sea		2	(19)
Shelter factor	ica			(20) = 1 -	[0.0 <b>75</b> x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind spec	ed								
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind s	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 (CC.)	20)			•			•	•	•	
Wind Factor (22a)m = ( $\frac{1}{2}$	<del>'</del>	1 0.05	0.05	0.00	4	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	J	

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 effecture of the Calculate of		_	rate for t	he appli	cable ca	se						0.5	(23
If exhaust air h	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				68.85	(23
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(24
b) If balance	d mech	anical ve	entilation	without	heat red	overy (I	ИV) (24b	)m = (22	2b)m + (	23b)		_	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n			ntilation o then (24)	•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
d) If natural if (22b)n			ole hous m = (22t	•					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= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(2
3. Heat losse	s and he	eat loss i	paramete	er:									
LEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
√indows Type	<del>.</del> 1				10.85	x1	/[1/( 1.2 )+	0.04] =	12.42				(2
Vindows Type	2				4.5	x1	/[1/( 1.2 )+	0.04] =	5.15				(2
Valls Type1	34.7	<b>'</b> 4	19.8	5	14.89	x	0.18	=	2.68				(2
/alls Type2	43.3	33	0		43.33	x	0.23	=	9.85				(2
otal area of e	lements	, m²			78.07	<del>-</del>							(3
arty wall					33.58	x	0		0				(3
for windows and include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	n 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				35.26	(3
eat capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	5004.3	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design assess an be used inste				construct	ion are no	known pi	ecisely the	e indicative	values of	TMP in Ta	able 1f		
hermal bridge				ısina An	pendix l	<						13.95	(3
details of therma	•	,		• .	•	•						10.00	(
otal fabric he				•				(33) +	(36) =			49.21	(3
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	]	
88)m= 19.82	19.63	19.43	18.43	18.24	17.24	17.24	17.05	17.64	18.24	18.63	19.03		(3
eat transfer o	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
9)m= 69.03	68.83	68.64	67.64	67.44	66.45	66.45	66.25	66.85	67.44	67.84	68.24	]	
' I													

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.93	0.93	0.93	0.91	0.91	0.9	0.9	0.9	0.9	0.91	0.92	0.92		
	!	ļ .		ļ .	Į.	<u> </u>	<u> </u>		Average =	Sum(40) <sub>1</sub> .	12 /12=	0.91	(40)
Number of da	ys 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	iting ene	rgy requi	rement:								kWh/ye	ear:	
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 ( <sup>-</sup>	TFA -13		34		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t	,		se target o		.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								I F		L	~~_		
(44)m= 98.74	95.15	91.56	87.97	84.38	80.79	80.79	84.38	87.97	91.56	95.15	98.74		
( )								<u> </u>	<u> </u>	m(44) <sub>112</sub> =	L	1077.13	(44)
Energy content o	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600	0 kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 146.42	128.06	132.15	115.21	110.55	95.39	88.4	101.44	102.65	119.63	130.58	141.8		
	1		l .		I				Total = Su	m(45) <sub>112</sub> =	=	1412.29	(45)
If instantaneous v	water heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46	) to (61)					
(46)m= 21.96	19.21	19.82	17.28	16.58	14.31	13.26	15.22	15.4	17.94	19.59	21.27		(46)
Water storage		•		•	•	•	•	•	•		· '		
Storage volun	ne (litres)	) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community I	_			-			, ,		(01.1)				
Otherwise if n		not wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	47)			
Water storage a) If manufac		eclared I	oss facto	or is kno	wn (k\/\/ł	n/day).					0		(48)
Temperature				01 10 KHO	WII (ICVVI	i/day).							(49)
Energy lost from				oor			(48) x (49)	\ _			0		
b) If manufac		•			or is not		(40) X (49)	) =		1	10		(50)
Hot water stor			-							0.	02		(51)
If community I	heating s	ee secti	on 4.3										
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (	55)								1.	03		(55)
Water storage	loss cal	culated t	or each	month			((56)m = (	$(55) \times (41)$	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)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хН	
(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 circui	t loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circui	`	,			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)

				<b>(- 1)</b>	<b></b>	(							
Combi loss ca	1			<del>`</del>	<u> </u>	<del>- ` ` `</del>	<u> </u>	<del></del>	<u> </u>	<u> </u>	<u> </u>	1	(04)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(61)
	<del>'                                      </del>						<del>`</del>		<del>` ´</del>	<del>`</del>	<del>`´</del>	(59)m + (61)m	
(62)m= 201.7	177.99	187.43	168.71	165.83	148.89	143.67	156.7		174.9	184.08	197.08	J	(62)
Solar DHW input									r contribut	ion to wate	er heating)		
(add additiona						<del> </del>	<del>.                                      </del>	<del></del>			1	1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from w	_										1	1	
(64)m= 201.7	177.99	187.43	168.71	165.83	148.89	143.67	156.7		174.9	184.08	197.08		٦
							0	utput from w	ater heate	r (annual) <sub>1</sub>	12	2063.13	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61	m] + 0.8	k [(46)m	+ (57)m	+ (59)m	[]	
(65)m= 92.91	82.52	88.16	81.1	80.98	74.51	73.61	77.95	76.93	84	86.21	91.37		(65)
include (57)	m in calc	culation o	of (65)m	only if c	ylinder i	s in the	dwellir	g or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a	):									
Metabolic gair	ns (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec	]	
(66)m= 116.97	116.97	116.97	116.97	116.97	116.97	116.97	116.9	7 116.97	116.97	116.97	116.97	1	(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5	•		•	•	
(67)m= 18.41	16.35	13.3	10.07	7.52	6.35	6.86	8.92		15.21	17.75	18.92	1	(67)
Appliances ga	ains (calc	ulated in	Append	dix L. ea	uation L	13 or L1	 3a). al	so see Ta	ble 5	!	!	J	
(68)m= 206.47	<del>`</del>	203.21	191.72	177.21	163.57	154.46	152.3		169.21	183.72	197.36	]	(68)
Cooking gains		ted in A	nendix	l equat	ion I 15	or I 15a'	l also	L see Tahle	5		!	J	
(69)m= 34.7	34.7	34.7	34.7	34.7	34.7	34.7	34.7		34.7	34.7	34.7	1	(69)
Pumps and fa												J	` /
(70)m= 0	0	0	0 0	0	0	0	0	0	0	0	0	1	(70)
				<u> </u>								J	(1.0)
Losses e.g. e <sup>-93.58</sup>	-93.58	-93.58	-93.58	-93.58	-93.58	-93.58	-93.5	3 -93.58	-93.58	-93.58	-93.58	1	(71)
			-93.36	-93.36	-93.36	-93.56	-93.5	-93.36	-93.36	-93.56	-93.36	J	(11)
Water heating			110.01	400.04	400.40	T 00 04	14047	7 1 400 04	1400	140.74	100.04	1	(70)
(72)m= 124.88	ļ	118.5	112.64	108.84	103.49	98.94	104.7		112.9	119.74	122.81	J	(72)
Total interna	<del>,                                    </del>	-				· · · ·		n + (69)m +	•	· · · ·		1	(70)
(73)m= 407.84		393.1	372.52	351.67	331.51	318.36	324.1	1 334.63	355.41	379.3	397.18		(73)
6. Solar gain			. () (	T-1-1- 0-							·		
Solar gains are		ŭ				•	itions to		ie applicai		iion.	Caina	
Orientation:	Access F Table 6d	actor	Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
							1						1(70)
	1	X	10.			19.64	]	0.5	_  ×	0.7	=	51.69	(76)
East 0.9x	2	X	4.			19.64	]	0.5		0.7	=	42.87	[(76)
East 0.9x	1	X	10.			38.42	]	0.5	×	0.7	=	101.11	<b>(76)</b>
East 0.9x	2	X	4.	5	X 3	38.42	_ x	0.5	x	0.7	=	83.87	(76)
East 0.9x	1	X	10.	85	x (	63.27	X	0.5	X	0.7	=	166.51	(76)

		_								
East 0.9x 2 x 4.5 x 63.27 x 0.5 x 0.7 =	138.12	(76)								
East 0.9x 1 x 10.85 x 92.28 x 0.5 x 0.7 =	242.85	(76)								
East 0.9x 2 x 4.5 x 92.28 x 0.5 x 0.7 =	201.44	(76)								
East 0.9x 1 x 10.85 x 113.09 x 0.5 x 0.7 =	297.62	(76)								
East 0.9x 2 x 4.5 x 113.09 x 0.5 x 0.7 =	246.88	(76)								
East 0.9x 1 x 10.85 x 115.77 x 0.5 x 0.7 =	304.67	(76)								
East 0.9x 2 x 4.5 x 115.77 x 0.5 x 0.7 =	252.72	(76)								
East 0.9x 1 x 10.85 x 110.22 x 0.5 x 0.7 =	290.06	(76)								
East 0.9x 2 x 4.5 x 110.22 x 0.5 x 0.7 =	240.6	(76)								
East 0.9x 1 x 10.85 x 94.68 x 0.5 x 0.7 =	249.16	(76)								
East 0.9x 2 x 4.5 x 94.68 x 0.5 x 0.7 =	206.67	(76)								
East 0.9x 1 x 10.85 x 73.59 x 0.5 x 0.7 =	193.66	(76)								
East 0.9x 2 x 4.5 x 73.59 x 0.5 x 0.7 =	160.64	(76)								
East 0.9x 1 x 10.85 x 45.59 x 0.5 x 0.7 =	119.98	(76)								
East 0.9x 2 x 4.5 x 45.59 x 0.5 x 0.7 =	99.52	(76)								
East 0.9x 1 x 10.85 x 24.49 x 0.5 x 0.7 =	64.45	(76)								
East 0.9x 2 x 4.5 x 24.49 x 0.5 x 0.7 =	53.46	(76)								
East 0.9x 1 x 10.85 x 16.15 x 0.5 x 0.7 =	42.5	(76)								
East 0.9x 2 x 4.5 x 16.15 x 0.5 x 0.7 =	35.26	(76)								
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	_									
(83)m= 94.56 184.98 304.64 444.29 544.5 557.39 530.66 455.83 354.3 219.49 117.91 77.76		(83)								
Total gains – internal and solar (84)m = (73)m + (83)m, watts	_									
(84)m= 502.4 590.83 697.73 816.81 896.17 888.9 849.02 779.93 688.93 574.9 497.21 474.94		(84)								
7. Mean internal temperature (heating season)										
Temperature during heating periods in the living area from Table 9, Th1 (°C)	21	(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	1									
(86)m= 0.95 0.92 0.86 0.75 0.61 0.45 0.34 0.38 0.59 0.82 0.93 0.96		(86)								
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	_									
(87)m= 19.24 19.53 19.97 20.46 20.78 20.94 20.98 20.97 20.85 20.4 19.73 19.19	]	(87)								
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	J									
(88)m= 20.14 20.14 20.14 20.16 20.16 20.17 20.17 20.17 20.16 20.16 20.15 20.15	]	(88)								
	]	, ,								
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.94 0.91 0.85 0.72 0.57 0.4 0.28 0.31 0.53 0.79 0.91 0.95	1	(89)								
	J	(03)								
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	7									
(90)m= 17.77 18.19 18.82 19.5 19.92 20.11 20.16 20.15 20.02 19.43 18.5 17.71		(90) —								
fLA = Living area ÷ (4) =	0.4	(91)								
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$										
	1	(92)								
(92)m= 18.35 18.72 19.28 19.88 20.26 20.44 20.48 20.48 20.35 19.81 18.99 18.29		(32)								

			_	_		_							
(93)m= 18.35	18.72	19.28	19.88	20.26	20.44	20.48	20.48	20.35	19.81	18.99	18.29		(93)
8. Space hea	ting req	uirement											
Set Ti to the			•		ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
the utilisation	Feb	Mar			Jun	Jul	Δυσ	Con	Oct	Nov	Dec	]	
Jan Utilisation fac		l	Apr	May	Juli	Jui	Aug	Sep	Oct	INOV	Dec		
(94)m= 0.93	0.89	0.83	0.71	0.57	0.42	0.3	0.34	0.55	0.78	0.9	0.94	]	(94)
	l	Į	ļ	<u> </u>		0.0	1 0.0 .	0.00	00		1 0.0 .		, ,
	Useful gains, hmGm, W = (94)m x (84)m 15)m= 465.78 527.52 577.78 584.01 512.04 370.06 253.32 263.2 376.62 448.68 445.57 444.35												(95)
. ,	age exte	rnal tem	ı Derature	e from Ta	ı able 8					<u> </u>			
(96)m= 4.3	Monthly average external temperature from Table 8 96)m=												(96)
Heat loss rate	Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]												
(97)m= 970.21												(97)	
Space heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m		l	
(98)m= 375.29	284.84	222.68	114.48	48.5	0	0	0	0	128.53	259.83	384.94		
	!	•			•	<u>.</u>	Tota	l per year	(kWh/yeaı	r) = Sum(9	)8) <sub>15,912</sub> =	1819.1	(98)
Space heatin	g require	ement in	kWh/m²	²/year								24.58	(99)
9b. Energy red	quiremer	nts – Cor	mmunity	heating	scheme								
This part is us	•		· ·	Ĭ			ting prov	ided by	a comm	unity scl	neme.		
Fraction of spa	ace heat	from se	condary	/suppler	nentary l	neating (	(Table 1	1) '0' if n	one	•		0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so	cheme ma	y obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and t	up to four	other heat	sources; ti	he latter	_
includes boilers, h		-			rom powe	r stations.	See Appei	ndix C.			1		<b>-</b>
Fraction of hea	at from (	Commun	ity heat	pump								0.5	(303a)
Fraction of cor	nmunity	heat fro	m heat s	source 2								0.5	(303b)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	sa) =	0.5	(304a)
Fraction of total	al space	heat fro	m comm	nunity he	at sourc	e 2			(3	02) x (303	3b) =	0.5	(304b)
Factor for conf	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribution los	ss factor	(Table 1	2c) for o	commun	ity heati	ng syste	m					1.05	(306)
Space heating	g										'	kWh/yea	 r
Annual space	heating	requiren	nent									1819.1	
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	955.03	(307a)
Space heat fro	m heat	source 2	!					(98) x (30	04b) x (30	5) x (306)	=	955.03	(307b)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308)
Space heating	require	ment fro	m secon	dary/su <sub>l</sub>	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating													_
Annual water	neating i	•										2063.13	
If DHW from c Water heat fro		•		)				(64) x (30	03a) x (30	5) x (306)	=	1083.14	(310a)
Water heat fro	m heat :	source 2						(64) x (30	03b) x (30	5) x (306)	=	1083.14	(310b)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(	(310e)] =	40.76	(313)
,								•	•	•			

Cooling System Energy Efficiency Rati	0				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 demechanical ventilation - balanced, extra	<b>O</b> (	outside			241.76	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/yea	ır	=(330a) + (330	(b) + (330g) =		241.76	(331)
Energy for lighting (calculated in Appel	ndix L)				325.07	(332)
Electricity generated by PVs (Appendix	(M) (negative quantity)				-452.02	(333)
Electricity generated by wind turbine (A	Appendix M) (negative qua	antity)			0	(334)
12b. CO2 Emissions – Community hea	ating scheme					
		Energy kWh/year	Emission facto kg CO2/kWh		sions O2/year	
CO2 from other sources of space and Efficiency of heat source 1 (%)		g two fuels repeat (363) to	(366) for the second for	ıel	425	(367a)
Efficiency of heat source 2 (%)	If there is CHP using	g two fuels repeat (363) to	(366) for the second for	ıel	91	(367b)
CO2 associated with heat source 1	[(307b)+	(310b)] x 100 ÷ (367b) x	0.52	=	248.9	(367)
CO2 associated with heat source 2	[(307b)+	(310b)] x 100 ÷ (367b) x	0.22	=	483.79	(368)
Electrical energy for heat distribution	I	[(313) x	0.52	=	21.16	(372)
Total CO2 associated with community	systems	(363)(366) + (368)(37	2)	=	753.84	(373)
CO2 associated with space heating (se	econdary)	(309) x	0	=	0	(374)
CO2 associated with water from imme	rsion heater or instantane	eous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375) =			753.84	(376)
CO2 associated with electricity for pur	nps and fans within dwelli	ng (331)) x	0.52	=	125.47	(378)
CO2 associated with electricity for light	ing	(332))) x	0.52	=	168.71	(379)
Energy saving/generation technologies Item 1	s (333) to (334) as applica	able	0.52 x 0.01 =	 - [	-234.6	(380)
Total CO2, kg/year	sum of (376)(382) =				813.43	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				10.99	(384)
						_

El rating (section 14)

(385)

90.84

			lloor D	) otoilo:						
Assessor Name: Software Name:	Joseph Treanor Stroma FSAP 20	12	User D	Strom Softwa					0032062 on: 1.0.4.14	
Contrar o Tramo.	0.10111.07.11 20		roperty	Address		OlOII.		7 01010	711 11011111	
Address :	, Gondar Gardens,									
1. Overall dwelling dime										
Ground floor				<b>a(m²)</b> 94.7	(1a) x		<b>ight(m)</b>	(2a) =	Volume(m <sup>3</sup>	(3a)
	1 - \ . (4  - \ . (4 - \ . (4 -   \ . (4	-) . (4						](==)	241.40	(00)
Total floor area TFA = (1	(1a)+(1b)+(1c)+(1d)+(1	e)+(1r	1)	94.7	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	241.48	(5)
2. Ventilation rate:										
	heating	econdar heating	· -	other	, –	total		40	m³ per hou	_
Number of chimneys	0 +	0	╛╵┖	0	<u> </u>	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	<b>X</b>	10 =	0	(7a)
Number of passive vents	S				Ī	0	x -	10 =	0	(7b)
Number of flueless gas f	fires				F	0	x	40 =	0	(7c)
· ·									-	`
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intend	led, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration	0.05 (a.e. et a.e.) a.e. ('a.e.)		0.05.6				[(9)	-1]x0.1 =	0	(10)
if both types of wall are p	0.25 for steel or timber present, use the value corre				•	uction			0	(11)
deducting areas of open	ings); if equal user 0.35 floor, enter 0.2 (unsea	iled) or 0	1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, er	,	ilou) oi o	. r (ocarc	<i>Ju)</i> , 0100	Cittor o				0	(13)
• •	s and doors draught s	tripped							0	(14)
Window infiltration	ŭ			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 cu	bic metre	s per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeab	ility value, then $(18) = [($	17) ÷ 20]+(8	8), otherw	ise (18) = (	16)				0.15	(18)
Air permeability value appli		s been dor	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides shelter Shelter factor	ed			(20) = 1 -	0.075 x (1	9) <u> </u>  =			2	(19)
Infiltration rate incorpora	iting shelter factor			(21) = (18		-/1			0.85	(20)
Infiltration rate modified	•	d		(=:)	/				0.13	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind s		1 ouii	<u> </u>	1 /wg	СОР	1 000	1 1101	500	J	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
, , [ ] •		1	I	1	<u> </u>	I	<u> </u>	<u> </u>	J	
Wind Factor (22a)m = (2	22)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltration ra	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		
<i>Calcul<mark>ate effective air</mark></i> If mechanical ventil	_	rate for t	he appli	cable ca	se	-		-	-	-		
If exhaust air heat pump		endix N (2	3h) <i>– (</i> 23a	a) × Fmv (e	equation (1	NS)) other	wise (23h	) = (23a)			0.5	(23
If balanced with heat rec	0		, ,	,	. ,	,, .	`	) = (20u)			0.5	(23
	-	-	_					2h\m . /	22h) v [	1 (220)	68.85	(23
a) If balanced mech (24a)m= 0.32 0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	230) <b>x</b> [	0.31	<del>-</del> 100] 	(24
b) If balanced mech					<u> </u>					0.51	J	(= .
(24b)m = 0 0		0	0	0	0	0	0	0	0	0	1	(24
c) If whole house ex											J	•
if (22b)m < 0.5			•	•				5 × (23b	p)			
(24c)m = 0 0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural ventilat if (22b)m = 1, th			•	•				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= 0.32 0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25
3. Heat losses and h	eat loss i	naramet	⊃r·									
<b>ELEMENT</b> Gro		Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-l		A X k kJ/K
Windows Type 1	()		•	4.5		/[1/( 1.2 )+		5.15		1.0/111		(2
Vindows Type 2				2.26	╡,	/[1/( 1.2 )+		2.59	=			(2
Windows Type 3				4.72	ऱ .			5.4	$\exists$			(27
Windows Type 4				2.29	ऱ .	/[1/( 1.2 )+		2.62	=			(2)
Floor					=		—, ¦		≓ ,			`
		40.7		33.02	_	0.13	=	4.2926			= =	(28
Walls Type1 34.  Walls Type2 4.0		13.7	<u>/</u>	21.05	=	0.10	╡ ┇	3.79	<u> </u>		╡	(29
		0		4.02		0.23	=	0.91				(29
otal area of element	5, 1112			71.86	_							(3
Party wall	,			78.29		0	=	0				(32
for windows and roof wind it include the areas on both					atea using	i tormula 1	/[(1/U-vail	ie)+0.04j a	as given in	n paragrapr	1 3.2	
abric heat loss, W/K	= S (A x	U)				(26)(30)	+ (32) =				24.76	(3:
leat capacity Cm = S	(A x k )						((28).	(30) + (32	2) + (32a).	(32e) =	7503.51	1 (34
hermal mass param	eter (TMF	= Cm -	TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design assessments was an be used instead of a de			constructi	ion are not	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
hermal bridges : S (I	. x Y) cal	culated	using Ap	pendix ł	<						13.95	(3
details of thermal bridging	are not kn	nown (36) =	= 0.15 x (3	1)								
otal fabric heat loss								(36) =			38.71	(3
entilation heat loss o	i	<u> </u>						= 0.33 × (		1	1	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		4
38)m= 25.37 25.11	24.86	23.59	23.33	22.06	22.06	21.81	22.57	23.33	23.84	24.35		(3
leat transfer coefficie	nt, W/K	,		,	,	,	(39)m	= (37) + (37)	38)m		1	
39)m= 64.08 63.83	63.57	62.3	62.05	60.78	60.78	60.52	61.29	62.05	62.56	63.06		
troma FSAP 2012 Version	: 1.0.4.14	(SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39) <sub>1</sub>	112 /12=	62.2 <b>≱</b> ∂	age 2 of 8

Additional   Control   C	Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
Number of days in month (Table 1a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(40)m= 0.68	0.67	0.67	0.66	0.66	0.64	0.64	0.64	0.65	0.66	0.66	0.67		
All   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec		!	!		!					Average =	Sum(40) <sub>1</sub>	12 /12=	0.66	(40)
4. Water heating energy requirement:  **RWIN/year:**  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 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) 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 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) 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 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  Annual average hot water usage in litres per day of water use, the and colod)  Jan Feb Man Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd, m = fector from Table r x (43)  (44)m= 107.76 103.84 99.92 98 92.09 88.17 88.17 92.09 96 99.92 103.84 107.76  Energy content of hot water used - calculated monthly = 4.190 x Vd, m x m x DTm / 3000 kWhitnorth (sea Tables 1b, 1c, 1d)  (45)m= 159.8 139.77 144.23 125.74 120.85 104.11 96.47 110.71 112.03 130.56 142.55 154.76  **Total = Sum(45) = 1175.55 (44)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (67)  (46)m= 23.97 20.98 21.63 18.86 18.1 15.62 14.47 16.61 16.8 19.58 21.38 23.21 (46)  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (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 cylinder loss factor is not known:  Hot water storage loss factor from Table 2b  Energy lost from water storage, kWhi/year (48) x (51) x (51) x (52) x (53) = 1.03 (52)  Energy lost from water storage, kWhi/year (47) x (51) x (52) x (53) = 1.03 (52)  Energy lost from water storage, kWhi/year (47) x (51) x (52) x (53) = 1.03 (52)  Energy lost from water storage, kWhi/year (47) x (5		<u> </u>							-	l _				
### 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 E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)2]  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)2]  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)2]  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)2]  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)2]  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)2]  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)2]  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)2]  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)2]  If TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9)2]  If TFA E 13.9, N = 1		-	_	<del></del>	<del>-</del>		<b>-</b>	Ť	<del></del>	-	<del>                                     </del>	<del></del>		
Assumed occupancy, N	(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)z)] + 0.0013 x (TFA -13.9)    Annual average hot water usage in litres per day Vd, average = (25 x N) + 36	4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Transmit a variege has minusal avariage to the various sage by 5% if the divelling is designed to achieve a water use target of 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	if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		68		(42)
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	Reduce the annua	al average	hot water	usage by	5% if the $c$	lwelling is	designed i			se target o		´.96		(43)
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Total = Sum(44)									1		1			
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x mm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)    Total = Sum (45)	(44)m= 107.76	103.84	99.92	96	92.09	88.17	88.17	92.09	96	99.92	103.84	107.76		
(45)ms	` '		l		l		l	l		Total = Su	m(44) <sub>112</sub> =	=	1175.55	(44)
Total = Sum(45) u =   1541.34   (45)	Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
## instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  ### (46)me     23.97	(45)m= 159.8	139.77	144.23	125.74	120.65	104.11	96.47	110.71	112.03	130.56	142.51	154.76		
(46)m=       23.97       20.96       21.63       18.86       18.1       15.62       14.47       16.61       16.8       19.58       21.38       23.21       (46)         Water storage loss:       Storage volume (litres) including any solar or WWHRS storage within same vessel       0       (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):       0       (48)         Temperature factor from Table 2b       0       (49)         Energy lost from water storage, kWh/year       (48) x (49) =       110       (50)         b) If manufacturer's declared cylinder loss factor is not known:       0.02       (51)         If community heating see section 4.3         Volume factor from Table 2a       0.02       (51)         If community heating see section 4.3         Volume factor from Table 2a       1.03       (52)         Temperature factor from Table 2b       0.6       (53)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       1.03       (54)				. ,						Total = Su	m(45) <sub>112</sub> =	=	1541.34	(45)
Water storage loss:         0         (47)           Storage volume (litres) including any solar or WWHRS storage within same vessel         0         (47)           If community heating and no tank in dwelling, enter 110 litres in (47)         (47)           Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         (48)           Water storage loss:         0         (48)           a) If manufacturer's declared loss factor is known (kWh/day):         0         (49)           Energy lost from water storage, kWh/year         (48) × (49) =         110         (50)           b) If manufacturer's declared cylinder loss factor is not known:         110         0.02         (51)           Hot water storage loss factor from Table 2 (kWh/litre/day)         0.02         (51)           If community heating see section 4.3         0.02         (51)           Volume factor from Table 2a         1.03         (52)           Temperature factor from Table 2b         0.6         (53)           Energy lost from water storage, kWh/year         (47) x (51) x (52) x (53) =         1.03         (54)           Enter (50) or (54) in (55)         1.03         (54)           Enter (50) or (54) in (55)         1.03         (55)           Water storage loss calculated for each month         ((56)m = (55) x	It instantaneous v	vater heatı	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46)	to (61)	1		11		
Storage volume (litres) including any solar or WWHRS storage within same vessel   0			21.63	18.86	18.1	15.62	14.47	16.61	16.8	19.58	21.38	23.21		(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  (48) × (49) = 110  (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  (47) × (51) × (52) × (53) = 1.03  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) = 1.03  (54)  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m = (55) × (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  If cylinder contains dedicated solar storage, (57)m = (56)m × ((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 (57)  Primary circuit loss (annual) from Table 3  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)	_		) includir	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ല		0		(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):  [	•	` .					•		a	001		<u> </u>		(47)
a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year (48) × (49) = 110 (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  Energy lost from water storage, kWh/year  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((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 30.98 32.01  If cylinder contains dedicated solar storage, (57)m = (56)m × [(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  Primary circuit loss (annual) from Table 3  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)	-	•			_			, ,	ers) ente	er '0' in (	(47)			
Temperature factor from Table 2b	Water storage	loss:		`					,	·	,			
Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) $0.02$ (51) If community heating see section 4.3  Volume factor from Table 2a $1.03$ (52) Temperature factor from Table 2b $0.6$ (53)  Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 1.03$ (54) Enter (50) or (54) in (55) $1.03$ (55)  Water storage loss calculated for each month $((56)m = (55) \times (41)m)$ (56) $m = (55) \times (41)m$ (56) $m = (56)m \times (57)m = (56)m \times $	a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(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 = $(55) \times (41)$ m  (56)m = $(55) \times (41)$ m  (56)m = $(55) \times (41)$ m  (57)m = $(55) \times (21$	Temperature f	actor fro	m Table	2b								0		(49)
Hot water storage loss factor from Table 2 (kWh/litre/day) $0.02 \qquad (51)$ If community heating see section 4.3 $ \text{Volume factor from Table 2a} \qquad 1.03 \qquad (52) \\ \text{Temperature factor from Table 2b} \qquad 0.6 \qquad (53) \\ \text{Energy lost from water storage, kWh/year} \qquad (47) \times (51) \times (52) \times (53) = \qquad 1.03 \qquad (54) \\ \text{Enter (50) or (54) in (55)} \qquad (1.03) \qquad (55) \\ \text{Water storage loss calculated for each month} \qquad ((56)m = (55) \times (41)m) \\ (56)m = 32.01  28.92  32.01  30.98 $	٠.		•					(48) x (49)	) =		1	10		(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	•			-										(=4)
Volume factor from Table 2a		•			ie Z (KVV	n/litre/da	ly)				0.	.02		(51)
Temperature factor from Table 2b	•	•		JII 4.5							1.	03		(52)
Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((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   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)] $\div$ (50), else (57)m = (56)m where (H11) is from Appendix H  (57)m = $32.01$   28.92   32.01   30.98   32.0				2b							-			
Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((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   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)] $\div$ (50), else (57)m = (56)m where (H11) is from Appendix H  (57)m = $32.01$   28.92   32.01   30.98   32.0	Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1	03		(54)
(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 $32.01$ 30.98 $32.01$ 30.98 32.01 (56) If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$ , else $(57)m = (56)m \text{ where (H11)}$ 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 $0$ (58) Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	••		_	,										
If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$ , 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  Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	Water storage	loss cal	culated f	or each	month			((56)m = (	(55) × (41)	m				
If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$ , 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  Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	(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)
Primary circuit loss (annual) from Table 3 $0$ (58)  Primary circuit loss calculated for each month (59)m = (58) $\div$ 365 $\times$ (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	` '	<u>I</u> s dedicate	<u>l</u> d solar sto	rage, (57)	<u>I</u> m = (56)m		<u>I</u> H11)] ÷ (5	<u>l</u> 0), else (5	<u>I</u> 7)m = (56)	m where (	H11) is fro	m Appendi	ix H	
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)	(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 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)		loos (s:	nuol\ f=-	m Table	. 2	<u> </u>	!	ļ	ļ .	!		<u> </u>		(58)
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	•	,	,			59)m = 4	(58) ± 36	35 × (41)	ım			·		(50)
	•				,	•	` '	, ,		r thermo	stat)			
	· ·					ı —		<del></del>	<u> </u>		<del>'</del>	23.26		(59)

Occalitació		<b>(</b>	Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m											
				,		· ` `	<u> </u>	Ι ,	Ι ,	Ι ,	Ι ,	1	(61)	
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	()	(61)	
	<del></del>						<u> </u>		<del>`                                    </del>	<del>ì ´</del>	<del>` ´                                     </del>	(59)m + (61)m	(00)	
(62)m= 215.0		199.5	179.23	175.93	157.61	151.75	165.98	165.52	185.83	196.01	210.04		(62)	
Solar DHW inpo									r contribut	tion to wate	er heating)			
(add addition (63)m= 0		0	0	0	applies 0	, see Ap	pendix (	0	0	0	0	1	(63)	
	Ļ		U	U	0								(00)	
Output from (64)m= 215.0		ter 199.5	179.23	175.93	157.61	151.75	165.98	165.52	185.83	196.01	210.04	]		
(0.)	- 1	1 .00.0				1 .00	<u> </u>	<u> </u>	l	r (annual)₁		2192.18	(64)	
Heat gains f	rom water	heating	k\/\/h/m/	anth () 24	5 ′ [N 85	v (45)m							1, ,	
(65)m= 97.36	1	92.18	84.6	84.34	77.41	76.3	81.03	80.04	87.63	90.18	95.68	]	(65)	
` '						Ļ		<u> </u>		<u> </u>		) Apating	(00)	
`	include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community hea										leating			
	5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts													
Jar		Mar	S Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(66)m= 134.2	+	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24	134.24		(66)	
Lighting gair		l l					l	l	1	1 10 1121			,	
(67)m= 23.48		16.96	12.84	9.6	8.1	8.75	11.38	15.27	19.39	22.63	24.13		(67)	
Appliances			Append	lix I ea	uation I	13 or I 1	<u> </u>	ļ	LLL ble 5					
(68)m= 247.4	<u> </u>	243.56	229.78	212.4	196.05	185.13	182.56	189.04	202.81	220.2	236.55		(68)	
Cooking gai		ted in Ar	nendix	l equat	ion I 15	or I 15a\	L also s	ee Table	. 5	ļ	ļ.			
(69)m= 36.42	<del>_`</del>	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42	36.42		(69)	
Pumps and		(Table 5	ia)											
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)	
Losses e.g.	 evaporatio	n (negat	ive valu	es) (Tab	le 5)	<u> </u>		<u> </u>		<u> </u>		<u> </u>		
	9 -107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39	-107.39		(71)	
Water heatir	ng gains (1	 able 5)				ļ						l		
(72)m= 130.8	<del></del>	123.89	117.5	113.36	107.52	102.55	108.91	111.17	117.78	125.25	128.6	]	(72)	
Total intern	ļ					l		<u> </u>	I	1 ′1)m + (72)	<u> </u>			
(73)m= 465.0	<del>_</del>	447.68	423.4	398.62	374.94	359.71	366.13	378.75	403.26	431.36	452.55		(73)	
6. Solar ga	ns:													
Solar gains ar	e calculated	using solaı	flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	tion.			
Orientation:			Area		Flu			g_		FF		Gains		
	Table 6d		m²		Ta	ble 6a	٦	able 6b	Т	able 6c		(W)		
East 0.9	( 1	X	4.5	5	X 1	9.64	x	0.5	x	0.7	=	21.44	(76)	
East 0.9	1	X	2.2	26	X	9.64	x	0.5	x	0.7	=	10.77	(76)	
East 0.9	1	X	4.	5	x (	88.42	x	0.5	x	0.7	=	41.94	(76)	
East 0.9	( 1	X	2.2	26	x (	38.42	x	0.5	x	0.7	=	21.06	(76)	
East 0.9	1	x	4.:	5	x (	3.27	x	0.5	х	0.7	=	69.06	(76)	

			_										_
East	0.9x	1	X	2.26	X	63.27	X	0.5	X	0.7	=	34.68	(76)
East	0.9x	1	X	4.5	X	92.28	х	0.5	X	0.7	=	100.72	(76)
East	0.9x	1	X	2.26	X	92.28	X	0.5	X	0.7	=	50.58	(76)
East	0.9x	1	X	4.5	X	113.09	х	0.5	X	0.7	=	123.44	(76)
East	0.9x	1	X	2.26	X	113.09	x	0.5	X	0.7	=	61.99	(76)
East	0.9x	1	X	4.5	X	115.77	X	0.5	X	0.7	=	126.36	(76)
East	0.9x	1	X	2.26	x	115.77	X	0.5	X	0.7	=	63.46	(76)
East	0.9x	1	X	4.5	x	110.22	x	0.5	x	0.7	=	120.3	(76)
East	0.9x	1	X	2.26	x	110.22	x	0.5	x	0.7	=	60.42	(76)
East	0.9x	1	X	4.5	x	94.68	x	0.5	X	0.7	=	103.34	(76)
East	0.9x	1	X	2.26	x	94.68	x	0.5	x	0.7	=	51.9	(76)
East	0.9x	1	X	4.5	x	73.59	x	0.5	x	0.7	=	80.32	(76)
East	0.9x	1	X	2.26	x	73.59	x	0.5	x	0.7	=	40.34	(76)
East	0.9x	1	X	4.5	x	45.59	x	0.5	x	0.7	=	49.76	(76)
East	0.9x	1	X	2.26	x	45.59	x	0.5	x	0.7	=	24.99	(76)
East	0.9x	1	X	4.5	x	24.49	x	0.5	x	0.7	=	26.73	(76)
East	0.9x	1	X	2.26	x	24.49	x	0.5	x	0.7	=	13.42	(76)
East	0.9x	1	X	4.5	x	16.15	x	0.5	X	0.7	=	17.63	(76)
East	0.9x	1	X	2.26	x	16.15	x	0.5	x	0.7	=	8.85	(76)
West	0.9x	0.77	X	4.72	x	19.64	x	0.5	x	0.7	=	22.48	(80)
West	0.9x	0.77	X	2.29	x	19.64	x	0.5	x	0.7	=	10.91	(80)
West	0.9x	0.77	X	4.72	x	38.42	x	0.5	x	0.7	=	43.99	(80)
West	0.9x	0.77	X	2.29	x	38.42	x	0.5	X	0.7	=	21.34	(80)
West	0.9x	0.77	X	4.72	x	63.27	x	0.5	x	0.7	=	72.44	(80)
West	0.9x	0.77	X	2.29	x	63.27	x	0.5	x	0.7	=	35.14	(80)
West	0.9x	0.77	X	4.72	x	92.28	x	0.5	x	0.7	=	105.65	(80)
West	0.9x	0.77	X	2.29	x	92.28	x	0.5	x	0.7	=	51.26	(80)
West	0.9x	0.77	X	4.72	x	113.09	x	0.5	x	0.7	=	129.47	(80)
West	0.9x	0.77	X	2.29	x	113.09	x	0.5	x	0.7	=	62.82	(80)
West	0.9x	0.77	X	4.72	x	115.77	x	0.5	x	0.7	=	132.54	(80)
West	0.9x	0.77	X	2.29	x	115.77	x	0.5	x	0.7	=	64.3	(80)
West	0.9x	0.77	X	4.72	x	110.22	x	0.5	X	0.7	=	126.18	(80)
West	0.9x	0.77	X	2.29	x	110.22	x	0.5	X	0.7	=	61.22	(80)
West	0.9x	0.77	X	4.72	x	94.68	x	0.5	x	0.7	=	108.39	(80)
West	0.9x	0.77	X	2.29	x	94.68	x	0.5	X	0.7	=	52.59	(80)
West	0.9x	0.77	x	4.72	x	73.59	x	0.5	x	0.7	j =	84.25	(80)
West	0.9x	0.77	x	2.29	x	73.59	x	0.5	x	0.7	j =	40.87	(80)
West	0.9x	0.77	x	4.72	x	45.59	x	0.5	х	0.7	j =	52.19	(80)
West	0.9x	0.77	x	2.29	x	45.59	x	0.5	x	0.7	j =	25.32	(80)
West	0.9x	0.77	x	4.72	x	24.49	x	0.5	x	0.7	j =	28.04	(80)
West	0.9x	0.77	X	2.29	x	24.49	x	0.5	x	0.7	j =	13.6	(80)
			_		_		_		-		_		

West	0.9x	0.77	x	4.7	72	x	16	6.15	x		0.5	x		0.7		=	18.49	(80)
West	0.9x	0.77	x	2.2	29	x	16	6.15	x		0.5	×	Γ	0.7		=	8.97	(80)
	_												_					
Solar g	gains in	watts, ca	alculated	for eac	h month				(83)m	= Sı	um(74)m .	(82)r	n					
(83)m=	65.6	128.32	211.33	308.21	377.72	3	86.66	368.12	316	.21	245.78	152.	26	81.79	53.9	94		(83)
Total g	ains – i	nternal a	nd solar	(84)m =	= (73)m ·	+ (	83)m ,	watts										
(84)m=	530.66	591.07	659.01	731.61	776.34	7	761.6	727.83	682	.34	624.53	555.	52	513.15	506.	49		(84)
7. Me	an inter	nal temp	erature	(heating	season	)												
Temp	erature	during h	eating p	eriods ir	n the livi	ng	area fi	rom Tab	ole 9,	Th	1 (°C)						21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(s	ee Tal	ole 9a)										
	Jan	Feb	Mar	Apr	May	È	Jun		Aı	ug	Sep	Od	ct	Nov	De	ec		
(86)m=	0.96	0.94	0.9	0.8	0.66		0.49	0.36	0.4	<del>-</del>	0.62	0.8	5	0.94	0.9	7		(86)
Moon	intorno	Ltompor	oturo in	living or	oo T1 /f/	الد مالد	w ctor	oc 2 to 7	 7 in T	I	. 00)				<u> </u>			
(87)m=	19.74	19.94	ature in	20.62	20.86	_	20.97	20.99	20.9		20.92	20.0	<u> </u>	20.12	19.7	71		(87)
						_	<u> </u>		<u> </u>			20.		20.12	15.7	'		(0.)
- 1			eating p		i	_	Ť				<u> </u>						1	(0.0)
(88)m=	20.36	20.36	20.37	20.38	20.38	2	20.39	20.39	20.	39	20.39	20.3	88	20.38	20.3	37		(88)
Utilisa	ation fac	tor for g	ains for ı	est of d	welling,	h2	,m (se	e Table	9a)									
(89)m=	0.96	0.94	0.89	0.78	0.63		0.45	0.31	0.3	5	0.58	0.8	3	0.93	0.9	6		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ina	T2 (fo	llow ste	ens 3	to 7	in Tabl	e 9c)					•	
(90)m=	18.64	18.93	19.38	19.9	20.22	Ť	20.36	20.39	20.	-	20.3	19.8	39	19.2	18.	6		(90)
						_			<u>!</u>	!	f	LA = L	ivin	g area ÷ (4	4) =		0.36	(91)
N.4				41		11:	-،\ دا	Λ Τ4	. /4	£I	۸) To							
1	19.04	19.3	ature (fo	20.17	20.45	_	$g_0 = 1L_{20.58}$	.A × 11 20.61	+ (1	_	A) × 12	20.1	_	19.54	19.0	11		(92)
(92)m=									<u> </u>					19.54	19.0	<i>)</i>	-	(32)
(93)m=	19.04	19.3	he mean	20.17	20.45	$\overline{}$	20.58	20.61	20.0		20.53	20.1		19.54	19.0	11	1	(93)
			uirement	20.17	20.43	L	20.36	20.01	20.	31	20.55	20.1	5	19.54	19.0	, ,		(00)
			ernal ter	mporatu	ro obtoir		l at ata	n 11 of	Tabl	o Oh	o co tha	t Tina	\_/-	76\m an	d ro	- olo	vulata	
			or gains (			iec	i ai sie	рпо	I abi	e ar	), 50 iiia	L 11,11	1=(	rojili ali	u ie-c	Jaic	uiale	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aı	ug	Sep	Od	ct	Nov	De	эс		
Utilisa	ation fac	tor for g	ains, hm	:		_					-						ı	
(94)m=	0.95	0.92	0.87	0.78	0.63		0.46	0.33	0.3	7	0.59	0.8	2	0.92	0.9	5		(94)
Usefu	ıl gains,	hmGm ,	, W = (94	1)m x (8	4)m	•				•					•			
(95)m=	501.81	545.04	575.54	567.43	492.39	3	52.49	241.23	251.	.07	366.45	454.	14	471.66	482.	25		(95)
Month	nly aver	age exte	rnal tem	perature	from T	abl	e 8			•							•	
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.	4	14.1	10.0	6	7.1	4.2	2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm	າ , W =	[(39)m	x [(93	3)m-	– (96)m	]						
(97)m=	944.47	918.8	839.18	701.92	542.93	3	63.52	243.54	254	.52	393.9	592.	44	778.06	933.	77		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh	/montl	h = 0.02	24 x [	(97)	m – (95	)m] x	(41	I)m			•	
(98)m=	329.34	251.17	196.15	96.84	37.6		0	0	0		0	102.	89	220.61	335.	93		
										Total	per year	(kWh/y	/ear	) = Sum(9	8)15,9	12 =	1570.53	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year												16.58	(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 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 polers, heat from power stations. See Appendix C.	Fraction of space heat from secondary/supplementary heating (Tal	ole 11) '0' if none		0	(301)
Praction of heat from Community heat pump					(302)
Fraction of heat from Community heat pump Fraction of community heat from heat source 2 Fraction of total space heat from Community heat pump Fraction of total space heat from Community heat source 2 Fractor for control and charging method (Table 4c(3)) for community heating system    1		•	four other heat sources;	the latter	
Fraction of total space heat from Community heat pump  (302) x (303a) =		• •		0.5	(303a)
Fraction of total space heat from community heat source 2 (302 x (303b) = 0.5 (304 x (303b) = 1 (305 x	Fraction of community heat from heat source 2			0.5	(303b)
Space heating   Space heating requirement   Space heating requirement   Space heating requirement   Space heat from Community heating system   Space heat from Community heating system   Space heat from Community heat pump   Space heat from Community heat pump   Space heat from Community heat pump   Space heat from heat source 2   Space heat from heat source 2   Space heating requirement   Space heating requirement   Space heat from heat source 2   Space heating requirement   Space heating heat from Community heat pump   Space heating heat from heat source   Space heating   Space heating heat from heat source   Space heating   Space heating	Fraction of total space heat from Community heat pump		(302) x (303a) =	0.5	(304a
Distribution loss factor (Table 12c) for community heating system   1.05   (306)	Fraction of total space heat from community heat source 2		(302) x (303b) =	0.5	(304b
Space heating	Factor for control and charging method (Table 4c(3)) for community	y heating system		1	(305)
Annual space heating requirement  Space heat from Community heat pump  (98) x (304a) x (305) x (306) = 824.53 (307.  Space heat from heat source 2  (98) x (304b) x (305) x (306) = 824.53 (307.  Space heat from heat source 2  (98) x (304b) x (305) x (306) = 824.53 (307.  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  (98) x (301) x 100 + (308) = 0 (308.  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 scheme:  Water heat from heat source 2  (64) x (303a) x (305) x (306) = 1150.89 (310.  Water heat from heat source 2  (64) x (303a) x (305) x (306) = 1150.89 (310.  Water heat from heat source 2  (64) x (307a)(307e) + (310a)(310e) = 39.51 (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  100 (330.  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 309.34 (331.  Energy for lighting (calculated in Appendix L)  Energy for lighting (calculated in Appendix M) (negative quantity)  12b. CO2 Emissions - Community heating scheme  Energy Emissions - Community heating scheme  Energy Emissions - Community heating scheme  Energy Fine Emission factor kg CO2/kwh kg CO2/k	Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heat from Community heat pump         (88) x (304a) x (306) x (306) =         824.53 (307)           Space heat from heat source 2         (88) x (304b) x (306) x (306) =         824.53 (307)           Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)         0 (308)           Space heating requirement from secondary/supplementary system         (88) x (301) x 100 + (308) =         0 (309)           Water heating requirement         2192.18           If DHW from community scheme:           Water heat from Community heat pump         (64) x (303a) x (305) x (306) =         1150.89 (310)           Water heat from heat source 2         (64) x (303b) x (306) x (306) =         1150.89 (310)           Electricity used for heat distribution         0.01 x [(307a)(307e) + (310a)(310e)] =         39.51 (313)           Cooling System Energy Efficiency Ratio         0 (314)         0 (315)           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 (330)           mechanical ventilation - balanced, extract or positive input from outside         309.34 (330)           warm air heating system fans         0 (330)           pump for solar water heating         0 (330)           Total electricity for the above, kWh/yea				kWh/year	
Space heat from heat source 2         (98) x (304b) x (306) x (306) =         824.53         (307)           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         2192.18         2192.18         (310)	, , ,			1570.53	╛
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 heat pump  (64) x (303a) x (305) x (306) =  (1150.89)  (310)  Water heat from heat source 2  (64) x (303a) x (305) x (306) =  (1150.89)  (311)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] =  (314)  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)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  Days (304)  12b. CO2 Emissions – Community heating scheme  Energy kWh/year kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  425  (367)		(98) x (304a) x	x (305) x (306) =	824.53	(307a
Water heating         2192.18           Water heating         2192.18           If DHW from community scheme:         309.34           Water heat from Community heat pump         (64) x (303a) x (305) x (306) =         1150.89           Water heat from heat source 2         (64) x (303b) x (305) x (306) =         1150.89           Water heat from heat source 2         (64) x (303b) x (305) x (306) =         1150.89           Water heat from heat source 2         (64) x (303b) x (305) x (306) =         1150.89           Electricity used for heat distribution         0.01 x [(307a)(307e) + (310a)(310e)] =         39.51         (313           Cooling System Energy Efficiency Ratio         0.01 x [(307a)(307e) + (310a)(310e)] =         0.0131         (314           Space cooling (if there is a fixed cooling system, if not enter 0)         = (107) + (314) =         0.031         (315           Electricity pumps and fans within dwelling (Table 4f):	Space heat from heat source 2	(98) x (304b) x	( (305) x (306) =	824.53	(307b
Water heating         Annual water heating requirement         2192.18           If DHW from community scheme:         (64) x (303a) x (305) x (306) =         1150.89         (310)           Water heat from Community heat pump         (64) x (303b) x (305) x (306) =         1150.89         (310)           Water heat from heat source 2         (64) x (303b) x (305) x (306) =         1150.89         (310)           Electricity used for heat distribution         0.01 x ((307a)(307e) + (310a)(310e)] =         39.51         (313)           Cooling System Energy Efficiency Ratio         0         (314)         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         (330)           mechanical ventilation - balanced, extract or positive input from outside         309.34         (330)           warm air heating system fans         0         (330)           pump for solar water heating         0         (330)           Total electricity for the above, kWh/year         = (330a) + (330b) + (330g) =         309.34         (331)           Electricity generated by PVs (Appendix M) (negative quantity)         -577.99         (333)           Electricity generated by wind turbine (Appendix M) (nega	Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appe	ndix E)	0	(308
Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) × (303a) × (305) × (306) = 1150.89 (310)  Water heat from heat source 2  (64) × (303b) × (305) × (306) = 1150.89 (310)  Electricity used for heat distribution  0.01 × ((307a)(307e) + (310a)(310e)] = 39.51 (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) = 309.34 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy km/year Emission factor kg CO2/kWh  Reg 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 fuels repeat (363) to (366) for the second fuel  425 (367)	Space heating requirement from secondary/supplementary system	(98) x (301) x	100 ÷ (308) =	0	(309)
Water heat from Community heat pump  (64) x (303a) x (305) x (306) = 1150.89 (310)  Water heat from heat source 2  (64) x (303b) x (305) x (306) = 1150.89 (310)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 39.51 (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  warm air heating system fans  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 309.34 (331)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kWh/year Engision factor 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 fuels repeat (363) to (366) for the second fuel 425 (367)	<del>-</del>			2192.18	7
Water heat from heat source 2  (64) × (303b) × (305) × (306) = 1150.89 [310]  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 39.51 [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  warm air heating system fans  0 [330]  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 309.34 [331]  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  0 [334]  12b. CO2 Emissions – Community heating scheme  Energy kg CO2/kWh kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel 425 [367]	•				_ _
Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 39.51 (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  warm air heating system fans  0 (330)  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 309.34 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor 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 fuels repeat (363) to (366) for the second fuel 425 (367)	·			1150.89	=
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) = 309.34 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)				1150.89	╡`
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) = 309.34 (330g)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (367)	·	0.01 × [(307a)(30	7e) + (310a)(310e)] =	39.51	╡
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330) pump for solar water heating  Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 309.34 (331g) Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy kWh/year kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel 425 (367)	·			0	(314)
mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330)  pump for solar water heating  Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 309.34 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel (367)		= (107) ÷ (314	) =	0	(315)
pump for solar water heating  Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 309.34 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (367)		side		309.34	(330a
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 309.34 (331)  Energy for lighting (calculated in Appendix L) 414.58 (332)  Electricity generated by PVs (Appendix M) (negative quantity) -577.99 (333)  Electricity generated by wind turbine (Appendix M) (negative quantity) 0 (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)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 425 (367)	warm air heating system fans			0	(330)
Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  414.58  (332)  (332)  (333)  (334)  (334)  (344)  (357)  (357)	pump for solar water heating			0	(330
Electricity generated by PVs (Appendix M) (negative quantity)  Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)	Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	309.34	(331)
Electricity generated by wind turbine (Appendix M) (negative quantity)  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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)	Energy for lighting (calculated in Appendix L)			414.58	(332)
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)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425 (367)	Electricity generated by PVs (Appendix M) (negative quantity)			-577.99	(333)
Energy Emission factor Emissions kWh/year kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  425 (367)	Electricity generated by wind turbine (Appendix M) (negative quant	ity)		0	(334)
kWh/year kg CO2/kWh 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 fuels repeat (363) to (366) for the second fuel  425  (367)	12b. CO2 Emissions – Community heating scheme				
Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  425  (367)					
420	•	o fuels repeat (363) to	) (366) for the second fue	el 405	7(267)
Ciliciency of fleat Source 2 (70)	(,			-120	_'`
	Efficiency of fleat source 2 (%)	o rueis repeat (505) tt	(300) for the Second Ide	91	(367k

CO2 associated with heat source 1	[(307b	b)+(310b)] x 100 ÷ (367b) x	0.52	=	241.23	(367)
CO2 associated with heat source 2	[(307)	b)+(310b)] x 100 ÷ (367b) x	0.22	=	468.89	(368)
Electrical energy for heat distribution		[(313) x	0.52	=	20.5	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	)	=	730.63	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			730.63	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	160.55	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	215.17	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl		0.52 x 0.01	=	-299.98	(380)
Total CO2, kg/year	sum of (376)(382) =				806.37	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				8.51	(384)
El rating (section 14)					92.27	(385)

			User D	etails:						
Assessor Name:	Joseph Treand	or		Strom	a Num	ber:		STRO	032062	
Software Name:	Stroma FSAP	2012		Softwa	are Ve	rsion:		Versio	n: 1.0.4.14	
		Р	roperty .	Address	P5					
Address :	, Gondar Garder	ns, London,	NW6 11	HG						
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m	<sup>3</sup> )
Ground floor			9	97.6	(1a) x	2	2.55	(2a) =	248.88	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+	+(1e)+(1r	n) [	97.6	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	248.88	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +		+	0	= [	0	X	40 =	0	(6a)
Number of open flues	0 +	- 0	Ī + Ē	0	i - F	0	x :	20 =	0	(6b)
Number of intermittent fa	ans				,	0	X	10 =	0	 (7a)
Number of passive vents					L		=	10 =		(7b)
•					Ļ	0			0	╡`
Number of flueless gas f	ires					0	X :	40 =	0	(7c)
								Air ch	anges per h	our
Infiltration due to chimne	eys, flues and fans =	= (6a)+(6b)+(7	'a)+(7b)+(	7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has	•				ontinue fr	-		, ,		``
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel or timb	ber frame or	0.35 fo	r masonr	y constr	ruction			0	(11)
if both types of wall are p		orresponding to	the great	er wall are	a (after					
deducting areas of open If suspended wooden		sealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	•	,	(***	,,					0	(13)
Percentage of window									0	(14)
Window infiltration	3	• •		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 metre	s per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	•		-	•	-		·		0.15	(18)
Air permeability value appli	-					is being u	sed			<b></b> ` ′
Number of sides shelter	ed								2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind sp	eed							•	
Jan Feb	Mar Apr M	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (225) (2										
Wind Factor $(22a)m = (2a)m =$	(2)m ÷ 4	0.05	0.05				1		İ	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

.ajacica iriilli	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		
Calcul <del>ate effe</del> If mechanic		•	rate for t	ne appli	cable ca	se						0.5	(23
If exhaust air h			endix N. (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) . othe	rwise (23b	) = (23a)				(23
If balanced wit									, (===,			0.5	<b>—</b>  `
a) If balance		•	•	ŭ		`		,	2h\m . /	22h) v [	1 (220)	68.85	(23
24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	+ 100j	(24
b) If balance	L	<u> </u>				<u> </u>	<u> </u>		<u> </u>		0.01		•
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h		<u> </u>			e input v	<u> </u>	n from c	L - outside					•
,	n < 0.5 ×			•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilation	on or wh	ole hous	e positiv	re input '	ventilatio	on from I	oft	<u> </u>	!	<u>!</u>		
if (22b)	m = 1, th	en (24d)	m = (22l	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	x (25)					
25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(2
3. Heat losse	es and he	eat loss r	paramet	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l		k-value kJ/m²-l		A X k kJ/K
/indows Typ		(111 )			4.5				5.15		10/111	`	(2
/indows Typ							/[1/( 1.2 )+			=			(2
Vindows Typ					2.26	╡,	/[1/( 1.2 )+		2.59	<b>=</b>			`
• •					4.72				5.4	<b>=</b>			(2
Vindows Typ	<del>2 4</del>				2.29	=	/[1/( 1.2 )+	0.04] =	2.62	亅 ,			(2
loor					33.02	_	0.13	_  "	4.2926			╡	(2
Valls Type1	34.8		13.7	7	21.05	×	0.18	= !	3.79	닠 !		┥	(2
Valls Type2	4.0		0		4.02	X	0.23	=	0.91				(2
otal area of	elements	, m²			71.86	<u> </u>							(3
arty wall					78.29		0	=	0				(32
for windows and * include the are						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
abric heat lo				s and pan	uuons		(26)(30)	) + (32) =				24.76	(3
leat capacity		•	<b>O</b> )				, , , ,		(30) + (32	2) + (32a).	(32e) =	7503.51	(3
hermal mass			⊃ = Cm -	- TFA) ir	n k.l/m²K			***	tive Value	, , ,	(020)	100	(3:
or design asses	•	•		,			ecisely the				able 1f	100	(0
an be used inste						·	·						
hermal bridg	es : S (L	x Y) cal	culated (	using Ap	pendix ł	<						13.95	(3
details of therm		are not kn	own (36) =	= 0.15 x (3	1)			(0.0)	(0.0)				
otal fabric he									(36) =	(a-)		38.71	(3
entilation he	1	i	· ·				_	<del>- ` ` ` </del>	= 0.33 × (	· · · · · ·	_	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(3
8)m= 26.14	25.88	25.62	24.31	24.05	22.74	22.74	22.48	23.26	24.05	24.57	25.1		(3
00++-0	acafficial	a+ \\\///						(20)	(07)	20/2			
leat transfer 89)m= 64.86	64.59	64.33	63.02	62.76	61.45	61.45	61.19	61.98	62.76	63.29	63.81	Ī	

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.66	0.66	0.66	0.65	0.64	0.63	0.63	0.63	0.64	0.64	0.65	0.65		
							l .		Average =	Sum(40) <sub>1</sub>	12 /12=	0.65	(40)
Number of day	<u> </u>	nth (Tab	le 1a)	1	ı	1		1					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occurring TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		72		(42)
if TFA £ 13.5	•		سمال مالسم		الما م		(05 v NI)	. 20					(40)
Annual average Reduce the annual									se target o		3.71		(43)
not more that 125	litres per	person pe	day (all w	/ater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
(44)m= 108.58	104.63	100.68	96.73	92.79	88.84	88.84	92.79	96.73	100.68	104.63	108.58		
	•	•				•	!			ım(44) <sub>112</sub> =		1184.51	(44)
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 161.02	140.83	145.32	126.7	121.57	104.9	97.21	111.55	112.88	131.55	143.6	155.94		
W. San January 1991					( )		h (40		Total = Su	ım(45) <sub>112</sub> =	=	1553.08	(45)
If instantaneous v	vater neati	ng at point	of use (no	not water	r storage),	enter 0 in	boxes (46)	to (61)					
(46)m= 24.15	21.12	21.8	19	18.24	15.74	14.58	16.73	16.93	19.73	21.54	23.39		(46)
Water storage Storage volum		) includir	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ല		0		(47)
If community h	•					· ·		anno 100	001		0		(47)
Otherwise if no	_			-			, ,	ers) ente	er '0' in (	(47)			
Water storage			(1)					, -		,			
a) If manufact	turer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
b) If manufact			-										
Hot water stor	-			le 2 (kW	h/litre/da	ay)				0.	.02		(51)
If community he Volume factor	_		011 4.3							1	.03		(52)
Temperature f			2b							-	.6		(52)
Energy lost fro				ear			(47) x (51)	) x (52) x (	(53) =		.03		(54)
Enter (50) or		_	, 1	oui			(11)11(21)	, (==, (	,/	-	.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												хН	(00)
										1			(57)
(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		
Primary circuit	•	,				(=o) =	,				0		(58)
Primary circuit				,	•	• •	, ,		r tharma	otat)			
(modified by			ı —		ı —		<del></del>	<u> </u>	1	<del>-                                    </del>	22.22		(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		(58)

				<b></b>	<b></b>								
Combi loss of				,	,	<del>- ` `</del>	<del></del>	1	1			1	(0.1)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(61)
	<del>`</del>						<del>`</del>		(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 216.3	190.76	200.6	180.19	176.85	158.4	152.49	166.83	166.38	186.83	197.09	211.22		(62)
Solar DHW inpu									r contribut	ion to wate	er heating)		
(add addition	nal lines if	FGHRS	and/or V	VWHRS	applies	s, see Ap	pendix	G)	1			1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from	water hea	ter										_	
(64)m= 216.3	190.76	200.6	180.19	176.85	158.4	152.49	166.83	166.38	186.83	197.09	211.22		_
							Out	put from w	ater heate	r (annual) <sub>1</sub>	112	2203.92	(64)
Heat gains for	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 97.76	86.77	92.54	84.92	84.64	77.68	76.54	81.31	80.33	87.96	90.54	96.07		(65)
include (5	7)m in cald	culation o	of (65)m	only if c	ylinder	is in the o	dwelling	or hot w	ater is f	om com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a	):									
Metabolic ga	ins (Table	: 5). Watt	s										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 135.8	1 135.81	135.81	135.81	135.81	135.81	135.81	135.81	135.81	135.81	135.81	135.81		(66)
Lighting gair	ıs (calcula	ted in Ap	pendix l	L, equati	on L9 c	r L9a), a	lso see	Table 5	•	•	•	ı	
(67)m= 24.1	21.4	17.41	13.18	9.85	8.32	8.99	11.68	15.68	19.91	23.23	24.77	]	(67)
Appliances of	ains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), als	o see Ta	ble 5			ı	
(68)m= 252.3	<u> </u>	248.41	234.36	216.62	199.95	188.82	186.2	192.8	206.85	224.58	241.25	]	(68)
Cooking gair	ns (calcula	ıted in Ar	pendix	L. eguat	ion L15	or L15a	). also s	ee Table	5	<u> </u>	<u> </u>	ı	
(69)m= 36.58	<del>`</del>	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	1	(69)
Pumps and f	ans gains	(Table 5	 ia)			1	l .	<u> </u>				ı	
(70)m= 0	0		0	0	0	Ιο	0	0	0	0	0	l	(70)
Losses e.g.						1 -		1 -				I	` /
	5 -108.65	-108.65	-108.65	-108.65	-108.65	-108.65	-108.65	-108.65	-108.65	-108.65	-108.65	1	(71)
` '	_!	<u> </u>	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	l	()
Water heatin	<del>``</del>	124.38	117.95	113.77	107.88	102.88	109.29	111.57	118.23	125.75	129.13	1	(72)
` '			117.93	113.77		<u> </u>	<u> </u>	1	l	I	I	J	(12)
Total intern	<del>_</del>		400.00	402.00		· · · · ·		+ (69)m +	· · · · · ·	437.31	i	1	(73)
(73)m= 471.6		453.94	429.22	403.98	379.89	364.43	370.91	383.78	408.73	437.31	458.89		(13)
6. Solar gains ar		usina solar	flux from	Table 6a :	and assoc	riated equa	itions to c	onvert to th	ne annlicat	ole orientat	tion		
Orientation:		•	Area		Flu	·	110110 10 0	g_	о арриоак	FF		Gains	
Onomation.	Table 6d		m <sup>2</sup>			ble 6a	-	9_ Table 6b	Т	able 6c		(W)	
East 0.9	( 1	x	4.5	5	х	19.64	1 x	0.5	¬ <sub>х</sub> Г	0.7		21.44	(76)
East 0.9		×	2.2		-	19.64	] ^ <u> </u> ] <sub>x</sub> [	0.5	^     x	0.7		10.77	](76)
East 0.9		^ ^					」^ <u>└</u> ┃ x		╣ ,				(76) (76)
East 0.9		_	4.5		-	38.42	; ⊨	0.5	<b>≓</b>	0.7	=	41.94	_
		X	2.2		-	38.42	X	0.5		0.7	_ =	21.06	(76)
East 0.9	1	X	4.5	5	X	63.27	X	0.5	X	0.7	=	69.06	(76)

			_										_
East	0.9x	1	X	2.26	X	63.27	X	0.5	X	0.7	=	34.68	(76)
East	0.9x	1	X	4.5	X	92.28	х	0.5	X	0.7	=	100.72	(76)
East	0.9x	1	X	2.26	X	92.28	X	0.5	X	0.7	=	50.58	(76)
East	0.9x	1	X	4.5	X	113.09	х	0.5	X	0.7	=	123.44	(76)
East	0.9x	1	X	2.26	X	113.09	X	0.5	X	0.7	=	61.99	(76)
East	0.9x	1	X	4.5	X	115.77	X	0.5	X	0.7	=	126.36	(76)
East	0.9x	1	X	2.26	x	115.77	X	0.5	X	0.7	=	63.46	(76)
East	0.9x	1	X	4.5	x	110.22	x	0.5	x	0.7	=	120.3	(76)
East	0.9x	1	X	2.26	x	110.22	x	0.5	x	0.7	=	60.42	(76)
East	0.9x	1	X	4.5	x	94.68	x	0.5	X	0.7	=	103.34	(76)
East	0.9x	1	X	2.26	x	94.68	x	0.5	x	0.7	=	51.9	(76)
East	0.9x	1	X	4.5	x	73.59	x	0.5	x	0.7	=	80.32	(76)
East	0.9x	1	X	2.26	x	73.59	x	0.5	x	0.7	=	40.34	(76)
East	0.9x	1	X	4.5	x	45.59	x	0.5	x	0.7	=	49.76	(76)
East	0.9x	1	X	2.26	x	45.59	x	0.5	x	0.7	=	24.99	(76)
East	0.9x	1	X	4.5	x	24.49	x	0.5	x	0.7	=	26.73	(76)
East	0.9x	1	X	2.26	x	24.49	x	0.5	x	0.7	=	13.42	(76)
East	0.9x	1	X	4.5	x	16.15	x	0.5	X	0.7	=	17.63	(76)
East	0.9x	1	X	2.26	x	16.15	x	0.5	x	0.7	=	8.85	(76)
West	0.9x	0.77	X	4.72	x	19.64	x	0.5	x	0.7	=	22.48	(80)
West	0.9x	0.77	X	2.29	x	19.64	x	0.5	x	0.7	=	10.91	(80)
West	0.9x	0.77	X	4.72	x	38.42	x	0.5	x	0.7	=	43.99	(80)
West	0.9x	0.77	X	2.29	x	38.42	x	0.5	X	0.7	=	21.34	(80)
West	0.9x	0.77	X	4.72	x	63.27	x	0.5	x	0.7	=	72.44	(80)
West	0.9x	0.77	X	2.29	x	63.27	x	0.5	x	0.7	=	35.14	(80)
West	0.9x	0.77	X	4.72	x	92.28	x	0.5	x	0.7	=	105.65	(80)
West	0.9x	0.77	X	2.29	x	92.28	x	0.5	x	0.7	=	51.26	(80)
West	0.9x	0.77	X	4.72	x	113.09	x	0.5	x	0.7	=	129.47	(80)
West	0.9x	0.77	X	2.29	x	113.09	x	0.5	x	0.7	=	62.82	(80)
West	0.9x	0.77	X	4.72	x	115.77	x	0.5	x	0.7	=	132.54	(80)
West	0.9x	0.77	X	2.29	x	115.77	x	0.5	x	0.7	=	64.3	(80)
West	0.9x	0.77	X	4.72	x	110.22	x	0.5	X	0.7	=	126.18	(80)
West	0.9x	0.77	X	2.29	x	110.22	x	0.5	X	0.7	=	61.22	(80)
West	0.9x	0.77	X	4.72	x	94.68	x	0.5	x	0.7	=	108.39	(80)
West	0.9x	0.77	X	2.29	x	94.68	x	0.5	X	0.7	=	52.59	(80)
West	0.9x	0.77	x	4.72	x	73.59	x	0.5	x	0.7	j =	84.25	(80)
West	0.9x	0.77	x	2.29	x	73.59	x	0.5	x	0.7	j =	40.87	(80)
West	0.9x	0.77	x	4.72	x	45.59	x	0.5	х	0.7	j =	52.19	(80)
West	0.9x	0.77	x	2.29	x	45.59	x	0.5	x	0.7	j =	25.32	(80)
West	0.9x	0.77	x	4.72	x	24.49	x	0.5	x	0.7	j =	28.04	(80)
West	0.9x	0.77	X	2.29	x	24.49	x	0.5	x	0.7	j =	13.6	(80)
			_		_		_		-		_		

West	0.9x	0.77	x	4.7	72	x	16	5.15	x		0.5	x		0.7		=	18.49	(80)
West	0.9x	0.77	x	2.2	29	x	16	.15	x		0.5	x	F	0.7		=	8.97	(80)
	L												_					
Solar q	ains in	watts, ca	alculated	l for eac	h month				(83)m	= St	um(74)m .	(82)n	n					
(83)m=	65.6	128.32	211.33	308.21	377.72		86.66	368.12	316.	21	245.78	152.2	26	81.79	53.9	4		(83)
Total g	ains – i	nternal a	and solar	(84)m =	= (73)m -	+ (8	83)m ,	watts	!								l	
(84)m=	537.23	597.59	665.27	737.43	781.7	76	66.56	732.55	687.	12	629.57	560.9	99	519.1	512.8	34		(84)
7. Me	an inter	nal temp	perature	(heating	season	)												
Temp	erature	during h	neating p	eriods ir	n the livii	ng :	area fr	om Tab	ole 9,	Th	1 (°C)						21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(se	ee Tab	ole 9a)										
	Jan	Feb	Mar	Apr	May	Ė	Jun	Jul	Αι	Ja T	Sep	Oc	t	Nov	De	eC.		
(86)m=	0.96	0.94	0.9	0.81	0.67	(	0.49	0.36	0.4	Ť	0.62	0.85	5	0.94	0.97	7		(86)
Moon	intorno	l tompor	ature in	living or	00 T1 (fc	مالد	w ctop	c 2 to 7	l 7 in T	able	. 00)							
(87)m=	19.76	19.95	20.27	20.63	20.86	_	20.97	20.99	20.9		20.92	20.6	1	20.13	19.7	3		(87)
L						<u> </u>			<u> </u>		!	20.0		20.10	13.7	<u> </u>		(0.)
· · · · · · · · · · · · · · · · · · ·			neating p		i	_			1		<u> </u>		_				ı	(0.0)
(88)m=	20.37	20.37	20.38	20.39	20.39	2	20.4	20.4	20.4	11	20.4	20.3	9	20.39	20.3	8		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	,m (see	e Table	9a)									
(89)m=	0.96	0.94	0.89	0.79	0.63	(	0.45	0.32	0.3	5	0.58	0.83	3	0.93	0.96	6		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na	T2 (fol	llow ste	ens 3	to 7	' in Tabl	e 9c)						
(90)m=	18.67	18.96	19.41	19.92	20.23	Ť	20.37	20.4	20.		20.32	19.9	1	19.23	18.6	4		(90)
		<u> </u>	!						!	!	f	LA = L	ivin	g area ÷ (4	1) =		0.35	(91)
Mana				41	ala akwal	II:	\ £1	Λ Τ4	. (4	£I	۸) <b>T</b> O							
r		19.31	ature (fo	20.17	20.45	_	<del></del>	20.61	20.6	_	A) × 12 20.53	20.1	<u></u>	10.55	10.0	2		(92)
(92)m=	19.06	l			l		20.58		l			20.1		19.55	19.0	2		(92)
(93)m=	19.06	19.31	he mean 19.71	20.17	20.45	_	20.58	20.61	20.6	$\neg$	20.53	20.1	_	19.55	19.0	2		(93)
					20.45		20.56	20.61	20.0	21	20.53	20.1	<u>۰</u>	19.55	19.0	_		(33)
			uirement		ra abtain		l ot oto	n 11 of	Tobl	o Oh	oo tha	t Time	. /-	76\m an	d ro o	مام	vuloto	
			ternal ter or gains			iea	at step	ртгог	rabi	e 91.	), so ma	ι 11,11	1=( /	rojm an	a re-c	aic	culate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	Ja	Sep	Oc	t l	Nov	De	C.		
บtilisa		l	ains, hm				-			<u> </u>								
(94)m=	0.95	0.92	0.88	0.78	0.64		0.47	0.33	0.3	7	0.59	0.82	2	0.92	0.95	5		(94)
ı Usefu	ıl gains,	hmGm .	, W = (9 <sup>4</sup>	1)m x (8	4)m	<u> </u>					!							
(95)m=	508.98	552.45	583.11	574.83	498.78	3	356.8	244.06	254.	04	371.24	460.4	41	478.29	489.	13		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able	e 8		!								l	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	14.6	16.6	16.	4	14.1	10.6	3	7.1	4.2			(96)
Heat I	loss rate	e for mea	an intern	al tempe	erature,	Lm	ı , W =[	[(39)m :	x [(93	3)m-	- (96)m	]					l	
(97)m=	956.99	930.74	849.83	710.44	549.4	36	67.66	246.3	257.	39	398.51	599.	7	787.95	945.9	94		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh.	/month	1 = 0.02	24 x [	(97)	m – (95)	)m] x	(41	I)m				
(98)m=	333.32	254.21	198.44	97.64	37.66		0	0	0		0	103.6	63	222.95	339.8	37		
•										Total	per year	(kWh/y	ear	) = Sum(9	8)15,91	2 =	1587.72	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year												16.27	(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 (Ta	ble 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 allo includes boilers, heat pumps, geothermal and waste heat from power stations. See		four other heat sources; t	the latter	
Fraction of heat from Community heat pump	ripportant C.		0.5	(303a)
Fraction of community heat from heat source 2			0.5	(303b)
Fraction of total space heat from Community heat pump		(302) x (303a) =	0.5	(304a)
Fraction of total space heat from community heat source 2		(302) x (303b) =	0.5	(304b)
Factor for control and charging method (Table 4c(3)) for communit	y heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heating			kWh/year	<u>-</u> _
Annual space heating requirement			1587.72	
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	833.56	(307a)
Space heat from heat source 2	(98) x (304b) x	(305) x (306) =	833.56	(307b)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appe	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2203.92	٦
If DHW from community scheme:				<b>-</b> -
Water heat from Community heat pump		( (305) x (306) =	1157.06	(310a)
Water heat from heat source 2		( (305) x (306) =	1157.06	(310b)
Electricity used for heat distribution	0.01 × [(307a)(30	7e) + (310a)(310e)] =	39.81	(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 ou	tside		318.82	(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) =	318.82	(331)
Energy for lighting (calculated in Appendix L)			425.59	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-596.1	(333)
Electricity generated by wind turbine (Appendix M) (negative quan-	tity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor 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 tw	o fuels repeat (363) to	o (366) for the second fue	405	7(267-
(,		o (366) for the second fue	1 - 120	(367a □
Efficiency of heat source 2 (%)  If there is CHP using tw	o racio repeat (505) to	(000) for the second fue	91	(367b)

CO2 associated with heat source 1	[(307b	y)+(310b)] x 100 ÷ (367b) x	0.52	=	243.09	(367)
CO2 associated with heat source 2	[(307b	y)+(310b)] x 100 ÷ (367b) x	0.22	=	472.5	(368)
Electrical energy for heat distribution		[(313) x	0.52	=	20.66	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	2)	=	736.25	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			736.25	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	165.47	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	220.88	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl	icable	0.52 × 0.01	= [	-309.38	(380)
Total CO2, kg/year	sum of (376)(382) =				813.21	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				8.33	(384)
El rating (section 14)					92.36	(385)

			User D	etails:						
Assessor Name:	Joseph Trea			Strom					032062	
Software Name:	Stroma FSAI			Softwa		rsion:		versio	n: 1.0.4.14	
A deligono i	, Gondar Gard		Property NIME 11		P6					
Address: 1. Overall dwelling dime		iens, London	, INVVO II	16						
1. Overall dwelling diffe	511310113.		Δre	a(m²)		Δν Ηρ	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor				<u> </u>	(1a) x		2.55	(2a) =	211.88	<b>)</b>   (3a
Total floor area TFA = (1	a)+(1h)+(1c)+(1	d)+(1e)+ (1			(4)			J` ' I		┛`
	۵,۰(۱۵)۰(۱۵)۰	<i>-</i> , · ( · <del>•</del> ) · · · · · ( ·	,	00.00		) . (20) . (20	d)+(3e)+	(2n) -		<b>—</b>
Dwelling volume					(3a)+(3b	)+(30)+(30	J)+(3e)+	(311) =	211.88	(5)
2. Ventilation rate:	main	seconda	P1/	other		total			m³ per hou	ır
	heating	heating	y 	Other	- <u>-</u>	lotai			ili pei liou	'' —
Number of chimneys	0	+ 0	+	0	] = [	0	X	40 =	0	(6a
Number of open flues	0	+ 0	+	0	] = [	0	Х	20 =	0	(6b
Number of intermittent fa	ins					0	X	10 =	0	(7a
Number of passive vents	3				Ē	0	x	10 =	0	(7b
Number of flueless gas f	ires				F	0	x	40 =	0	<u> </u>
· ·					_					`
								Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fan	s = (6a) + (6b) + (6b)	(7a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has b	oeen carried out or is	intended, proced	ed to (17),	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0 if both types of wall are p					•	uction			0	(11
deducting areas of openi			o ine great	ler wall are	a (aitei					
If suspended wooden	floor, enter 0.2 (u	unsealed) or (	).1 (seale	ed), else	enter 0				0	(12
If no draught lobby, en	ter 0.05, else en	ter 0							0	(13
Percentage of window	s and doors drau	ight stripped							0	(14
Window infiltration				0.25 - [0.2	. ,	_			0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value,			•	•	•	etre of e	envelope	area	3	(17
If based on air permeabil  Air permeability value applie	-					io hoina u	and		0.15	(18
Number of sides sheltere		lesi nas been ud	irie or a de	yree air pe	пеаышу	is being u	seu	1	2	(19
Shelter factor	-			(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.85	(20
Infiltration rate incorpora	ting shelter facto	r		(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	peed from Table	7							•	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
		•	•	•		•	•	•	•	
Nind Factor (22a)m = (2	2)m ÷ 4	1.00 0.05	0.05			,		, ,	ı	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

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 If mechanica		_	rate for t	he appli	cable ca	se	-		-	-	-		
If exhaust air he			endix N (2	3h) = (23a	a) × Fmv (e	equation (	NS)) othe	wise (23h	) = (23a)			0.5	(23
If balanced with		0		, ,	,	. `	,, .	`	) = (23a)			0.5	(23
		-	-	_					2h\m . /	00k\ f	(00.0)	68.85	(23
a) If balance (24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	230) × [ 0.3	0.31	÷ 100] 	(24
		<u> </u>			<u> </u>	<u> </u>					0.31		(24
b) If balance		ı				<del></del>	<del>,                                    </del>	<del></del>	<del>- ^ `</del>	<del>- ´                                   </del>	1 0	1	(24
(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	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)		•	•	•	
(25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25
3. Heat losse	c and he	nat loce r	aramata	or:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·ł		A X k kJ/K
Vindows Type	: 1				4.5	x1	/[1/( 1.2 )+	0.04] =	5.15				(27
Vindows Type	2				2.26	x1	/[1/( 1.2 )+	0.04] =	2.59				(27
Windows Type	3				4.72	<sub>x1</sub>	/[1/( 1.2 )+	0.04] =	5.4				(27
Vindows Type	· 4				2.29	<b>=</b>   <sub>x</sub> 1	/[1/( 1.2 )+	0.04] =	2.62	=			(27
Floor					33.02	=	0.13		4.2926			<b>-</b>	(28
Walls Type1	34.8	12	13.7	7	21.05	_		╡┇	3.79	<b>=</b>		╡┝	(29
Walls Type2	4.02		0	<u>'</u>	4.02	,	0.23	=	0.91	<b>-</b>		╡	(29
Total area of e						_	0.23		0.91				
	icilicilis	, 111-			71.86	_							(31
Party wall for windows and	roof wind	014/0 1100 0	effootivo wi	ndow I I v	78.29		0 x formulo 1	/[/1/    volu	0		norograph		(32
* include the area						ateu usirig	j iorriula i	/[( I/ <b>U-</b> vait	1 <del>0</del> )+0.04] a	as giveri iri	paragrapri	1 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				24.76	(33
leat capacity	Cm = S(	(Axk)						((28).	.(30) + (32	2) + (32a).	(32e) =	7503.5	1 (34
hermal mass	parame	ter (TMF	c = Cm ÷	TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35
or design assess an be used inste				construct	ion are not	t known pi	recisely the	indicative	values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix ł	<						13.95	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	1)								
otal fabric he	at loss							(33) +	(36) =			38.71	(37
entilation hea		i	l monthly			<u> </u>	1		= 0.33 × (	(25)m x (5)		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 22.26	22.03	21.81	20.7	20.47	19.36	19.36	19.14	19.8	20.47	20.92	21.37		(38
Heat transfer of	oefficier	nt, W/K						(39)m	= (37) + (	38)m			
39)m= 60.97	60.75	60.52	59.41	59.19	58.07	58.07	57.85	58.52	59.19	59.63	60.08		
tromo ESAD 201	2 Version	1.0.4.14	SAP 9.92	- http://w	ww.stroma	.com			Average =	Sum(39) <sub>1</sub>	12 /12=	59.3 <b>5</b>	age 2 of 8

Heat loss par	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.73	0.73	0.73	0.71	0.71	0.7	0.7	0.7	0.7	0.71	0.72	0.72		
			<u> </u>	<u> </u>		<u> </u>	<u> </u>		ı Average =	Sum(40) <sub>1</sub> .	12 /12=	0.71	(40)
Number of da	ys 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	ating ene	rgy requi	irement:								kWh/ye	ar:	
Assumed 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 ( <sup>-</sup>	TFA -13		52		(42)
Annual avera Reduce the annu not more that 12	ual average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t	,		se target o		.02		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea			ctor from	Table 1c x		<u>'</u>	!	!			
(44)m= 103.43	99.66	95.9	92.14	88.38	84.62	84.62	88.38	92.14	95.9	99.66	103.43		
	-1								Total = Su	m(44) <sub>112</sub> =	=	1128.28	(44)
Energy content o	of hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 153.38	134.14	138.43	120.68	115.8	99.92	92.6	106.25	107.52	125.31	136.78	148.54		
If instantaneous	water boots	'na at naint	of upo (no	hat water	, ataragal	antar O in	haves (46		Total = Su	m(45) <sub>112</sub> =	-	1479.35	(45)
If instantaneous			,		, , , , , , , , , , , , , , , , , , ,		· · ·		ī	ī	1		(10)
(46)m= 23.01 Water storage	20.12	20.76	18.1	17.37	14.99	13.89	15.94	16.13	18.8	20.52	22.28		(46)
Storage volur		) includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	•	•				Ū							, ,
Otherwise if r	_			_			, ,	ers) ente	er '0' in (	47)			
Water storage													
a) If manufac	cturer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost fr		•					(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water sto</li></ul>			-								02		(51)
If community	•			IC 2 (KVV)	ii/iiti C/GC	<b>'</b> y)				0.	02		(31)
Volume factor	_									1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost fr	om wate	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (	55)								1.	03		(55)
Water storage	e 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	ns 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	хН	
(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 circui	it loss (ar	nual) fro	m Table			•	•	•	•		0		(58)
Primary circuit	`	,			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 calcu	lated for e	ach mo	onth (61)m	n – (6	30) ± 36	35 <b>v</b> (41)	)m							
(61)m= 0	0 0		0 0	Ť	0	0	)   0	)	0	0	T 0	0	1	(61)
Total heat require	!	r heati	na calcula	ted t	for eac	h month					ļ	<u> </u>	] : (59)m + (61)m	, ,
<del>_</del>	84.07 193		4.18 171.	_	153.42	147.87	161	_	161.02	180.58	190.28	203.81	]	(62)
Solar DHW input calc	ulated using	Appendi	x G or Appe	ndix H	I (negati	Lve quantity	l /) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	1	
(add additional lir	_											0,		
(63)m= 0	0 0		0 0		0	0	0	)	0	0	0	0	]	(63)
Output from wate	r heater											•		
(64)m= 208.65 18	84.07 193	.7 17	4.18 171.	07	153.42	147.87	161	.53	161.02	180.58	190.28	203.81	1	
	•	•	•				•	Outp	out from wa	ater heate	er (annual) <sub>1</sub>	112	2130.19	(64)
Heat gains from v	water heat	ing, kW	/h/month	0.25	´ [0.85	× (45)m	+ (6	1)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	١]	
(65)m= 95.22 8	4.55 90.2	25 82	2.92 82.7	72	76.02	75.01	79.	55	78.55	85.89	88.28	93.61		(65)
include (57)m i	n calculati	on of (6	55)m only	if cy	linder i	s in the o	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal gains	s (see Tab	le 5 an	d 5a):											
Metabolic gains (	Table 5), \	Vatts												
	Feb M		Apr Ma	ay	Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec	]	
(66)m= 125.94 12	25.94 125.	94 12	5.94 125.	94	125.94	125.94	125	.94	125.94	125.94	125.94	125.94		(66)
Lighting gains (ca	alculated ir	n Appei	ndix L, eq	uatic	n L9 o	r L9a), a	lso s	ee -	Table 5				•	
(67)m= 20.86 1	8.53 15.0	07 11	.41 8.5	3	7.2	7.78	10.	11	13.57	17.23	20.11	21.44		(67)
Appliances gains	(calculate	d in Ap	pendix L,	equ	ation L	13 or L1	3a), a	also	see Tal	ole 5		-	•	
(68)m= 225.78 22	28.12 222.	22 20	9.65 193.	78	178.87	168.91	166	.57	172.47	185.04	200.9	215.82		(68)
Cooking gains (ca	alculated in	n Appe	ndix L, eq	uatio	on L15	or L15a)	), als	o se	e Table	5	-	-	•	
(69)m= 35.59 3	5.59 35.5	59 35	5.59 35.5	59	35.59	35.59	35.	59	35.59	35.59	35.59	35.59	]	(69)
Pumps and fans	gains (Tab	le 5a)											-	
(70)m= 0	0 0		0 0		0	0	0	)	0	0	0	0		(70)
Losses e.g. evap	oration (ne	egative	values) (	Γable	e 5)								_	
(71)m= -100.76 -1	00.76 -100	.76 -10	0.76 -100.	76	-100.76	-100.76	-100	.76	-100.76	-100.76	-100.76	-100.76	]	(71)
Water heating ga	ins (Table	5)											_	
(72)m= 127.98 12	25.81 121	.3 11	5.17 111.	19	105.58	100.82	106	.92	109.09	115.44	122.6	125.82		(72)
Total internal ga	ins =				(66)	m + (67)m	ı + (68	3)m +	- (69)m + (	70)m + (	71)m + (72)	)m	_	
(73)m= 435.4 43	33.24 419.	37   39	7.01 374.	28	352.43	338.29	344	.38	355.91	378.49	404.4	423.86		(73)
6. Solar gains:														
Solar gains are calc	•			6a ar		•	tions	to co		e applica		tion.		
Orientation: Acc	ess Facto le 6d	r ,	Area m²		Flu Tal	x ble 6a		т	g_ able 6b	7	FF able 6c		Gains (W)	
	1	_		_			1							7,
East 0.9x	1	X _	4.5	→		9.64	X		0.5	_	0.7	=	21.44	[76]
East 0.9x	1	X	2.26	_ X		9.64	X		0.5		0.7	=	10.77	[(76)
East 0.9x	1	X	4.5	→		88.42	X		0.5	X	0.7	=	41.94	](76)
East 0.9x	1	X	2.26	→		88.42	X		0.5		0.7	=	21.06	<b></b> (76)
East 0.9x	1	X	4.5	X	6	3.27	X		0.5	X	0.7	=	69.06	(76)

			_										_
East	0.9x	1	X	2.26	X	63.27	X	0.5	X	0.7	=	34.68	(76)
East	0.9x	1	X	4.5	X	92.28	х	0.5	X	0.7	=	100.72	(76)
East	0.9x	1	X	2.26	X	92.28	X	0.5	X	0.7	=	50.58	(76)
East	0.9x	1	X	4.5	X	113.09	х	0.5	X	0.7	=	123.44	(76)
East	0.9x	1	X	2.26	X	113.09	X	0.5	X	0.7	=	61.99	(76)
East	0.9x	1	X	4.5	X	115.77	X	0.5	X	0.7	=	126.36	(76)
East	0.9x	1	X	2.26	x	115.77	X	0.5	X	0.7	=	63.46	(76)
East	0.9x	1	X	4.5	x	110.22	x	0.5	x	0.7	=	120.3	(76)
East	0.9x	1	X	2.26	x	110.22	x	0.5	x	0.7	=	60.42	(76)
East	0.9x	1	X	4.5	x	94.68	x	0.5	X	0.7	=	103.34	(76)
East	0.9x	1	X	2.26	x	94.68	x	0.5	x	0.7	=	51.9	(76)
East	0.9x	1	X	4.5	x	73.59	x	0.5	x	0.7	=	80.32	(76)
East	0.9x	1	X	2.26	x	73.59	x	0.5	x	0.7	=	40.34	(76)
East	0.9x	1	X	4.5	x	45.59	x	0.5	x	0.7	=	49.76	(76)
East	0.9x	1	X	2.26	x	45.59	x	0.5	x	0.7	=	24.99	(76)
East	0.9x	1	X	4.5	x	24.49	x	0.5	x	0.7	=	26.73	(76)
East	0.9x	1	X	2.26	x	24.49	x	0.5	x	0.7	=	13.42	(76)
East	0.9x	1	X	4.5	x	16.15	x	0.5	X	0.7	=	17.63	(76)
East	0.9x	1	X	2.26	x	16.15	x	0.5	x	0.7	=	8.85	(76)
West	0.9x	0.77	X	4.72	x	19.64	x	0.5	x	0.7	=	22.48	(80)
West	0.9x	0.77	X	2.29	x	19.64	x	0.5	x	0.7	=	10.91	(80)
West	0.9x	0.77	X	4.72	x	38.42	х	0.5	x	0.7	=	43.99	(80)
West	0.9x	0.77	X	2.29	x	38.42	x	0.5	X	0.7	=	21.34	(80)
West	0.9x	0.77	X	4.72	x	63.27	x	0.5	x	0.7	=	72.44	(80)
West	0.9x	0.77	X	2.29	x	63.27	x	0.5	x	0.7	=	35.14	(80)
West	0.9x	0.77	X	4.72	x	92.28	X	0.5	x	0.7	=	105.65	(80)
West	0.9x	0.77	X	2.29	x	92.28	x	0.5	x	0.7	=	51.26	(80)
West	0.9x	0.77	X	4.72	x	113.09	x	0.5	x	0.7	=	129.47	(80)
West	0.9x	0.77	X	2.29	x	113.09	x	0.5	x	0.7	=	62.82	(80)
West	0.9x	0.77	X	4.72	x	115.77	x	0.5	x	0.7	=	132.54	(80)
West	0.9x	0.77	X	2.29	x	115.77	x	0.5	x	0.7	=	64.3	(80)
West	0.9x	0.77	X	4.72	x	110.22	x	0.5	X	0.7	=	126.18	(80)
West	0.9x	0.77	X	2.29	x	110.22	x	0.5	X	0.7	=	61.22	(80)
West	0.9x	0.77	X	4.72	x	94.68	x	0.5	x	0.7	=	108.39	(80)
West	0.9x	0.77	X	2.29	x	94.68	x	0.5	X	0.7	=	52.59	(80)
West	0.9x	0.77	x	4.72	x	73.59	x	0.5	x	0.7	j =	84.25	(80)
West	0.9x	0.77	x	2.29	x	73.59	x	0.5	x	0.7	j =	40.87	(80)
West	0.9x	0.77	x	4.72	x	45.59	x	0.5	х	0.7	j =	52.19	(80)
West	0.9x	0.77	x	2.29	x	45.59	x	0.5	x	0.7	j =	25.32	(80)
West	0.9x	0.77	x	4.72	x	24.49	x	0.5	x	0.7	j =	28.04	(80)
West	0.9x	0.77	X	2.29	x	24.49	x	0.5	x	0.7	j =	13.6	(80)
			_		_		_		-		_		

West	0.9x	0.77	x	4.7	72	x	1	6.15	x		0.5		х	0.7	=	18.49	(80)
West	0.9x	0.77	x	2.2	29	x	1	6.15	х		0.5	$\exists$	х	0.7	_ =	8.97	(80)
	_								•				_				
Solar o	gains in	watts, ca	alculated	for eacl	h month				(83)m	ı = Sı	um(74)m .	(82	2)m				
(83)m=	65.6	128.32	211.33	308.21	377.72	$\overline{}$	86.66	368.12	316	.21	245.78	15	2.26	81.79	53.94	7	(83)
Total g	ains – ii	nternal a	and solar	(84)m =	= (73)m	+ (	83)m	, watts				•				_	
(84)m=	501	561.56	630.69	705.21	752	7	739.1	706.41	660	.59	601.7	53	0.75	486.19	477.8		(84)
7. Me	an inter	nal temp	perature	(heating	season	)											
Temp	erature	during h	neating p	eriods ir	n the livi	ng	area	from Tab	ole 9	Th'	1 (°C)					21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	ı (s	ee Ta	ıble 9a)									
	Jan	Feb	Mar	Apr	May	Ù	Jun	Jul	А	ug	Sep		Oct	Nov	Dec	7	
(86)m=	0.96	0.93	0.89	0.79	0.65	T	0.48	0.36	0.3	39	0.61	0.	.84	0.93	0.96	1	(86)
Mean	intorna	l tompor	ature in	living ar	oa T1 /f/	الد مالد	w eto	ns 3 to 7	I 7 in T	able	2 00)	!				_	
(87)m=	19.65	19.86	20.2	20.59	20.84	_	20.96	20.99	20.		20.91	20	).57	20.05	19.61	٦	(87)
					!	_		<u> </u>		!			7.01	20.00	10.01	J	()
			neating p		i	_		i			<u> </u>	1	-			7	(00)
(88)m=	20.31	20.31	20.32	20.33	20.33		20.34	20.34	20.	34	20.34	20	).33	20.33	20.32		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2	,m (se	e Table	9a)			_				_	
(89)m=	0.95	0.93	0.87	0.77	0.61		0.44	0.3	0.3	34	0.56	0.	.81	0.92	0.96		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ina	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9	c)			_	
(90)m=	18.47	18.78	19.27	19.82	20.15	Ť	20.3	20.33	20.	-	20.24		9.79	19.07	18.43	7	(90)
					ļ				<u> </u>		f	LA =	= Livin	g area ÷ (4	4) =	0.42	(91)
Maan	intowns	1 4 0 00 0 0 0		مادين مادي	مارات مارات	11:	~\ f	I A <b>T</b> 4	. /4	£I	Λ) Το						
(92)m=	18.96	19.23	ature (fo	20.14	20.44	_	<u>g) = 1</u> 20.58	20.61	+ (1	$\neg$	A) × 12	20	).11	19.48	18.92	٦	(92)
` '					l	<u> </u>		l				<u> </u>		19.40	10.92	_	(32)
(93)m=	18.96	19.23	he mean 19.65	20.14	20.44	$\overline{}$	20.58	20.61	20		20.52	Ė	).11	19.48	18.92	٦	(93)
. ,			uirement		20.44	L	20.00	20.01		. •	20.52		). I I	13.40	10.92		(00)
			ternal ter		ro obtair	200	l at et	on 11 of	Tabl	a Oh	o co tha	+ Ti	m-(-	76\m an	d ro-ca	lculate	
			or gains			iec	ı al Si	ер птог	ıabı	e ar	), 50 iiia		,111=(	rojili ali	u ie-ca	lculate	
	Jan	Feb	Mar	Apr	May	Г	Jun	Jul	A	ug	Sep		Oct	Nov	Dec	7	
Utilisa		tor for g	ains, hm		,	_				<u> </u>						_	
(94)m=	0.94	0.91	0.86	0.76	0.62		0.45	0.33	0.3	86	0.58	0.	.81	0.91	0.95	7	(94)
Usefu	ıl gains,	hmGm	, W = (9 <sup>2</sup>	1)m x (84	4)m							•				_	
(95)m=	470.11	512.47	542.74	536.11	465.98	3	35.03	229.94	239	.18	346.76	42	7.34	442.5	451.71	7	(95)
Month	nly avera	age exte	rnal tem	perature	from T	abl	e 8	•				•				_	
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16	.4	14.1	10	0.6	7.1	4.2	7	(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm	า , W =	=[(39)m :	x [(9	3)m-	– (96)m	]				_	
(97)m=	893.8	870.49	796.14	667.6	517.03	3	47.05	232.66	243	.18	375.49	56	3.14	738.01	884.49	7	(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	24 x	(97)	m – (95	)m]	x (41	I)m		_	
(98)m=	315.22	240.59	188.53	94.67	37.98		0	0	C		0	10	1.04	212.77	321.98	<u> </u>	
						_				Total	per year	(kWl	h/year	) = Sum(9	8) <sub>15,912</sub> =	1512.78	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year											18.21	(99)

This part is used for space heating, space cooling or water heating provided by a community scheme.

9b. Energy requirements – Community heating scheme

				_
Fraction of space heat from secondary/supplementary heating (Tab	le 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 allow includes boilers, heat pumps, geothermal and waste heat from power stations. See		our other heat sources; t	he latter	
Fraction of heat from Community heat pump	pperium Ci		0.5	(303a)
Fraction of community heat from heat source 2			0.5	(303b)
Fraction of total space heat from Community heat pump		(302) x (303a) =	0.5	(304a
Fraction of total space heat from community heat source 2		(302) x (303b) =	0.5	(304b
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 heating requirement			1512.78	╛
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	794.21	(307a
Space heat from heat source 2	(98) x (304b) x	(305) x (306) =	794.21	(307b
Efficiency of secondary/supplementary heating system in % (from T	able 4a or Apper	ndix 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			2130.19	7
If DHW from community scheme:				_ _
Water heat from Community heat pump	(64) x (303a) x	$(305) \times (306) =$	1118.35	(310a
Water heat from heat source 2	(64) x (303b) x	$(305) \times (306) =$	1118.35	(310b
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	38.25	(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 outs	side		271.42	(330a
warm air heating system fans			0	(330b
pump for solar water heating			0	(330g
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	271.42	(331)
Energy for lighting (calculated in Appendix L)			368.35	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-507.18	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ty)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor 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	fuels repeat (363) to	(366) for the second fue	105	(367
Efficiency of heat source 2 (%)  If there is CHP using two			720	_'`
Efficiency of fleat source 2 (70)		(230) is: the second fue	91	(367b

CO2 associated with heat source 1	[(307b	b)+(310b)] x 100 ÷ (367b) x	0.52	=	233.56	(367)
CO2 associated with heat source 2	[(307)	b)+(310b)] x 100 ÷ (367b) x	0.22	=	453.97	(368)
Electrical energy for heat distribution		[(313) x	0.52	=	19.85	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	)	=	707.38	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			707.38	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	140.87	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	=	191.17	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl		0.52 x 0.01	l = [	-263.23	(380)
Total CO2, kg/year	sum of (376)(382) =				776.19	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				9.34	(384)
El rating (section 14)					91.88	(385)

			lloor F	Notaile						
Assessor Name:	Joseph Treanor		User D	Strom	a Num	bor		STDC	0032062	
Software Name:	Stroma FSAP 20	)12		Softwa					on: 1.0.4.14	
		Р	roperty	Address						
Address :	, Gondar Gardens									
1. Overall dwelling dim	nensions:									
			Are	a(m²)		Av. He	ight(m)	,	Volume(m <sup>3</sup>	<u>^</u>
Ground floor			4	19.09	(1a) x	2	2.55	(2a) =	125.18	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	le)+(1r	n)	19.09	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	125.18	(5)
2. Ventilation rate:										
	main heating	secondai heating	'у 	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 t	fans				Ī	0	X	10 =	0	(7a)
Number of passive ven	ts				F	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	X 4	40 =	0	(7c)
The second of th					L					(, o)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans =	(6a)+(6b)+(7	7a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is inten	ded, procee	d to (17),	otherwise (	continue fr	om (9) to	(16)			<u> </u>
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 for atout on timeles		. 0 05 4-				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timbe present, use the value corre				•	uction			0	(11)
	nings); if equal user 0.35	soponanig to	o uno grodi	ior man are	a (ano					
If suspended wooder	floor, enter 0.2 (unse	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
•	enter 0.05, else enter 0								0	(13)
· ·	ws and doors draught	stripped		0.05 10.0	(4.4)	001			0	(14)
Window infiltration				0.25 - [0.2			. (45)		0	(15)
Infiltration rate	a GEO overseed in a	ıbia matra	o nor h	(8) + (10)	, , ,	, , ,	, ,	oroo	0	(16)
If based on air permeat	e, q50, expressed in cu pility value, then (18) = [		•	•	•	elle oi e	rivelope	alea	3	(17)
·	lies if a pressurisation test h					is being u	sed		0.15	(18)
Number of sides shelte			·		•	J			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind spec	ed							•	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind s	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 <i>± 1</i>									
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
1.27	1.00	1 0.00	L 3.33	1 3.02			I ''' <sup>2</sup>	L '''	]	

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	•	•	•	•	•	<u>-</u>	
If mechanica			andiv N. /O	2h) _ (22c	) Em. (a	auation (	VEVV otho	muiaa (22h	) - (220)			0.5	(23a
									) = (23a)			0.5	(23b
If balanced with		-	-	_					DI. ) (	001-) [	4 (00)	68.85	(23c
a) If balance		i				<del>- `</del>	<del>, ``</del>	<del>í `</del>	<del> </del>	<del></del>	<del>``</del>	) ÷ 100] 1	(24a
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(24a
b) If balance		i					<del>É Ì</del>	<del>i `</del>	<del>r ´       `</del>	<del> </del>	Ι ,	1	(24h
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24b
c) If whole h if (22b)n				•					5 v (22k	<b>5)</b>			
(24c)m = 0	0.5 x	0	0	0 = (230)	0	0	$\frac{C_{i} = (221)}{0}$	0	0	0	0	1	(240
( 1/						<u> </u>						J	(=
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 (24k	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	1	(25)
							ı	ı		1	1	1	
3. Heat losse					NIa4 Aa		المناا		A V 11		la condicio	_	A X I-
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-		A X k kJ/K
Windows Type		` ,			4.72	<del></del>	/[1/( 1.2 )+	0.04] =	5.4	$\stackrel{\prime}{\Box}$			(27)
Windows Type					2.29	〓 ,	/[1/( 1.2 )+	0.04] =	2.62	=			(27)
Walls Type1	21.9	10	7.01		14.98		0.18		2.7	=			(29)
Walls Type2	32.4	_	0	=	32.46	=	0.18		7.38	믁 ¦		_	(29)
Total area of e						=	0.23		7.30				
	icilicilio	, 111			54.45	_							(31)
Party wall					23.76		0	= [	0				(32)
* for windows and ** include the area						atea using	i tormula 1	/[(1/ <b>U-</b> vail	ie)+0.04j a	as given in	paragrapi	7 3.2	
Fabric heat los	s, W/K =	= S (A x	U)				(26)(30)	) + (32) =				18.1	(33)
Heat capacity	Cm = S(	Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	3915.6	(34)
Thermal mass	,	,	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assess	•	•		•			ecisely the	e indicative	values of	TMP in Ta	able 1f		`` ^
can be used instead	ad of a de	tailed calc	ulation.										
Thermal bridge	`	,		• .	•	<						5.66	(36)
if details of therma		are not kn	own (36) =	= 0.15 x (3	1)			(00)	(0.0)				
Total fabric he									(36) =	(a=) (=)		23.76	(37)
Ventilation hea		i	·				Ι ,			(25)m x (5)	i	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	(00)
(38)m= 13.15	13.02	12.89	12.23	12.1	11.44	11.44	11.31	11.7	12.1	12.36	12.62	J	(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (	38)m		1	
(39)m= 36.91	36.78	36.65	35.99	35.86	35.2	35.2	35.07	35.46	35.86	36.12	36.39		
									Average =	Sum(39) <sub>1</sub>	12 /12=	35.96	(39)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.75	0.75	0.75	0.73	0.73	0.72	0.72	0.71	0.72	0.73	0.74	0.74		
						l	l		Average =	: Sum(40) <sub>1</sub>	12 /12=	0.73	(40)
Number of day	·	nth (Tab	le 1a)		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	ear:	
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		66		(42)
Annual average Reduce the annu- not more that 125	al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t	,		se target o		3.7		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage													
(44)m= 81.07	78.13	75.18	72.23	69.28	66.33	66.33	69.28	72.23	75.18	78.13	81.07		
	ļ								Total = Su	ım(44) <sub>112</sub> =	-	884.45	(44)
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 120.23	105.16	108.51	94.6	90.77	78.33	72.58	83.29	84.29	98.23	107.22	116.44		
If instantaneous v	water heati	ing at noint	of use (no	hot water	r storaga)	enter∩in	hoves (16		Total = Su	ım(45) <sub>112</sub> =	= [	1159.66	(45)
		· ·	·	i	, , , , , , , , , , , , , , , , , , ,		· · ·	, , , <del>,</del>	1470	1 40 00	17.47		(46)
(46)m= 18.03 Water storage	15.77 : loss:	16.28	14.19	13.62	11.75	10.89	12.49	12.64	14.73	16.08	17.47		(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)						
Otherwise if n	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	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		•			or io not		(48) x (49)	) =		1	10		(50)
b) If manufact Hot water stor			-							0	02		(51)
If community h	•			_ (	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-77				0.	.02		()
Volume factor	from Ta	ble 2a								1.	.03		(52)
Temperature f	factor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (	55)								1.	.03		(55)
Water storage	loss cal	culated f	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	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	t loss (ar	nnual) fro	m Table	 3							0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	)m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loog	anloulated	for oach	month /	(61)m -	(60) · '	DGE v. (11	١m						
(61)m= 0	calculated	o each	0	0 1)111 =	00) - \	000 x (41	)III   0	0	Ιο	T 0	0	1	(61)
	!										<u> </u>	(50) (04)	(01)
(62)m= 175	<del></del>	163.79	148.1	146.05	131.82		(62)n		(45)m + 153.5	160.72	(57)m +	· (59)m + (61)m 1	(62)
` '	ļ.								<u> </u>			]	(02)
	put calculated onal lines if								ir contribu	tion to wate	er neating)		
(63)m= 0		0	0	0	<u>аррііе</u> 0	0 0	0		0	0	0	1	(63)
					Ů							J	(00)
(64)m= 175	n water hea .51 155.08	163.79	148.1	146.05	131.82	127.86	138.5	7 137.78	153.5	160.72	171.71	1	
. /		<u> </u>		<u> </u>			L	L Output from w	ater heat	_ <b>I</b> er (annual)₁	112	1810.5	(64)
Heat gains	from water	heating	k\Wh/m	onth 0 2	8 01 ` 7	5 × (45)m						. 1	_
(65)m= 84		80.3	74.25	74.4	68.84	68.36	71.9	<del>`                                    </del>	76.88	78.45	82.94	]	(65)
` '	l 57)m in cald					is in the	dwellii	<u> </u>	<u>l</u>		<u>l</u>	l neating	
· ·	ıl gains (see				yiiiidoi		avveiiii	ng or not w	ator io	10111 00111	irriariity i	loating	
	gains (Table			, ·									
Ja		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec	]	
(66)m= 83.	17 83.17	83.17	83.17	83.17	83.17	83.17	83.1		83.17	83.17	83.17	ĺ	(66)
Lighting ga	ins (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso se	e Table 5	•		•	J	
(67)m= 13	<del>`</del>	9.97	7.54	5.64	4.76	5.14	6.69		11.4	13.3	14.18		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation	 _13 or L1	3a), a	lso see Ta	ble 5			•	
(68)m= 144	.87 146.37	142.59	134.52	124.34	114.77	108.38	106.8	38 110.67	118.73	128.91	138.48		(68)
Cooking ga	ains (calcula	ted in A	ppendix	L, equat	ion L1	or L15a	), also	see Table	5	•	•	•	
(69)m= 31.	32 31.32	31.32	31.32	31.32	31.32	31.32	31.3	2 31.32	31.32	31.32	31.32	1	(69)
Pumps and	fans gains	(Table 5	ōa)					•		•		•	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	]	(70)
Losses e.g	. evaporation	n (nega	tive valu	es) (Tab	le 5)							•	
(71)m= -66	.53 -66.53	-66.53	-66.53	-66.53	-66.53	-66.53	-66.5	66.53	-66.53	-66.53	-66.53		(71)
Water heat	ing gains (T	able 5)		-		-		-	-	-	-	•	
(72)m= 113	.17 111.47	107.93	103.13	100	95.61	91.88	96.6	6 98.36	103.34	108.95	111.47		(72)
Total inter	nal gains =				(6	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (	71)m + (72)	)m	•	
(73)m= 319	.79 318.05	308.43	293.14	277.94	263.09	253.35	258.1	18 265.95	281.41	299.12	312.08		(73)
6. Solar g	ains:												
Solar gains	are calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to the	ne applica	ble orienta	tion.		
Orientation	: Access F Table 6d		Area m²			ux able 6a		g_ Table 6b	_	FF		Gains	
					- 10	able ba	, -	Table 6b	_ ,	Table 6c		(W)	,
	9x 0.77	X	4.7	72	X	19.64	X	0.5	x [	0.7	=	22.48	(80)
	9x 0.77	X	2.2	29	X	19.64	X	0.5	x [	0.7	=	10.91	(80)
	9x 0.77	X	4.7	72	X	38.42	X	0.5	× [	0.7	=	43.99	(80)
	9x 0.77	Х	2.2	29	x	38.42	X	0.5	x [	0.7	=	21.34	(80)
West 0.	9x 0.77	X	4.7	72	X	63.27	X	0.5	X	0.7	=	72.44	(80)

									,			_				_
West	0.9x	0.77	X	2.2	29	X	6	3.27	X		0.5	X	0.7	=	35.14	(80)
West	0.9x	0.77	X	4.7	72	X	9	2.28	X		0.5	X	0.7	=	105.65	(80)
West	0.9x	0.77	X	2.2	29	X	ę	2.28	X		0.5	X	0.7	=	51.26	(80)
West	0.9x	0.77	X	4.7	72	X	1	13.09	X		0.5	X	0.7	=	129.47	(80)
West	0.9x	0.77	X	2.2	29	X	1	13.09	X		0.5	X	0.7	=	62.82	(80)
West	0.9x	0.77	X	4.7	72	X	1	15.77	X		0.5	X	0.7	=	132.54	(80)
West	0.9x	0.77	X	2.2	29	X	1	15.77	x		0.5	X	0.7	=	64.3	(80)
West	0.9x	0.77	X	4.7	72	X	1	10.22	X		0.5	X	0.7	=	126.18	(80)
West	0.9x	0.77	X	2.2	29	X	1	10.22	X		0.5	X	0.7	=	61.22	(80)
West	0.9x	0.77	X	4.7	72	X	9	4.68	x		0.5	X	0.7	=	108.39	(80)
West	0.9x	0.77	X	2.2	29	x	9	4.68	x		0.5	x	0.7		52.59	(80)
West	0.9x	0.77	X	4.7	72	X	7	3.59	x		0.5	x	0.7	_ =	84.25	(80)
West	0.9x	0.77	X	2.2	29	X	7	3.59	x		0.5	×	0.7	_ =	40.87	(80)
West	0.9x	0.77	X	4.7	72	X	4	5.59	x		0.5	×	0.7	_ =	52.19	(80)
West	0.9x	0.77	X	2.2	29	X	4	5.59	x		0.5	×	0.7	_ =	25.32	(80)
West	0.9x	0.77	X	4.7	72	X	2	4.49	x		0.5	×	0.7	_ =	28.04	(80)
West	0.9x	0.77	X	2.2	29	X	2	4.49	x		0.5	×	0.7	_ =	13.6	(80)
West	0.9x	0.77	X	4.7	72	X	1	6.15	x		0.5	×	0.7	_ =	18.49	(80)
West	0.9x	0.77	X	2.2	29	X	1	6.15	x		0.5	×	0.7	_ =	8.97	(80)
	-								•							
Solar g	ains in	watts, ca	alculated	for eac	h month	1			(83)m	n = Su	m(74)m .	(82)m				
(83)m=	33.39	65.33	107.58	156.9	192.29	19	96.84	187.4	160	.98	125.12	77.51	41.64	27.46		(83)
Total g	ains – i	nternal a	nd solar	(84)m =	= (73)m	+ (8	83)m	, watts							_	
(84)m=	353.18	383.37	416.02	450.04	470.22	4	59.94	440.75	419	.15	391.07	358.9	3 340.75	339.54		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	า)										
Temp	erature	during h	eating p	eriods ir	n the livi	ing	area	from Tal	ole 9	, Th1	(°C)				21	(85)
Utilisa	tion fac	ctor for g	ains for	living are	ea, h1,n	า (ร	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	0.93	0.91	0.86	0.77	0.63	(	0.47	0.35	0.3	38	0.58	0.79	0.9	0.94		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)			-	_	
(87)m=	19.79	19.97	20.27	20.61	20.84	1	0.96	20.99	20.		20.92	20.63	20.17	19.76	7	(87)
Temp	erature	during h	eating n	erinde i	rest of	. 4/v	elling	from Ta	hle (	<u> </u>	 2 (°C)			!	_	
(88)m=	20.3	20.3	20.3	20.31	20.31	1	20.33	20.33	20.		20.32	20.31	20.31	20.3	1	(88)
			<u> </u>	<u> </u>	<u> </u>			<u> </u>						<u>I</u>	_	
(89)m=	0.92	tor for g	0.85	0.74	0.6	1	).43	0.29	9a) 0.3	32	0.53	0.77	0.89	0.93	7	(89)
			<u> </u>	<u> </u>	<u> </u>			<u> </u>					0.00	0.55	J	(55)
		l temper	i	i	i	Ť	•	i	ri —		i			1,000	7	(00)
(90)m=	18.66	18.93	19.35	19.83	20.14	<u> </u>	20.29	20.32	20.	32	20.24	19.86		18.63		(90)
											Ţ	LA = LI\	ving area ÷ (	4) =	0.5	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	ellin	g) = f	LA × T1	+ (1	– fL/	A) × T2				_	
(92)m=	19.22	19.44	19.8	20.22	20.49		0.62	20.65	20.		20.57	20.24		19.19		(92)
Apply	adjustr	ment to tl	he mear	interna	l tempe	ratu	re fro	m Table	4e,	wher	e appro	priate				

												1	
(93)m= 19.22	19.44	19.8	20.22	20.49	20.62	20.65	20.65	20.57	20.24	19.69	19.19		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l	l	<u> </u>	iviay	Our	l oui	//ug	ССР	000	1101	B00		
(94)m= 0.91	0.88	0.83	0.74	0.61	0.44	0.32	0.35	0.55	0.76	0.88	0.92		(94)
Useful gains,	hmGm	, W = (9	4)m x (84	4)m	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>		
(95)m= 321.64	339.26	346.96	332.51	284.99	204.64	140.92	146.67	214.02	274.45	298.28	311.85		(95)
Monthly average	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)
Heat loss rate	i	i	· ·		i —	<del></del>			<del> </del>			ı	
(97)m= 550.8	534.95	487.57	407.46	315.17	211.98	142.63	149.03	229.61	345.69	454.91	545.47		(97)
Space heatin	<del></del>	1		1	I	I			<del>i</del>	r -	T		
(98)m= 170.49	131.5	104.61	53.97	22.45	0	0	0	0	53.01	112.77	173.81		¬,,,,,
							Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	822.62	(98)
Space heatin	g require	ement in	kWh/m²	<sup>2</sup> /year								16.76	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme	)							
This part is us										unity sch	neme.		_
Fraction of spa	ace heat	from se	condary,	/supplen	nentary l	heating (	(Table 1	1) '0' if n	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so	cheme ma	y obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and	up to four	other heat	sources; ti	he latter	
includes boilers, h		-			rom powe	r stations.	See Appe	ndix C.				0.5	7(2025)
Fraction of hea												0.5	(303a)
Fraction of cor	nmunity	heat fro	m heat s	source 2								0.5	(303b)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	a) =	0.5	(304a)
Fraction of total	al space	heat fro	m comm	nunity he	at sourc	e 2			(3	02) x (303	b) =	0.5	(304b)
Factor for cont	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for c	commun	ity heati	ng syste	m					1.05	(306)
Space heating	g										'	kWh/yea	 r
Annual space	heating	requiren	nent									822.62	
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	431.87	(307a)
Space heat fro	m heat	source 2	2					(98) x (30	04b) x (30	5) x (306)	=	431.87	(307b)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating	ı										!		<u> </u>
Annual water h	neating i	•										1810.5	
If DHW from co Water heat fro		•		o				(64) x (30	03a) x (30	5) x (306) :	=	950.51	(310a)
Water heat fro	m heat s	source 2						(64) x (30	03b) x (30	5) x (306)	=	950.51	(310b)
Electricity used	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	- (310a)(	(310e)] =	27.65	(313)
													_

Cooling System Energy Efficiency Rati	0				0	(314)
Space cooling (if there is a fixed cooling	g system, if not enter 0)	$=(107) \div (314)$	=		0	(315)
Electricity for pumps and fans within demechanical ventilation - balanced, extra	· ,	outside		16	0.35	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/yea	ar	=(330a) + (330	b) + (330g) =	16	0.35	(331)
Energy for lighting (calculated in Appel	ndix L)			24	3.65	(332)
Electricity generated by PVs (Appendix	(M) (negative quantity)			-2	99.7	(333)
Electricity generated by wind turbine (A	Appendix M) (negative qua	antity)			0	(334)
12b. CO2 Emissions – Community hea	ating scheme					
		Energy kWh/year	Emission factoring CO2/kWh	r Emissi kg CO2		
CO2 from other sources of space and Efficiency of heat source 1 (%)	<b>3</b> ,	two fuels repeat (363) to	(366) for the second fu	ıel	425	(367a)
Efficiency of heat source 2 (%)	If there is CHP using	two fuels repeat (363) to	(366) for the second fu	ıel	91	(367b)
CO2 associated with heat source 1	[(307b)+(3	310b)] x 100 ÷ (367b) x	0.52	= 1	68.81	(367)
CO2 associated with heat source 2	[(307b)+(3	310b)] x 100 ÷ (367b) x	0.22	= 3	28.13	(368)
Electrical energy for heat distribution	[[	(313) x	0.52	=	14.35	(372)
Total CO2 associated with community	systems (3	363)(366) + (368)(372	2)	= 5	11.29	(373)
CO2 associated with space heating (se	econdary) (3	309) x	0	=	0	(374)
CO2 associated with water from imme	rsion heater or instantaned	ous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and	water heating (3	373) + (374) + (375) =		5	11.29	(376)
CO2 associated with electricity for pur	nps and fans within dwellin	ng (331)) x	0.52	= {	33.22	(378)
CO2 associated with electricity for light	ting (3	332))) x	0.52	= 1	26.45	(379)
Energy saving/generation technologies Item 1	s (333) to (334) as applical	ble	0.52 × 0.01 =	-1	55.54	(380)
Total CO2, kg/year	sum of (376)(382) =			5	65.42	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				11.52	(384)
						_

El rating (section 14)

(385)

91.95

			lloor D	Notaile						
Assessor Name:	Joseph Treanor		User D	Strom	a Num	ber:		STRC	0032062	
Software Name:	Stroma FSAP 20	)12		Softwa	are Vei	rsion:		Versio	on: 1.0.4.14	
		Р	roperty	Address	P8					
Address :	, Gondar Gardens	, London,	NW6 11	HG						
1. Overall dwelling dim	nensions:									
Ground floor				<b>a(m²)</b> 54.2	(1a) x		ight(m) 2.55	(2a) =	<b>Volume(m³</b> 138.21	(3a)
Total floor area TFA = (	(1a)+(1b)+(1c)+(1d)+(1	le)+(1r	n) ====================================	54.2	(4)			-		
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	138.21	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+ [	0	= [	0	X e	40 =	0	(6a)
Number of open flues	0 +	0	<u> </u>	0	Ī = Ē	0	x :	20 =	0	(6b)
Number of intermittent	fans				, <u> </u>	0	x	10 =	0	(7a)
Number of passive ven	ts					0	x	10 =	0	(7b)
Number of flueless gas						0	X	40 =	0	(7c)
rumber of mueroes gus									0	(,,,)
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans =	(6a)+(6b)+(7	7a)+(7b)+(	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has	s been carried out or is inten	ded, procee	d to (17),	otherwise (	continue fr	om (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 (		0.05.6				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timbe present, use the value corre				•	uction			0	(11)
	nings); if equal user 0.35	osponding to	The great	ici wali arc	a (anoi					
If suspended wooder	n floor, enter 0.2 (unse	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
• ,	enter 0.05, else enter 0								0	(13)
J	ws and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2			. (45)		0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeat	e, q50, expressed in cu		•	•	•	etre or e	envelope	area	3	(17)
·	lies if a pressurisation test h					is beina u	sed		0.15	(18)
Number of sides shelte				<b>5 1</b>	,	3			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpor	ating shelter factor			(21) = (18	x (20) =				0.13	(21)
Infiltration rate modified	I for monthly wind spee	ed							_	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	speed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (	22)m ± 4									
(22a)m = 1.27  1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(-20)	0   1.100	0.00	L 3.55	1 3.02		L	I ''' <sup>2</sup>	L '''	J	

0.16	0.16	0.16	0.14	0.14	0.12	0.12	(21a) x	(22a)m 0.13	0.14	0.14	0.15	1	
Calculate effec			l -	_		-	0.12	0.13	0.14	0.14	0.15	]	
If mechanica	al ventila	ition:										0.5	(2
If exhaust air he	eat pump ı	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	wise (23b	) = (23a)			0.5	(2
If balanced with	heat reco	overy: effici	iency in %	allowing f	or in-use fa	actor (fron	n Table 4h	) =				68.85	(2
a) If balance	d mecha	anical ve	entilation	with he	at recove	ery (MVI	<del>-                                    </del>	m = (22)	2b)m + (	23b) × [	1 – (23c)	) ÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(2
b) If balance	d mecha	anical ve	entilation	without	heat red	overy (N	ЛV) (24b	m = (22)	2b)m + (2	23b)	1	7	
24b)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>	· ` ·	, ,	<del> </del>	,	<del>_``</del>		· ` `	<del></del>	Ι ,	1	(2
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(2
d) If natural if (22b)n				•					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 (24b	o) or (24	c) or (24	d) in box	(25)	<u> </u>	<u> </u>	!	J	
25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(2
							ı		l	l	ı	1	
3. Heat losse	_	·			Not Am		امدالا		AXU		ر بامید یا	^	Χk
LEMENT	Gros area	-	Openin m		Net Ar A ,n		U-valı W/m2		(W/I	K)	k-value kJ/m²-		J/K
indows Type	1				4.72	<sub>x</sub> 1	/[1/( 1.2 )+	0.04] =	5.4				(2
/indows Type	2				2.29	x1,	/[1/( 1.2 )+	0.04] =	2.62				(2
loor					4.31	x	0.13	i	0.5603	T r			(2
/alls Type1	20.2	2	7.01		13.19	x	0.18	<u> </u>	2.37	<b>=</b>		i i	<u> </u>
/alls Type2	31.4	6	0		31.46	x	0.23	<b>=</b>	7.15	F i			<u> </u>
otal area of e					55.97								(;
arty wall					26.04	=	0		0	[		$\neg \vdash$	
for windows and	roof winde	ows, use e	effective wi	ndow U-va						L as given in	paragrapl		
include the area	as on both	sides of in	nternal wali	s and pan	titions	_				-			
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				18.11	(:
eat capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	4174.05	(;
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(;
or design assess an be used inste				construct	ion are not	known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridge				ısina Ar	nendix k	<b>(</b>						5.72	(:
details of therma	,	•		• .	•	•						5.12	'`
otal fabric he			()	(-	,			(33) +	(36) =			23.83	(3
entilation hea	at 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	]	
8)m= 14.52	14.37	14.23	13.5	13.35	12.63	12.63	12.48	12.92	13.35	13.65	13.94	]	(;
eat transfer o	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m		-	
9)m= 38.35	38.2	38.05	37.33	37.18	36.46	36.46	36.31	36.75	37.18	37.47	37.76	]	
00.00													

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.71	0.7	0.7	0.69	0.69	0.67	0.67	0.67	0.68	0.69	0.69	0.7		
					l .	l .	l .		Average =	Sum(40) <sub>1</sub>	12 /12=	0.69	(40)
Number of day	<u> </u>	nth (Tab	le 1a)	1				1	1				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy 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		81		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the $c$	lwelling is	designed i			se target o		7.28		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								1 - 22		L			
(44)m= 85.01	81.92	78.83	75.73	72.64	69.55	69.55	72.64	75.73	78.83	81.92	85.01		
. ,				l .	l .	l .	<u> </u>		Total = Su	ım(44) <sub>112</sub> =	=	927.36	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,ı	n x nm x E	OTm / 3600	0 kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 126.06	110.26	113.77	99.19	95.18	82.13	76.11	87.33	88.38	102.99	112.42	122.09		
									Total = Su	im(45) <sub>112</sub> =	=	1215.91	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	to (61)					
(46)m= 18.91	16.54	17.07	14.88	14.28	12.32	11.42	13.1	13.26	15.45	16.86	18.31		(46)
Water storage Storage volum		\ includir	na anv e	olar or M	WHDC	etorago	within co	ama vac	വ				(47)
•	•	•				•		airie ves	361		0		(47)
If community h Otherwise if no	_			_			, ,	ers) ente	er '0' in <i>(</i>	(47)			
Water storage			(					,		( )			
a) If manufact	turer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
b) If manufact			-										
Hot water stor	-			le 2 (kW	h/litre/da	ay)				0.	.02		(51)
If community he Volume factor	_		011 4.3							1	03		(52)
Temperature f			2b							-	.6		(52)
Energy lost fro				ear			(47) x (51)	) x (52) x (	53) =		03		(54)
Enter (50) or		_	, 1	oui			(11)11(21)	, (==, (	,	-	.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 contains												ix H	(00)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
(57)m= 32.01	20.92	32.01	30.96	32.01	30.96	32.01	32.01	30.96	32.01	<u> </u>	<u> </u>		, ,
Primary circuit	•	,			>	(=o) -	,				0		(58)
Primary circuit				,	•	` '	, ,		r tharma	otat)			
(modified by			ı —				<del></del>	<u> </u>		<del>-                                    </del>	22.22		(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		(38)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	0	00) + 0	0 7 (41	0		0	0	0	0	1	(61)
	<u> </u>							 				<u> </u>	J (59)m + (61)m	(0.)
(62)m= 181.3	<del></del>	169.05	152.69	150.45	135.62	131.38	142.0	_	141.87	158.27	165.92	177.36	(39)111 + (01)111	(62)
Solar DHW inpu													I	(- )
(add addition										COLLING	ion to wat	or riodaling)		
(63)m= 0	0	0	0	0	0	0	0	Ť	0	0	0	0	]	(63)
Output from	water hea	ter				!					!	!	ı	
(64)m= 181.3	_	169.05	152.69	150.45	135.62	131.38	142.6	61	141.87	158.27	165.92	177.36	]	
						1		Output	t from wa	ater heate	r (annual)	112	1866.75	(64)
Heat gains f	om water	heating,	kWh/m	onth 0.2	5 ′ [0.85	5 × (45)m	ı + (6′	1)m]	+ 0.8 x	: [(46)m	+ (57)m	+ (59)m	]	-
(65)m= 86.14		82.05	75.78	75.87	70.1	69.53	73.2	<del>' i</del>	72.18	78.47	80.18	84.82	]	(65)
include (5	7)m in cald	culation of	of (65)m	only if c	ylinder	is in the	dwelli	ng o	r hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a	):	-									
Metabolic gains (Table 5), Watts														
Jan		Mar	Apr	May	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(66)m= 90.69	90.69	90.69	90.69	90.69	90.69	90.69	90.6	69	90.69	90.69	90.69	90.69		(66)
Lighting gair	ıs (calcula	ted in Ap	pendix	L, equati	on L9 o	or L9a), a	lso se	ee Ta	able 5				•	
(67)m= 15.39	13.67	11.12	8.42	6.29	5.31	5.74	7.46	6	10.01	12.71	14.84	15.82	]	(67)
Appliances of	gains (calc	ulated in	Append	dix L, eq	uation L	_13 or L1	3a), a	also s	see Tal	ole 5	•	•	•	
(68)m= 158.1	2 159.76	155.63	146.83	135.71	125.27	118.29	116.0	65	120.79	129.59	140.7	151.14		(68)
Cooking gair	ns (calcula	ted in A	pendix	L, equat	ion L15	or L15a	), also	see	Table	5	•	•	•	
(69)m= 32.07	32.07	32.07	32.07	32.07	32.07	32.07	32.0	7	32.07	32.07	32.07	32.07		(69)
Pumps and f	ans gains	(Table 5	ia)			•						•	•	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)	•							•	
(71)m= -72.5	6 -72.56	-72.56	-72.56	-72.56	-72.56	-72.56	-72.5	56	-72.56	-72.56	-72.56	-72.56		(71)
Water heating	ng gains (T	able 5)											•	
(72)m= 115.7	8 113.99	110.28	105.24	101.97	97.37	93.45	98.4	7	100.25	105.47	111.36	114		(72)
Total intern	al gains =				(66	6)m + (67)m	n + (68)	)m + (	(69)m + (	70)m + (7	'1)m + (72)	)m	•	
(73)m= 339.5	337.63	327.24	310.69	294.19	278.15	267.69	272.	79	281.26	297.98	317.1	331.17		(73)
6. Solar gai	ns:													
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	tions to	o conv	vert to th	e applical		tion.		
Orientation: Access Factor Area Flux g_ FF Gains Table 6d m <sup>2</sup> Table 6a Table 6b Table 6c (W)														
	Table 6d		m²			ble 6a		Tal	Die ob	_ '	able 6c		(W)	,
West 0.9		X	4.7	′2	X	19.64	X		0.5	x	0.7	=	22.48	(80)
West 0.9		X	2.2	29	х	19.64	X		0.5	_	0.7	=	10.91	(80)
West 0.9		Х	4.7	2	x	38.42	X		0.5	x	0.7	=	43.99	(80)
West 0.9		X	2.2	29	х	38.42	X		0.5	×	0.7	=	21.34	(80)
West 0.9	0.77	X	4.7	<b>7</b> 2	X	63.27	x		0.5	X	0.7	=	72.44	(80)

	-								,			_				_
West	0.9x	0.77	X	2.2	29	X	6	3.27	X		0.5	X	0.7	=	35.14	(80)
West	0.9x	0.77	X	4.7	'2	X	9	2.28	X		0.5	X	0.7	=	105.65	(80)
West	0.9x	0.77	X	2.2	29	X	9	2.28	X		0.5	X	0.7	=	51.26	(80)
West	0.9x	0.77	X	4.7	'2	X	1	13.09	X		0.5	X	0.7	=	129.47	(80)
West	0.9x	0.77	X	2.2	29	X	1	13.09	X		0.5	X	0.7	=	62.82	(80)
West	0.9x	0.77	X	4.7	<b>'</b> 2	X	1	15.77	X		0.5	X	0.7	=	132.54	(80)
West	0.9x	0.77	X	2.2	29	X	1	15.77	x		0.5	X	0.7	=	64.3	(80)
West	0.9x	0.77	X	4.7	′2	X	1	10.22	x		0.5	x	0.7	=	126.18	(80)
West	0.9x	0.77	X	2.2	29	X	1	10.22	X		0.5	X	0.7	=	61.22	(80)
West	0.9x	0.77	X	4.7	'2	X	9	94.68	x		0.5	X	0.7	=	108.39	(80)
West	0.9x	0.77	X	2.2	29	X	9	94.68	x		0.5	x	0.7	=	52.59	(80)
West	0.9x	0.77	X	4.7	<b>'</b> 2	X	7	3.59	x		0.5	x	0.7	_ =	84.25	(80)
West	0.9x	0.77	X	2.2	29	X	7	3.59	x		0.5	x	0.7		40.87	(80)
West	0.9x	0.77	X	4.7	'2	X	4	15.59	x		0.5	x	0.7	=	52.19	(80)
West	0.9x	0.77	X	2.2	29	X	4	15.59	x		0.5	x	0.7	=	25.32	(80)
West	0.9x	0.77	X	4.7	'2	X	2	24.49	x		0.5	x	0.7		28.04	(80)
West	0.9x	0.77	X	2.2	29	X	2	24.49	x		0.5	x	0.7		13.6	(80)
West	0.9x	0.77	X	4.7	'2	X	1	6.15	x		0.5	x	0.7	=	18.49	(80)
West	0.9x	0.77	X	2.2	29	X	1	6.15	x		0.5	x	0.7	=	8.97	(80)
	-								•							
Solar g	ains in	watts, ca	alculated	I for eac	h month	า			(83)m	n = Su	m(74)m .	(82)m				
(83)m=	33.39	65.33	107.58	156.9	192.29	1	96.84	187.4	160	.98	125.12	77.51	41.64	27.46	]	(83)
Total g	ains – i	nternal a	nd solar	(84)m =	= (73)m	+ (	83)m	, watts					•		_	
(84)m=	372.89	402.96	434.82	467.59	486.47		475	455.09	433	.76	406.38	375.4	358.74	358.63		(84)
7. Me	an inter	nal temp	erature	(heating	seasoi	n)										
Temp	erature	during h	eating p	eriods ir	n the liv	ing	area	from Tal	ole 9	, Th1	(°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,n	n (s	ee Ta	ıble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	0.94	0.91	0.87	0.77	0.64		0.47	0.35	0.3	38	0.58	0.8	0.9	0.94		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (1	follo	w ste	ps 3 to 7	7 in T	able	9c)			•	_	
(87)m=	19.87	20.04	20.32	20.65	20.86	$\overline{}$	20.97	20.99	20.		20.93	20.66	20.23	19.84	]	(87)
Tamn	erature	during h	eating n	ariade ir	rest of	f du	elling	from Ta	hla (	a Th	2 (°C)			!	J	
(88)m=	20.33	20.34	20.34	20.35	20.35	$\overline{}$	20.37	20.37	20.		20.36	20.35	20.35	20.34	1	(88)
								<u> </u>							J	
(89)m=	0.93	tor for ga	0.85	0.75	weiling, 0.6	$\overline{}$	,m (se 0.43	0.3	9a) 0.3	22	0.53	0.77	0.89	0.94	1	(89)
								<u> </u>					0.09	0.94		(00)
		l temper		1	1	Ť	•	i	r <del>i</del>				1	1	1	(00)
(90)m=	18.8	19.05	19.45	19.91	20.19	1 2	20.33	20.36	20.	36	20.29	19.94		18.77		(90)
											t	LA = LI\	ving area ÷ (	4) =	0.52	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	ellin	g) = f	LA × T1	+ (1	– fL/	A) × T2				_	
(92)m=	19.36	19.57	19.9	20.3	20.54		20.67	20.69	20.		20.62	20.32		19.33		(92)
Apply	adjustr	nent to th	ne mear	interna	tempe	ratu	ire fro	m Table	4e,	wher	re appro	priate				

												1	
(93)m= 19.36	19.57	19.9	20.3	20.54	20.67	20.69	20.69	20.62	20.32	19.81	19.33		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at st	ep 11 of	Table 9	b, so tha	ıt Ti,m=(	76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l	l	· ·	iviay	Juli	Jul	Aug	[ ОСР	000	1407			
(94)m= 0.92	0.89	0.84	0.75	0.61	0.45	0.32	0.35	0.55	0.77	0.88	0.92		(94)
Useful gains,	hmGm	, W = (94	4)m x (8	4)m	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>		
(95)m= 341.59	359.22	366.19	349.78	299.09	214.22	147.6	153.61	224.75	289.78	316.2	331.2		(95)
Monthly avera	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)
Heat loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]			•	
(97)m= 577.48	560.31	510.08	425.39	328.85	221.1	149.13	155.74	239.69	361.26	476.11	571.48		(97)
Space heatin	<del></del>	1	1	nonth, k	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m	,	İ	
(98)m= 175.5	135.14	107.06	54.43	22.14	0	0	0	0	53.18	115.13	178.76		_
							Tota	ıl per year	(kWh/yea	r) = Sum(9	8)15,912 =	841.34	(98)
Space heatin	g require	ement in	kWh/m²	?/year								15.52	(99)
9b. Energy red	quiremer	nts – Cor	mmunity	heating	scheme	<b>;</b>							
This part is us	ed for sp	ace hea	iting, spa	ace cool	ing or wa	ater hea	ting prov	rided by	a comm	unity scl	neme.		
Fraction of spa	ace heat	from se	condary	supplen/	nentary l	heating	(Table 1	1) '0' if n	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so	cheme ma	y obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and	up to four	other heat	sources; ti	he latter	
includes boilers, h		-			rom powe	r stations.	See Appe	ndix C.					_
Fraction of hea	at from C	Commun	ity heat	pump								0.5	(303a)
Fraction of cor	mmunity	heat fro	m heat s	ource 2								0.5	(303b)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	a) =	0.5	(304a)
Fraction of total	al space	heat fro	m comm	unity he	at sourc	e 2			(3	02) x (303	b) =	0.5	(304b)
Factor for cont	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribution los	ss factor	(Table 1	2c) for d	commun	ity heati	ng syste	m					1.05	(306)
Space heating	g										'	kWh/yea	r
Annual space	heating	requiren	nent									841.34	
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	441.7	(307a)
Space heat fro	m heat	source 2	2					(98) x (30	04b) x (30	5) x (306)	=	441.7	(307b)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating	3												_
Annual water h	_	•										1866.75	
If DHW from co Water heat fro		•		)				(64) x (30	03a) x (30	5) x (306)	=	980.04	(310a)
Water heat fro	m heat s	source 2						(64) x (30	03b) x (30	5) x (306)	=	980.04	(310b)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a)	(307e) +	- (310a)	(310e)] =	28.43	(313)
													_

Cooling System Energy Efficiency Rati	0			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 demechanical ventilation - balanced, extra	· ,	outside		177.05	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/yea	ar	=(330a) + (330	0b) + (330g) =	177.05	(331)
Energy for lighting (calculated in Appel	ndix L)			271.77	(332)
Electricity generated by PVs (Appendix	(M) (negative quantity)			-330.99	(333)
Electricity generated by wind turbine (A	Appendix M) (negative qu	uantity)		0	(334)
12b. CO2 Emissions – Community hea	ating scheme				
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and Efficiency of heat source 1 (%)	<b>3</b>	g two fuels repeat (363) to	(366) for the second fue	el 425	(367a)
Efficiency of heat source 2 (%)	If there is CHP usin	g two fuels repeat (363) to	(366) for the second fue	91	(367b)
CO2 associated with heat source 1	[(307b)+	-(310b)] x 100 ÷ (367b) x	0.52	173.62	(367)
CO2 associated with heat source 2	[(307b)+	-(310b)] x 100 ÷ (367b) x	0.22	337.47	(368)
Electrical energy for heat distribution		[(313) x	0.52	14.76	(372)
Total CO2 associated with community	systems	(363)(366) + (368)(37	(2)	525.85	(373)
CO2 associated with space heating (se	econdary)	(309) x	0	0	(374)
CO2 associated with water from imme	rsion heater or instantane	eous heater (312) x	0.52	0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375) =		525.85	(376)
CO2 associated with electricity for pur	nps and fans within dwell	ing (331)) x	0.52	91.89	(378)
CO2 associated with electricity for light	ting	(332))) x	0.52	141.05	(379)
Energy saving/generation technologies Item 1	s (333) to (334) as applica	able	0.52 x 0.01 =	-171.78	(380)
Total CO2, kg/year	sum of (376)(382) =			587	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			10.83	(384)
					<b>⊣</b>

El rating (section 14)

(385)

92.07

Assessor Name: Joseph Treanor Stroma Number: STRO032062 Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.4.14  Property Address: P9  Address: , Gondar Gardens, London, NW6 1HG  1. Overall dwelling dimensions:  Area(m²) Av. Height(m) Volume(m³) Ground floor 94.22 (1a) x 2.55 (2a) = 240.26 (3a)  Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 94.22 (4)  Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 240.26 (5)  2. Ventilation rate:    Main heating
Software Name:         Stroma FSAP 2012         Software Version:         Version: 1.0.4.14           Property Address: P9           Address: , Gondar Gardens, London, NW6 1HG           1. Overall dwelling dimensions:           Area(m²)         Av. Height(m)         Volume(m³)           Ground floor         94.22         (1a) x         2.55         (2a) =         240.26         (3a)           Dwelling volume         (3a)+(3b)+(3c)+(3d)+(3e)+(3n) =         240.26         (5)           2. Ventilation rate:           Main main heating heating         heating         heating         m³ per hour heating           Number of chimneys         0         +         0         +         0         x 40 =         0         (6a)           Number of open flues         0         +         0         +         0         0         x 20 =         0         (6b)           Number of intermittent fans         0         x 10 =         0         (7a)
Address: , Gondar Gardens, London, NW6 1HG           Area(m²) Av. Height(m) Volume(m³)           Ground floor         94.22 (1a) x 2.55 (2a) = 240.26 (3a)           Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 94.22 (4)         (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 240.26 (5)           Dwelling volume         secondary heating heating         total m³ per hour heating           Number of chimneys         0 + 0 + 0 = 0 x 20 = 0 (6a)           Number of open flues         0 + 0 + 0 = 0 x 20 = 0 (6b)           Number of intermittent fans         0 x 10 = 0 (7a)
Area(m²)
Ground floor $Area(m^2)$ $Av. Height(m)$ $Volume(m^3)$ $Av. Height(m)$ $Av. H$
Ground floor $94.22$ (1a) x $2.55$ (2a) = $240.26$ (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $94.22$ (4)  Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 240.26$ (5)  2. Ventilation rate:     Main heating heating Secondary heating other total m³ per hour heating   Number of chimneys 0 + 0 + 0 = 0 $\times 40 =$ 0 (6a)   Number of open flues 0 + 0 + 0 = 0 $\times 20 =$ 0 (6b)   Number of intermittent fans 0 $\times 10 =$ 0 (7a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 240.26 $ (5)  2. Ventilation rate:  Number of chimneys $0 + 0 + 0 = 0 \times 40 = 0 $ Number of open flues $0 + 0 + 0 = 0 \times 20 = 0 $ Number of intermittent fans
Dwelling volume
2. Ventilation rate:    main heating secondary heating other heating total m³ per hour   Number of chimneys 0 + 0 + 0 = 0 $\times$ 40 = 0 (6a)   Number of open flues 0 + 0 + 0 = 0 $\times$ 20 = 0 (6b)   Number of intermittent fans 0 $\times$ 10 = 0 (7a)
Number of chimneys  O + O + O + O + O + O + O + O + O + O
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 fans       0       x 10 =       0       (7a)
Number of open flues  0 + 0 + 0 = 0
Number of intermittent fans  0
Number of passive vents $0   x   10 = 0   (7b)$
Number of flueless gas fires $0 \times 40 = 0$ (7c)
Air changes per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)
Number of storeys in the dwelling (ns)  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
If no draught lobby, enter 0.05, else enter 0  O  (13)  Percentage of windows and doors draught stripped  O  (14)
Percentage of windows and doors draught stripped $0.25 - [0.2 \times (14) \div 100] = 0 \tag{14}$ Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0 \tag{15}$
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 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.15 $(18)$
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used
Number of sides sheltered  2 (19)
Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.85$ (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.13$ (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 $(22a)m = (22)m \div 4$
(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 rate	e (allowi	ing for sh	nelter ar	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 effect		-	rate for t	he appli	cable ca	ise						0.5	(23a
If exhaust air he			endix N, (2	(23a) = (23a	a) × Fmv (	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23k
If balanced with									, , ,			68.85	(230
a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (2:	2b)m + (	23b) × [	1 – (23c)		(
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(24a
b) If balance	d mecha	anical ve	entilation	without	heat red	covery (ľ	MV) (24l	p(m) = (22)	2b)m + (	23b)	·!	•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24)
c) If whole h				•	•				.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	]	(240
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25)
3. Heat losse	s and he	at loss	paramet	er:									
ELEMENT	Gros area	ss	Openin m	gs	Net Aı A ,ı		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Windows Type	<del>:</del> 1				4.86	<sub>x</sub> 1	/[1/( 1.2 )+	0.04] =	5.56				(27)
Windows Type	2				2.29	x1	/[1/( 1.2 )+	0.04] =	2.62				(27)
Windows Type	3				4.69	x1	/[1/( 1.2 )+	0.04] =	5.37				(27)
Windows Type	<b>4</b>				2.26	<sub>x</sub> 1	/[1/( 1.2 )+	0.04] =	2.59				(27)
Windows Type	5				4.5	<sub>X</sub> 1	/[1/( 1.2 )+	- 0.04] =	5.15				(27)
Windows Type	6				4.5	x1	/[1/( 1.2 )+	0.04] =	5.15				(27)
Windows Type	e 7				2.26	<sub>x</sub> 1	/[1/( 1.2 )+	0.04] =	2.59				(27)
Walls Type1	72.9	2	27.6	2	45.3	X	0.18	=	8.15				(29)
Walls Type2	4.01	1	0		4.01	X	0.23	=	0.91				(29)
Total area of e	lements	, m²			76.93	3							(31)
Party wall					42.4	5 X	0	=	0				(32)
* for windows and ** include the area						lated using	g formula :	1/[(1/U-valu	ie)+0.04] a	as given in	n paragrapi	n 3.2	
Fabric heat los	ss, W/K =	= S (A x	U)				(26)(30	) + (32) =				40.69	(33)
Heat capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	4868.85	(34)
Thermal mass	•	•		•					tive Value			100	(35)
For design assess	ad of a det	tailed calc	ulation.				recisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridge	•	,			•	K						10.08	(36)
if details of therma	n bridging	are not kn	10wn (36) =	= ().15 x (3	37)								

Ventila	ition hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	25.24	24.99	24.73	23.47	23.22	21.95	21.95	21.7	22.46	23.22	23.72	24.23		(38)
Heat tr	ansfer c	coefficier	nt, W/K	-	-	-	-	-	(39)m	= (37) + (3	38)m	-		
(39)m=	76.01	75.76	75.51	74.24	73.99	72.73	72.73	72.47	73.23	73.99	74.49	75		
Heat lo	ss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	74.18	(39)
(40)m=	0.81	0.8	0.8	0.79	0.79	0.77	0.77	0.77	0.78	0.79	0.79	0.8		
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	0.79	(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)
		ing enei	rgy requi	irement:							2	kWh/ye	ear:	(42
if TF.	A > 13.9 A £ 13.9	9, N = 1 9, N = 1	+ 1.76 x	[1 - exp	`	,	•	, , <b>-</b>	,	ΓFA -13.				(
Reduce	the annua	al average	hot water	ge in litre usage by day (all w	5% if the $a$	lwelling is	designed			se target o		7.83		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)		-	-	-		
(44)m=	107.61	103.7	99.79	95.87	91.96	88.05	88.05	91.96	95.87	99.79	103.7	107.61		
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1173.97	(44)
(45)m=	159.59	139.58	144.03	125.57	120.49	103.97	96.34	110.56	111.88	130.38	142.32	154.55		
lf instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	•	1539.26	(45
(46)m=	23.94	20.94	21.6	18.84	18.07	15.6	14.45	16.58	16.78	19.56	21.35	23.18		(46)
	storage							***						
If comr Otherw	munity h	eating a	nd no ta	ng any so nk in dw er (this in	velling, e	nter 110	litres in	(47)				0		(47)
	storage anufact		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48
Tempe	erature fa	actor fro	m Table	2b								0		(49
			_	, kWh/ye		or is not		(48) x (49)	=		1	10		(50
		_	factor fr	om Tabl on 4.3	e 2 (kW	h/litre/da	ıy)				0.	02		(51
	-	from Ta									1.	03		(52
Tempe	erature 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
	` ,	(54) in (5	•								1.	03		(55
Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)ı	m 				
	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01						(56

	anis dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (l	∃11)] ÷ (50	<i>3)</i> , clac (0)	(56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.0	)1 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circ	cuit loss (ar	nual) fro	m Table	 : 3					•		0		(58)
Primary circ	,	,			59)m = (	58) ÷ 36	5 × (41)	m				'	
(modified	by factor f	rom Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 23.2	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 r	equired for	water he	eating ca	alculated	for each	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 214.	87 189.5	199.31	179.06	175.76	157.46	151.62	165.83	165.37	185.66	195.82	209.83		(62)
Solar DHW inp	out calculated	using App	endix G or	Appendix	H (negativ	e quantity	) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add addition	nal lines if	FGHRS	and/or \	VWHRS	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= 214.	87 189.5	199.31	179.06	175.76	157.46	151.62	165.83	165.37	185.66	195.82	209.83		_
							Outp	out from wa	ater heate	r (annual)₁	12	2190.1	(64)
Heat gains	from water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	]	
(65)m= 97.2	28 86.35	92.11	84.55	84.28	77.37	76.26	80.98	79.99	87.57	90.12	95.61		(65)
include (5	57)m in cal	culation of	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Interna	l gains (see	e Table 5	and 5a	):									
Metabolic g	ains (Table	e 5), Wat	ts										
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 133.	96 133.96	133.96	133.96	133.96	133.96	133.96	133.96	133.96	133.96	133.96	133.96		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	_, equati	on L9 or	L9a), a	lso see	Table 5					
(67)m= 21.9	99 19.53	15.88	12.02	8.99	7.59	8.2	10.66	14.3	18.16	21.2	22.6		(67)
Appliances	gains (calc	ulated in	Append	lix L, eq	iotion L								
(68)m= 246.	63 249.19	040.74		′ '	Jalion L	13 or L13	3a), also	see Tal	ble 5				
		242.74	229.01	211.68	195.39	13 or L1: 184.51	3a), also	see Tal	ble 5 202.13	219.46	235.75		(68)
Cooking ga	ins (calcula			211.68	195.39	184.51	181.95	188.4	202.13	219.46	235.75		(68)
Cooking ga (69)m= 36.	<del>`</del>			211.68	195.39	184.51	181.95	188.4	202.13	219.46	235.75		(68) (69)
ت ا	4 36.4	ated in Ap	opendix 36.4	211.68 L, equat	195.39 ion L15	184.51 or L15a)	181.95 , also se	188.4 ee Table	202.13				
(69)m= 36.	4 36.4 fans gains	ated in Ap	opendix 36.4	211.68 L, equat	195.39 ion L15	184.51 or L15a)	181.95 , also se	188.4 ee Table	202.13				
(69)m= 36. Pumps and	4 36.4 fans gains	36.4 (Table 5	36.4 5a)	211.68 L, equat 36.4	195.39 ion L15 36.4	184.51 or L15a) 36.4	181.95 , also se 36.4	188.4 ee Table 36.4	202.13 5 36.4	36.4	36.4		(69)
$(69)$ m= $\boxed{36}$ .  Pumps and $(70)$ m= $\boxed{0}$	fans gains  0 evaporation	ated in Al 36.4 (Table 5 0 on (negation)	opendix 36.4 5a) 0	211.68 L, equat 36.4 0 es) (Tab	195.39 ion L15 36.4	184.51 or L15a) 36.4	181.95 , also se 36.4	188.4 ee Table 36.4	202.13 5 36.4	36.4	36.4		(69)
(69)m= 36.  Pumps and (70)m= 0  Losses e.g. (71)m= -107.	4 36.4 fans gains 0 evaporation 17 -107.17	36.4 (Table 5 0 on (negated)	opendix 36.4 5a) 0	211.68 L, equat 36.4 0 es) (Tab	195.39 ion L15 36.4 0 le 5)	184.51 or L15a) 36.4	181.95 , also se 36.4	188.4 ee Table 36.4	202.13 5 36.4	36.4	36.4		(69) (70)
(69)m= 36.  Pumps and (70)m= 0  Losses e.g.	4 36.4  fans gains  0  evaporation  17 -107.17  ng gains (7)	36.4 (Table 5 0 on (negated)	opendix 36.4 5a) 0	211.68 L, equat 36.4 0 es) (Tab	195.39 ion L15 36.4 0 le 5)	184.51 or L15a) 36.4	181.95 , also se 36.4	188.4 ee Table 36.4	202.13 5 36.4	36.4	36.4		(69) (70)
(69)m= 36.  Pumps and (70)m= 0  Losses e.g. (71)m= -107.  Water heati (72)m= 130.	4 36.4 fans gains 0 evaporatio 17 -107.17 ng gains (776 128.5	on (negation -107.17) Table 5)	opendix 36.4 5a) 0 tive valu	211.68 L, equat 36.4 0 es) (Tab	195.39 ion L15 36.4  0 le 5) -107.17	184.51 or L15a) 36.4 0 -107.17	181.95 , also se 36.4 0 -107.17	188.4 ee Table 36.4 0	202.13 5 36.4 0 -107.17	36.4 0 -107.17	36.4 0 -107.17		(69) (70) (71)
(69)m= 36.  Pumps and (70)m= 0  Losses e.g. (71)m= -107.  Water heati	4 36.4  fans gains 0 evaporation 17 -107.17 ng gains (176 128.5  hal gains =	on (negation -107.17) Table 5)	opendix 36.4 5a) 0 tive valu	211.68 L, equat 36.4 0 es) (Tab	195.39 ion L15 36.4  0 le 5) -107.17	184.51 or L15a) 36.4 0 -107.17	181.95 , also se 36.4 0 -107.17	188.4 ee Table 36.4  0  -107.17	202.13 5 36.4 0 -107.17	36.4 0 -107.17	36.4 0 -107.17		(69) (70) (71)
(69)m= 36.  Pumps and (70)m= 0  Losses e.g. (71)m= -107.  Water heati (72)m= 130.  Total interior	4 36.4  fans gains 0  evaporation 17 -107.17  ng gains (76 128.5  hal gains =	ated in A  36.4 (Table 5) on (negation of the context of the conte	opendix 36.4 5a) 0 tive valu -107.17	211.68 L, equat 36.4 0 es) (Tab -107.17	195.39 ion L15 36.4  0 lle 5) -107.17  107.45 (66)	184.51 or L15a) 36.4 0 -107.17 102.49 m + (67)m	181.95  , also se 36.4  0  -107.17  108.85  + (68)m +	188.4 ee Table 36.4  0  -107.17  111.1 - (69)m + (	202.13 5 36.4 0 -107.17 117.71 (70)m + (7	36.4 0 -107.17 125.16 1)m + (72)	36.4 0 -107.17 128.51 m		(69) (70) (71) (72)
(69)m= 36.  Pumps and (70)m= 0  Losses e.g. (71)m= -107.  Water heati (72)m= 130.  Total interior (73)m= 462.  6. Solar ga	4 36.4  fans gains 0  evaporation 17 -107.17  ng gains (76 128.5  hal gains =	ated in A  36.4 (Table 5) 0 on (negation 107.17 able 5) 123.81 445.62	opendix 36.4 5a) 0 tive valu -107.17 117.43	211.68 L, equat 36.4 0 es) (Tab -107.17 113.28	195.39 ion L15 36.4  0 le 5) -107.17  107.45 (66) 373.62	184.51 or L15a) 36.4 0 -107.17 102.49 m + (67)m 358.39	181.95  , also se 36.4  0  -107.17  108.85  + (68)m + 364.64	188.4 ee Table 36.4  0  -107.17  111.1 - (69)m + ( 376.99	202.13 5 36.4 0 -107.17 117.71 (70)m + (7 401.19	36.4 0 -107.17 125.16 1)m + (72) 429.01	36.4 0 -107.17 128.51 m 450.04		(69) (70) (71) (72)
(69)m= 36.  Pumps and (70)m= 0  Losses e.g. (71)m= -107.  Water heati (72)m= 130.  Total interior (73)m= 462.  6. Solar ga	4 36.4  fans gains 0  evaporation 17 -107.17  ng gains (7) 76 128.5  hal gains = 56 460.41  gins: aire calculated	on (negation 123.81)  1445.62  ated in A  36.4  (Table 5)  123.81	opendix 36.4 5a) 0 tive valu -107.17 117.43	211.68 L, equat 36.4 0 es) (Tab -107.17 113.28	195.39 ion L15 36.4  0 le 5) -107.17  107.45 (66) 373.62  and associ	184.51 or L15a) 36.4 0 -107.17 102.49 m + (67)m 358.39 ated equa	181.95  , also se 36.4  0  -107.17  108.85  + (68)m + 364.64  tions to co	188.4 ee Table 36.4  0  -107.17  111.1 - (69)m + ( 376.99	202.13 5 36.4 0 -107.17 117.71 (70)m + (7 401.19 e applicable	36.4 0 -107.17 125.16 1)m + (72) 429.01	36.4 0 -107.17 128.51 m 450.04	Gains (W)	(69) (70) (71) (72)

	_		_										_
North	0.9x	0.77	X	4.69	X	10.63	X	0.5	X	0.7	=	12.1	(74)
North	0.9x	0.77	X	2.26	X	10.63	X	0.5	X	0.7	=	11.66	(74)
North	0.9x	0.77	X	4.5	X	10.63	X	0.5	X	0.7	=	11.61	(74)
North	0.9x	0.77	X	4.69	X	20.32	X	0.5	X	0.7	=	23.12	(74)
North	0.9x	0.77	X	2.26	X	20.32	X	0.5	X	0.7	=	22.28	(74)
North	0.9x	0.77	X	4.5	X	20.32	X	0.5	X	0.7	=	22.18	(74)
North	0.9x	0.77	X	4.69	x	34.53	X	0.5	X	0.7	=	39.28	(74)
North	0.9x	0.77	X	2.26	x	34.53	x	0.5	x	0.7	=	37.86	(74)
North	0.9x	0.77	X	4.5	x	34.53	X	0.5	x	0.7	=	37.69	(74)
North	0.9x	0.77	X	4.69	x	55.46	x	0.5	x	0.7	] =	63.09	(74)
North	0.9x	0.77	x	2.26	x	55.46	X	0.5	x	0.7	=	60.81	(74)
North	0.9x	0.77	X	4.5	x	55.46	x	0.5	x	0.7	=	60.54	(74)
North	0.9x	0.77	X	4.69	x	74.72	X	0.5	x	0.7	=	84.99	(74)
North	0.9x	0.77	x	2.26	x	74.72	X	0.5	x	0.7	=	81.91	(74)
North	0.9x	0.77	X	4.5	x	74.72	X	0.5	x	0.7	=	81.55	(74)
North	0.9x	0.77	X	4.69	x	79.99	X	0.5	x	0.7	=	90.99	(74)
North	0.9x	0.77	X	2.26	x	79.99	X	0.5	x	0.7	=	87.69	(74)
North	0.9x	0.77	X	4.5	x	79.99	X	0.5	x	0.7	=	87.3	(74)
North	0.9x	0.77	X	4.69	x	74.68	X	0.5	x	0.7	=	84.95	(74)
North	0.9x	0.77	X	2.26	x	74.68	X	0.5	X	0.7	=	81.87	(74)
North	0.9x	0.77	X	4.5	x	74.68	X	0.5	x	0.7	=	81.51	(74)
North	0.9x	0.77	X	4.69	x	59.25	X	0.5	x	0.7	=	67.4	(74)
North	0.9x	0.77	X	2.26	x	59.25	X	0.5	X	0.7	=	64.95	(74)
North	0.9x	0.77	X	4.5	x	59.25	X	0.5	x	0.7	=	64.67	(74)
North	0.9x	0.77	X	4.69	x	41.52	X	0.5	x	0.7	=	47.23	(74)
North	0.9x	0.77	X	2.26	x	41.52	X	0.5	X	0.7	=	45.52	(74)
North	0.9x	0.77	X	4.5	x	41.52	x	0.5	x	0.7	=	45.31	(74)
North	0.9x	0.77	X	4.69	x	24.19	x	0.5	x	0.7	=	27.52	(74)
North	0.9x	0.77	X	2.26	x	24.19	x	0.5	x	0.7	=	26.52	(74)
North	0.9x	0.77	X	4.5	x	24.19	x	0.5	x	0.7	=	26.4	(74)
North	0.9x	0.77	X	4.69	x	13.12	X	0.5	x	0.7	=	14.92	(74)
North	0.9x	0.77	X	2.26	x	13.12	X	0.5	X	0.7	=	14.38	(74)
North	0.9x	0.77	X	4.5	x	13.12	X	0.5	x	0.7	=	14.32	(74)
North	0.9x	0.77	x	4.69	x	8.86	x	0.5	x	0.7	] =	10.08	(74)
North	0.9x	0.77	X	2.26	x	8.86	x	0.5	x	0.7	] =	9.72	(74)
North	0.9x	0.77	X	4.5	x	8.86	x	0.5	x	0.7	] =	9.68	(74)
East	0.9x	1	x	4.5	x	19.64	x	0.5	x	0.7	j =	21.44	(76)
East	0.9x	1	x	2.26	x	19.64	x	0.5	x	0.7	] =	10.77	(76)
East	0.9x	1	x	4.5	x	38.42	x	0.5	x	0.7	] =	41.94	(76)
East	0.9x	1	x	2.26	x	38.42	x	0.5	x	0.7	j =	21.06	(76)
East	0.9x	1	x	4.5	x	63.27	x	0.5	x	0.7	] =	69.06	(76)
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East	0.9x	1	X	2.26	X	63.27	X	0.5	X	0.7	=	34.68	(76)
East	0.9x	1	X	4.5	X	92.28	X	0.5	X	0.7	=	100.72	(76)
East	0.9x	1	X	2.26	X	92.28	X	0.5	X	0.7	=	50.58	(76)
East	0.9x	1	X	4.5	X	113.09	X	0.5	X	0.7	=	123.44	(76)
East	0.9x	1	X	2.26	X	113.09	X	0.5	X	0.7	=	61.99	(76)
East	0.9x	1	X	4.5	X	115.77	X	0.5	x	0.7	=	126.36	(76)
East	0.9x	1	X	2.26	X	115.77	X	0.5	X	0.7	=	63.46	(76)
East	0.9x	1	X	4.5	X	110.22	X	0.5	X	0.7	=	120.3	(76)
East	0.9x	1	X	2.26	X	110.22	X	0.5	X	0.7	=	60.42	(76)
East	0.9x	1	X	4.5	X	94.68	X	0.5	X	0.7	=	103.34	(76)
East	0.9x	1	X	2.26	X	94.68	x	0.5	X	0.7	=	51.9	(76)
East	0.9x	1	X	4.5	X	73.59	X	0.5	X	0.7	=	80.32	(76)
East	0.9x	1	X	2.26	x	73.59	x	0.5	X	0.7	=	40.34	(76)
East	0.9x	1	X	4.5	X	45.59	x	0.5	X	0.7	=	49.76	(76)
East	0.9x	1	X	2.26	X	45.59	X	0.5	X	0.7	=	24.99	(76)
East	0.9x	1	X	4.5	x	24.49	x	0.5	X	0.7	=	26.73	(76)
East	0.9x	1	X	2.26	X	24.49	X	0.5	X	0.7	=	13.42	(76)
East	0.9x	1	X	4.5	X	16.15	X	0.5	X	0.7	=	17.63	(76)
East	0.9x	1	X	2.26	X	16.15	X	0.5	X	0.7	=	8.85	(76)
West	0.9x	0.77	X	4.86	X	19.64	X	0.5	X	0.7	=	23.15	(80)
West	0.9x	0.77	X	2.29	X	19.64	X	0.5	X	0.7	=	10.91	(80)
West	0.9x	0.77	X	4.86	X	38.42	x	0.5	x	0.7	=	45.29	(80)
West	0.9x	0.77	X	2.29	X	38.42	X	0.5	x	0.7	=	21.34	(80)
West	0.9x	0.77	X	4.86	X	63.27	X	0.5	X	0.7	=	74.59	(80)
West	0.9x	0.77	X	2.29	X	63.27	x	0.5	X	0.7	=	35.14	(80)
West	0.9x	0.77	X	4.86	X	92.28	X	0.5	X	0.7	=	108.78	(80)
West	0.9x	0.77	X	2.29	X	92.28	X	0.5	X	0.7	=	51.26	(80)
West	0.9x	0.77	X	4.86	X	113.09	X	0.5	X	0.7	=	133.31	(80)
West	0.9x	0.77	X	2.29	X	113.09	X	0.5	X	0.7	=	62.82	(80)
West	0.9x	0.77	X	4.86	X	115.77	x	0.5	X	0.7	=	136.47	(80)
West	0.9x	0.77	X	2.29	x	115.77	x	0.5	X	0.7	=	64.3	(80)
West	0.9x	0.77	X	4.86	X	110.22	X	0.5	X	0.7	=	129.92	(80)
West	0.9x	0.77	X	2.29	X	110.22	X	0.5	X	0.7	=	61.22	(80)
West	0.9x	0.77	X	4.86	x	94.68	x	0.5	x	0.7	=	111.6	(80)
West	0.9x	0.77	X	2.29	x	94.68	x	0.5	X	0.7	=	52.59	(80)
West	0.9x	0.77	X	4.86	x	73.59	x	0.5	x	0.7	=	86.75	(80)
West	0.9x	0.77	x	2.29	x	73.59	x	0.5	x	0.7	=	40.87	(80)
West	0.9x	0.77	x	4.86	x	45.59	x	0.5	x	0.7	=	53.74	(80)
West	0.9x	0.77	x	2.29	x	45.59	x	0.5	x	0.7	=	25.32	(80)
West	0.9x	0.77	x	4.86	x	24.49	x	0.5	x	0.7	=	28.87	(80)
West	0.9x	0.77	x	2.29	x	24.49	x	0.5	x	0.7	=	13.6	(80)

West	0.9x	0.77	x	4.8	6	x	1	6.15	x		0.5	x	0.7		19.04	(80)
West	0.9x	0.77	X	2.2	9	X	1	6.15	x		0.5	x	0.7		8.97	(80)
	_											_ '				
Solar g	ains in v	watts, ca	lculated	for eacl	n month				(83)m	= Su	ım(74)m .	(82)m				
(83)m=	101.62	197.2	328.3	495.78	630.02	65	56.57	620.19	516.4	44	386.34	234.25	126.24	83.97	$\neg$	(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	(73)m	+ (8	33)m ,	watts					_l	1	_	
(84)m=	564.19	657.61	773.92	917.43	1027.16	10	30.19	978.58	881.0	08	763.33	635.44	555.25	534.01		(84)
7. Mea	an interi	nal temp	erature	(heating	season	)										
		during h					area f	rom Tab	ole 9,	Th1	I (°C)				21	(85)
-		tor for ga				_					` '					
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Au	ıa	Sep	Oct	Nov	Dec	:	
(86)m=	0.96	0.94	0.88	0.76	0.6	-	0.43	0.32	0.37	Ť	0.6	0.84	0.94	0.97	7	(86)
L					T4 ((			0	<del>.</del> .	- 1- 1-				Į		
r	i	tempera			,	1	<del>i</del>		1			20.40	10.00	10.00	٦	(87)
(87)m=	19.43	19.7	20.11	20.57	20.84		0.96	20.99	20.9	18	20.89	20.49	19.89	19.39	_	(67)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	, Th	12 (°C)		_		_	
(88)m=	20.25	20.25	20.25	20.26	20.27	2	0.28	20.28	20.2	8.	20.27	20.27	20.26	20.26		(88)
Utilisa	ition fac	tor for ga	ains for i	est of d	welling,	h2,	m (se	e Table	9a)							
(89)m=	0.96	0.93	0.87	0.74	0.56		0.39	0.27	0.3	1	0.55	0.81	0.93	0.96	7	(89)
Maan	intornal	tompore	atura in i	the rest	of dwall	ina	T2 (fc	allow etc	no 2	+o 7	in Tobl	0.00)		Į	_	
(90)m=	18.13	tempera 18.51	19.09	19.73	20.09	Ť	20.24	20.27	20.2	-	20.16	19.64	18.79	18.07	٦	(90)
(90)111=	10.13	10.51	19.09	19.75	20.03		.0.24	20.21	20.2	<u>'                                    </u>			ing area ÷ (		0.34	(91)
												L/ ( — L/V	ing area . (	, -	0.34	(91)
Mean		tempera	ature (fo	r the wh	ole dwe	llin	g) = fL	_A × T1	+ (1 -	- fL/	A) × T2				_	
(92)m=	18.57	18.91	19.43	20.01	20.35	2	0.48	20.51	20.5	1	20.41	19.92	19.16	18.52		(92)
Apply	adjustn	nent to th	ne mean	interna	temper	atu	re fro	m Table	4e, v	vhe	re appro	priate		•	_	
(93)m=	18.57	18.91	19.43	20.01	20.35	2	0.48	20.51	20.5	1	20.41	19.92	19.16	18.52		(93)
8. Spa	ace hea	ting requ	irement													
				•		ned	at ste	p 11 of	Table	9b	, so tha	t Ti,m=	:(76)m an	d re-ca	lculate	
the uti		factor fo				_	. 1						T		$\neg$	
[	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
г	i	tor for ga			0.57	_	<u> </u>	2.00		. 1	0.50		1 004	1	7	(04)
(94)m=	0.94	0.91	0.85	0.73	0.57		0.4	0.29	0.33	3	0.56	8.0	0.91	0.95		(94)
r		hmGm ,		<u> </u>		Ι	45.00	004.40	000	<u></u> Т	404.00	500.00	500.77	500.0	П	(05)
(95)m=	530.74	598.6	656.44	667.61	583.34	_	15.03	281.49	292.8	83	424.39	509.03	506.77	506.37		(95)
Г		age exter				_	T	40.0	10	. 1	444	40.0	7.4	1.0	¬	(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)
r		for mea				_		-, ,	<del></del>	<del>-</del>	<u>`</u>		000.00	1070.0	_	(07)
` ' L	1084.39		976.46	825.06	639.69	_	27.93	284.53	297.		461.87	689.76		1073.6	2	(97)
	i	g require				vvn. T				9/)	<u>`i</u>	- `	<u> </u>	400.05	╗	
(98)m=	411.91	310.83	238.1	113.36	41.92	<u> </u>	0	0	0		0	134.46		422.05	_	
										otal	per year	(KVVh/ye	ar) = Sum(9	が) <sub>15,912</sub>	1954.48	(98)
		g require														

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 (Ta	able 11) '0' if none		0	(301)
Fraction of space heat from community system 1 – (301) =	able 11) o il floric		1	(302)
The community scheme may obtain heat from several sources. The procedure allo includes boilers, heat pumps, geothermal and waste heat from power stations. See		four other heat sources;		(602)
Fraction of heat from Community heat pump			0.5	(303a)
Fraction of community heat from heat source 2			0.5	(303b)
Fraction of total space heat from Community heat pump		(302) x (303a) =	0.5	(304a)
Fraction of total space heat from community heat source 2		(302) x (303b) =	0.5	(304b)
Factor for control and charging method (Table 4c(3)) for communi	ty heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heating Annual space heating requirement			<b>kWh/yea</b> i 1954.48	, 
Space heat from Community heat pump	(98) x (304a)	x (305) x (306) =	1026.1	(307a)
Space heat from heat source 2	(98) x (304b)	x (305) x (306) =	1026.1	(307b)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appe	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	n (98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2190.1	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a)	x (305) x (306) =	1149.8	(310a)
Water heat from heat source 2	(64) x (303b)	x (305) x (306) =	1149.8	(310b)
Electricity used for heat distribution	0.01 × [(307a)(30	7e) + (310a)(310e)] =	43.52	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314	1) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from our	utside		307.77	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	0b) + (330g) =	307.77	(331)
Energy for lighting (calculated in Appendix L)			388.3	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-575.52	(333)
Electricity generated by wind turbine (Appendix M) (negative quar	ntity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor 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 to	wo fuels repeat (363) t	o (366) for the second fu	el 425	(367a)
(1)		o (366) for the second fu	720	(367b)
	, ( )			

CO2 associated with heat source 1	[(307b	y)+(310b)] x 100 ÷ (367b) x	0.52	=	265.72	(367)
CO2 associated with heat source 2	[(307b	y)+(310b)] x 100 ÷ (367b) x	0.22	=	516.48	(368)
Electrical energy for heat distribution		[(313) x	0.52	=	22.59	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	)	=	804.78	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			804.78	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	159.73	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	201.53	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl		0.52 x 0.01	l = [	-298.7	(380)
Total CO2, kg/year	sum of (376)(382) =				867.35	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				9.21	(384)
El rating (section 14)					91.65	(385)

			User D	etails:						
Assessor Name:	Joseph Trean	or		Stroma	a Num	ber:		STRO	032062	
Software Name:	Stroma FSAP	2012		Softwa	re Vei	rsion:		Versio	n: 1.0.4.14	
		Р	roperty .	Address:	P10					
Address :	, Gondar Garde	ns, London,	NW6 1F	HG						
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m	3)
Ground floor			7	4.01	(1a) x	2	2.55	(2a) =	188.73	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)	+(1e)+(1r	1) 7	4.01	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	188.73	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hoι	ır
Number of chimneys		+ 0	+ [	0	] = [	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	ī + Ē	0	-	0	x	20 =	0	(6b)
Number of intermittent fa	ans				J	0	x	10 =	0	(7a)
					Ļ		=	10 =		= ``
Number of passive vents					Ĺ	0			0	(7b)
Number of flueless gas f	ires					0	X	40 =	0	(7c)
								Air ch	anges per he	our
Infiltration due to chimne	evs. flues and fans	= (6a)+(6b)+(7	'a)+(7b)+(	7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has I	-				ontinue fr	-		. (=)	Ŭ	(``
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	)-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or tim	ber frame or	0.35 fo	r masonr	y constr	uction			0	(11)
if both types of wall are p		-	the great	er wall are	a (after					<del></del>
deducting areas of openi If suspended wooden			1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, er	•	,	ir (ooaic	, o.oo	011101 0				0	(13)
Percentage of window									0	(14)
Window infiltration	s and doors araag	пт этгрроц		0.25 - [0.2	x (14) ÷ 1	001 =			0	(15)
Infiltration rate				(8) + (10)			+ (15) =		0	(16)
Air permeability value,	a50 expressed in	cubic metre	s per ho	. , . ,	, , ,	, , ,		area	3	(17)
If based on air permeabi			-	•	-	0110 01 0	жи	diod	0.15	(18)
Air permeability value applie	-					is being u	sed		0.15	(10)
Number of sides sheltered	ed				·				2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind s	peed								
Jan Feb	Mar Apr N	/lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4	.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
		•							•	
Wind Factor $(22a)m = (2a)m =$	<del></del>	00 005	0.05	,		,			Ī	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe If mechanic		_	rate for t	he appli	cable ca	se	•			•	•	0.5	(23
If exhaust air h	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	ciency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				68.85	(23
a) If balance	d mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(24
b) If balance	d mech	anical ve	entilation	without	heat red	overy (N	ЛV) (24b	)m = (22	2b)m + (	23b)		_	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)r			ntilation on the them (24)		•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r			ole hous m = (22l	•					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= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(2
3. Heat losse	s and he	eat loss	paramet	er:									
LEMENT	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 J/K
/indows Type	1				10.85	x1	/[1/( 1.2 )+	0.04] =	12.42				(2
/indows Type	2				4.5	x1	/[1/( 1.2 )+	0.04] =	5.15				(2
/alls Type1	34.7	<b>'</b> 4	19.8	5	14.89	X	0.18		2.68				(2
/alls Type2	45.6	3	0		45.63	x	0.23	= [	10.37				(2
otal area of e	lements	, m²			80.37	,							(3
arty wall					31.28	x	0	=	0	$\neg$			(3
for windows and include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	n 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				35.78	(3
eat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	5038.8	(3
hermal mass	parame	ter (TMF	= Cm +	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design asses: an be used inste				construct	ion are no	known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
hermal bridg				usina An	pendix l	<						9.48	(3
details of therma	•	,			•	•						0.40	(
otal fabric he				•				(33) +	(36) =			45.25	(3
entilation hea	at loss ca	alculated	d monthly	<u>/</u>				(38)m	= 0.33 × (	(25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 19.82	19.63	19.43	18.43	18.24	17.24	17.24	17.05	17.64	18.24	18.63	19.03		(3
eat transfer of	coefficier	nt, W/K						(39)m	= (37) + (	38)m			
	04.00	64.60	60.60	62.40	62.5	62.5	62.3	62.9	62.40	62.00	64.20	1	
89)m= 65.08	64.88	64.68	63.69	63.49	02.5	02.5	02.3	02.9	63.49	63.89	64.29		

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.88	0.88	0.87	0.86	0.86	0.84	0.84	0.84	0.85	0.86	0.86	0.87		
	!	!							Average =	Sum(40) <sub>1</sub>	12 /12=	0.86	(40)
Number of day	<u> </u>							-					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occurring TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		34		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o		.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								1		1			
(44)m= 98.74	95.15	91.56	87.97	84.38	80.79	80.79	84.38	87.97	91.56	95.15	98.74		
` '		l		l		l	l		I Total = Su	m(44) <sub>112</sub> =	-	1077.13	(44)
Energy content of	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 146.42	128.06	132.15	115.21	110.55	95.39	88.4	101.44	102.65	119.63	130.58	141.8		
			. ,						Total = Su	m(45) <sub>112</sub> =	= [	1412.29	(45)
If instantaneous v			,		, , , , , , , , , , , , , , , , , , ,		· · ·	to (61)					
(46)m= 21.96 Water storage	19.21	19.82	17.28	16.58	14.31	13.26	15.22	15.4	17.94	19.59	21.27		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` '					_					<u> </u>		(,
Otherwise if no	_			_			, ,	ers) ente	er '0' in (	(47)			
Water storage	loss:												
a) If manufact	turer's d	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		•					(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stor</li></ul>			-								00		(51)
If community h	•			IC 2 (KVV)	ii/iiti C/GC	<i>y)</i>				0.	02		(31)
Volume factor	-									1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m watei	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 f	or each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	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 Appendi	хН	
(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	nual) fro	m Table	 e 3		-		-			0		(58)
Primary circuit	•	,			59)m = (	(58) ÷ 36	65 × (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)

				<b>(- 1)</b>	<b></b>	(							
Combi loss ca	1			<del>`</del>	<u> </u>	<del>- ` ` `</del>	<u> </u>	<del></del>	<u> </u>	<u> </u>	<u> </u>	1	(04)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(61)
	<del>'                                      </del>						ř		<del>` ´</del>	<del>`</del>	<del>`´</del>	(59)m + (61)m	
(62)m= 201.7	177.99	187.43	168.71	165.83	148.89	143.67	156.7		174.9	184.08	197.08	J	(62)
Solar DHW input									r contribut	ion to wate	er heating)		
(add additiona						<del> </del>	<del>.                                      </del>	<del></del>			1	1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from w	_										1	1	
(64)m= 201.7	177.99	187.43	168.71	165.83	148.89	143.67	156.7		174.9	184.08	197.08		٦
							0	utput from w	ater heate	r (annual) <sub>1</sub>	12	2063.13	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61	m] + 0.8	k [(46)m	+ (57)m	+ (59)m	[]	
(65)m= 92.91	82.52	88.16	81.1	80.98	74.51	73.61	77.95	76.93	84	86.21	91.37		(65)
include (57)	m in calc	culation o	of (65)m	only if c	ylinder i	s in the	dwellir	g or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a	):									
Metabolic gair	ns (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec	]	
(66)m= 116.97	116.97	116.97	116.97	116.97	116.97	116.97	116.9	7 116.97	116.97	116.97	116.97	1	(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5	•		•	•	
(67)m= 18.41	16.35	13.3	10.07	7.52	6.35	6.86	8.92		15.21	17.75	18.92	1	(67)
Appliances ga	ains (calc	ulated in	Append	dix L. ea	uation L	13 or L1	 3a). al	so see Ta	ble 5	!	!	J	
(68)m= 206.47	<del>- ` -</del>	203.21	191.72	177.21	163.57	154.46	152.3		169.21	183.72	197.36	]	(68)
Cooking gains		ted in A	nendix	l equat	ion I 15	or I 15a'	l also	L see Tahle	5		!	J	
(69)m= 34.7	34.7	34.7	34.7	34.7	34.7	34.7	34.7		34.7	34.7	34.7	1	(69)
Pumps and fa												J	` /
(70)m= 0	0	0	0 0	0	0	0	0	0	0	0	0	1	(70)
				<u> </u>								J	(1.0)
Losses e.g. e <sup>-93.58</sup>	-93.58	-93.58	-93.58	-93.58	-93.58	-93.58	-93.5	3 -93.58	-93.58	-93.58	-93.58	1	(71)
			-93.36	-93.36	-93.36	-93.56	-93.5	-93.36	-93.36	-93.56	-93.36	J	(11)
Water heating			110.01	400.04	400.40	T 00 04	14047	7 1 400 04	1400	140.74	100.04	1	(70)
(72)m= 124.88	ļ	118.5	112.64	108.84	103.49	98.94	104.7		112.9	119.74	122.81	J	(72)
Total interna	<del>,                                    </del>	-				· · · ·		n + (69)m +	•	· · · ·		1	(70)
(73)m= 407.84		393.1	372.52	351.67	331.51	318.36	324.1	1 334.63	355.41	379.3	397.18		(73)
6. Solar gain			. () (	T-1-1- 0-							·		
Solar gains are		ŭ				•	itions to		ie applicai		iion.	Caina	
Orientation:	Access F Table 6d	actor	Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
							1						1(70)
	1	X	10.		<b>—</b>	19.64	]	0.5	_  ×	0.7	=	51.69	(76)
East 0.9x	2	X	4.			19.64	]	0.5		0.7	=	42.87	[(76)
East 0.9x	1	X	10.			38.42	]	0.5	×	0.7	=	101.11	<b>(76)</b>
East 0.9x	2	X	4.	5	X 3	38.42	_ x	0.5	x	0.7	=	83.87	(76)
East 0.9x	1	X	10.	85	x (	63.27	X	0.5	X	0.7	=	166.51	(76)

East	0.9x	2	X	4.	5	x	6	3.27	X	0.5	X	0.7	=	138.12	(76)
East	0.9x	1	х	10.	85	x	9	2.28	x	0.5	х	0.7	=	242.85	(76)
East	0.9x	2	Х	4.	5	x	9	2.28	x	0.5	X	0.7	=	201.44	(76)
East	0.9x	1	х	10.	85	x	1	13.09	x	0.5	х	0.7	=	297.62	(76)
East	0.9x	2	X	4.	5	x	1	13.09	x	0.5	х	0.7	=	246.88	(76)
East	0.9x	1	X	10.	85	x	1	15.77	х	0.5	х	0.7	=	304.67	(76)
East	0.9x	2	х	4.	5	x	1	15.77	x	0.5	х	0.7	=	252.72	(76)
East	0.9x	1	X	10.	85	x	1	10.22	х	0.5	х	0.7	=	290.06	(76)
East	0.9x	2	X	4.	5	x	1	10.22	x	0.5	x	0.7	=	240.6	(76)
East	0.9x	1	X	10.	85	x	9	94.68	x	0.5	X	0.7	=	249.16	(76)
East	0.9x	2	х	4.	5	x	9	94.68	x	0.5	x	0.7	=	206.67	(76)
East	0.9x	1	X	10.	85	x	7	73.59	x	0.5	X	0.7	=	193.66	(76)
East	0.9x	2	х	4.	5	x	7	'3.59	x	0.5	x	0.7	=	160.64	(76)
East	0.9x	1	х	10.	85	x	4	15.59	x	0.5	х	0.7	=	119.98	(76)
East	0.9x	2	х	4.	5	x	4	15.59	x	0.5	x	0.7	=	99.52	(76)
East	0.9x	1	X	10.	85	x	2	24.49	х	0.5	x	0.7	=	64.45	(76)
East	0.9x	2	X	4.	5	x	2	24.49	x	0.5	х	0.7	=	53.46	(76)
East	0.9x	1	х	10.	85	x	1	6.15	x	0.5	х	0.7	=	42.5	(76)
East	0.9x	2	X	4.	5	x	1	6.15	х	0.5	х	0.7	=	35.26	(76)
Solar g	ains in	watts, ca	alculated	for eac	h mont	h			(83)m	n = Sum(74)m	(82)m	1		•	
(83)m=	94.56	184.98	304.64	444.29	544.5		57.39	530.66	455	.83 354.3	219.4	9 117.91	77.76		(83)
Total g	ains – i	nternal a	nd solai	(84)m =	= (73)m	1 + (	83)m	, watts					•	•	
(84)m=	502.4	590.83	697.73	816.81	896.17	7   8	388.9	849.02	779	.93 688.93	574.9	9 497.21	474.94		(84)
7. Me	an inter	nal temp	erature	(heating	seaso	n)									
Temp	erature	during h	eating p	eriods ir	the liv	/ing	area	from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	iving are	ea, h1,ı	m (s	ee Ta	ble 9a)			_		-		
	Jan	Feb	Mar	Apr	May	/	Jun	Jul	Α	ug Sep	Oc	t Nov	Dec		
(86)m=	0.95	0.92	0.86	0.74	0.59		0.43	0.32	0.3	0.57	0.81	0.92	0.96		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (	follo	w ste	ps 3 to 7	7 in T	able 9c)					
(87)m=	19.37	19.66	20.09	20.55	20.82	2	20.95	20.99	20.	98 20.88	20.48	3 19.85	19.33		(87)
Temp	erature	during h	eating p	eriods ir	n rest o	of dw	elling	from Ta	able 9	9, Th2 (°C)		-			
(88)m=	20.19	20.19	20.19	20.2	20.2		20.21	20.21	20.		20.2	20.2	20.19	]	(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling	h2	m (se	e Table	9a)	· · ·		!	!	4	
(89)m=	0.94	0.91	0.84	0.71	0.55	$\neg$	0.38	0.26	0.:	3 0.52	0.78	0.91	0.95	]	(89)
	intorno	l tompor	oturo in	the rest	of dura	الل	T2 /f	ollow oto	<u> </u>	to 7 in Tob	اه ۵۵٪	<u> </u>		1	
(90)m=	18	18.41	19.02	19.65	20.01	Ť	20.17	20.21	20	to 7 in Tab	19.5	7 18.69	17.93	1	(90)
(50)111=	10	10.71	10.02	10.00	20.01		-0.17	20.21	L 20			ving area ÷ (		0.4	(91)
-												J (	,	U.4	(01)
		$\overline{}$				_				– fLA) × T2	1		1.5 :-	1	(00)
(92)m=	18.54	18.91	19.44	20.01	20.33		20.48	20.52	20.		19.93		18.49		(92)
Apply	aajustr	nent to th	ne mear	ınterna	tempe	eratu	ire fro	m rable	4e,	where appr	opriate	9			

				_		_							
(93)m= 18.54	18.91	19.44	20.01	20.33	20.48	20.52	20.51	20.41	19.93	19.15	18.49		(93)
8. Space hea	iting req	uirement											
Set Ti to the			•		ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
the utilisation	Feb	Mar			Jun	Jul	Διια	Con	Oct	Nov	Dec	]	
	I	L	Apr	May	Juli	Jui	Aug	Sep	Oct	INOV	Dec		
(94)m= 0.93	0.89	0.82	0.7	0.55	0.4	0.28	0.32	0.53	0.77	0.89	0.93	]	(94)
Useful gains,		Į	l	ļ		0.20	1 0.02	0.00	•	0.00	1 0.00		,
(95)m= 465.06	525.61	572.99	573.4	496.36	354.37	241.4	251.19	364.42	443.14	444.01	443.83		(95)
Monthly average	age exte	rnal tem	ı Derature	e from Ta	ı able 8					<u> </u>			
(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	e for me	an intern	ial temp	erature,	Lm , W =	-[(39)m	x [(93)m	– (96)m	]	<u> </u>			
(97)m= 927.05	908.77	837.12	707.29	548.11	367.54	244.69	256.11	396.76	592.42	769.89	918.39		(97)
Space 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		l	
(98)m= 343.72	257.48	196.51	96.4	38.5	0	0	0	0	111.06	234.63	353.07		
	•	•		•	•		Tota	l per year	(kWh/yeaı	r) = Sum(9	08)15,912 =	1631.38	(98)
Space heatin	g requir	ement in	kWh/m²	²/year								22.04	(99)
9b. Energy red	guireme	nts – Coi	mmunity	heating	scheme								
This part is use			· ·	Ĭ			tina prov	ided by	a comm	unitv sch	neme.		
Fraction of spa			• .		•		• .	•		, ,		0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so	cheme ma	y obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and t	up to four	other heat	sources; t	he latter	
includes boilers, h		-			rom powe	r stations.	See Appei	ndix C.			,		_
Fraction of hea	at from (	Commun	ity heat	pump								0.5	(303a)
Fraction of cor	mmunity	heat fro	m heat s	source 2								0.5	(303b)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	sa) =	0.5	(304a)
Fraction of total	al space	heat fro	m comm	nunity he	at sourc	e 2			(3	02) x (303	8b) =	0.5	(304b)
Factor for cont	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for o	commun	ity heati	ng syste	em					1.05	(306)
Space heating	g										'	kWh/yea	r
Annual space	heating	requiren	nent									1631.38	
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	856.48	(307a)
Space heat fro	m heat	source 2	2					(98) x (30	04b) x (30	5) x (306)	=	856.48	(307b)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su <sub>l</sub>	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water beating	_												
Water heating Annual water h		requirem	ent									2063.13	
If DHW from c Water heat fro		•		0				(64) x (30	03a) x (30	5) x (306)	=	1083.14	(310a)
Water heat fro	m heat	source 2						(64) x (30	03b) x (30	5) x (306)	=	1083.14	(310b)
Electricity used	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)	(310e)] =	38.79	(313)
-													_

Cooling System Energy Efficiency Rati	0				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 demechanical ventilation - balanced, extra	<b>.</b> ,	outside		24	1.76	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/yea	ar	=(330a) + (330	0b) + (330g) =	24	1.76	(331)
Energy for lighting (calculated in Appel	ndix L)			32	5.07	(332)
Electricity generated by PVs (Appendix	(M) (negative quantity)			-45	2.02	(333)
Electricity generated by wind turbine (A	Appendix M) (negative qu	antity)			0	(334)
12b. CO2 Emissions – Community hea	ating scheme					
		Energy kWh/year	Emission factor kg CO2/kWh	r Emissi kg CO2		
CO2 from other sources of space and Efficiency of heat source 1 (%)	<b>0</b>	g two fuels repeat (363) to	(366) for the second fu	ıel	425	(367a)
Efficiency of heat source 2 (%)	If there is CHP using	g two fuels repeat (363) to	(366) for the second fu	ıel	91	(367b)
CO2 associated with heat source 1	[(307b)+	(310b)] x 100 ÷ (367b) x	0.52	= 2	36.86	(367)
CO2 associated with heat source 2	[(307b)+	(310b)] x 100 ÷ (367b) x	0.22	= 4	60.39	(368)
Electrical energy for heat distribution		[(313) x	0.52	= 2	20.13	(372)
Total CO2 associated with community	systems	(363)(366) + (368)(37	2)	= 7	17.39	(373)
CO2 associated with space heating (se	econdary)	(309) x	0	=	0	(374)
CO2 associated with water from imme	rsion heater or instantane	eous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375) =		7	17.39	(376)
CO2 associated with electricity for pur	nps and fans within dwelli	ng (331)) x	0.52	= 1	25.47	(378)
CO2 associated with electricity for light	ting	(332))) x	0.52	= 1	68.71	(379)
Energy saving/generation technologies Item 1	s (333) to (334) as applica	able	0.52 x 0.01 =	: -	234.6	(380)
Total CO2, kg/year	sum of (376)(382) =			7	76.98	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				10.5	(384)
						<u> </u>

El rating (section 14)

(385)

		User Details:				
Assessor Name:	Joseph Treanor		na Number:	QTD()	032062	
Software Name:	Stroma FSAP 2012		vare Version:		n: 1.0.4.14	
Continuite Hume.	3.10111a 1 6/11 2012	Property Addres		7 01010	11. 1.0. 1.1	
Address :	, Gondar Gardens, Lor	·				
1. Overall dwelling dime	nsions:					
		Area(m²)	Av. Heig	ht(m)	Volume(m³	)
Ground floor		56.61	(1a) x 2.55	(2a) =	144.36	(3a)
First floor		62.48	(1b) x 3	(2b) =	187.44	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+.	(1n) 119.09	(4)			_
Dwelling volume			(3a)+(3b)+(3c)+(3d)+	(3e)+(3n) =	331.8	(5)
2. Ventilation rate:						
		ondary other iting	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 fa	ns		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)
				Δir ch	anges per ho	nur
Infiltration due to chimne	vs flues and fans = $(6a)+$	(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
•	een carried out or is intended,				U	
Number of storeys in the	ne dwelling (ns)				0	(9)
Additional infiltration				[(9)-1]x0.1 =	0	(10)
	.25 for steel or timber fra		•		0	(11)
if both types of wall are pa deducting areas of openir	resent, use the value correspor nas): if equal user 0.35	nding to the greater wall a	rea (after			
=	loor, enter 0.2 (unsealed	) or 0.1 (sealed), els	e enter 0		0	(12)
If no draught lobby, en	ter 0.05, else enter 0				0	(13)
Percentage of windows	s and doors draught strip	ped			0	(14)
Window infiltration		0.25 - [	$0.2 \times (14) \div 100] =$		0	(15)
Infiltration rate		(8) + (1	0) + (11) + (12) + (13) + (	15) =	0	(16)
Air permeability value,	q50, expressed in cubic	metres per hour per	square metre of env	velope area	3	(17)
If based on air permeabil	•				0.15	(18)
	s if a pressurisation test has be	een done or a degree air	permeability is being used	d		_
Number of sides sheltere	d	(20) – 1	- [0.075 x (19)] =		2	(19)
Shelter factor	ing chalter facts:				0.85	(20)
Infiltration rate incorporat	ing sneiter lactor	(21) = (	18) x (20) =		0.13	(21)
Indianation and the US	an managed at the desired					
Infiltration rate modified f	<del></del>			N. 5	1	
Infiltration rate modified for Jan Feb Monthly average wind sp	Mar Apr May	Jun Jul Aug	g Sep Oct	Nov Dec		

4.9

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

Mind Footor (220)m (22)m	1									
Wind Factor $(22a)m = (22)m \div (22a)m = 1.27  1.25  1.23$	1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
	<u> </u>			<u> </u>			ļ		J	
Adjusted infiltration rate (allowi	ng for shelter a		<u> </u>	<del>`</del>	<del>ì </del>	T 0.44		1 0.45	1	
0.16 0.16 0.16 0.16 Calculate effective air change			0.12 S <b>e</b>	0.12	0.13	0.14	0.14	0.15	J	
If mechanical ventilation:									0.5	(23a)
If exhaust air heat pump using Appe	endix N, (23b) = (2	3a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0.5	(23b)
If balanced with heat recovery: effici	iency in % allowin	g for in-use fa	actor (from	n Table 4h	ı) =				68.85	(23c)
a) If balanced mechanical ve	ntilation with h	eat recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (	23b) ×	[1 - (23c)	÷ 100]	
(24a)m= 0.32 0.32 0.31	0.3 0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(24a)
b) If balanced mechanical ve	ntilation witho	ut heat rec	overy (N	ЛV) (24b	p)m = (22)	2b)m + (	23b)		1	
(24b)m= 0 0 0	0 0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ven if (22b)m < 0.5 x (23b), t	•	•				5 × (23)	))			
(24c)m =	0 0	0	0	0	0	0	0	0	1	(24c)
d) If natural ventilation or wh	ole house posi	tive input	L ventilatio	n from l	loft	<u>!</u>	<u>!</u>		J	
if $(22b)m = 1$ , then $(24d)$	•	•				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 (2	4b) or (24d	c) or (24	d) in box	x (25)				_	
(25)m= 0.32 0.32 0.31	0.3 0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(25)
3. Heat losses and heat loss p	parameter:									
3. Heat losses and heat loss p <b>ELEMENT</b> Gross  area (m²)	oarameter: Openings m²	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
<b>ELEMENT</b> Gross	Openings		n²		2K					
<b>ELEMENT</b> Gross area (m²)	Openings	A ,n	m² x1/	W/m2	2K - 0.04] =	(W/				kJ/K
<b>ELEMENT</b> Gross area (m²) Windows Type 1	Openings	A ,r	m <sup>2</sup> x <sup>1</sup> /	W/m2 /[1/( 1.2 )+	2K $0.04 = 0.04 = 0.04 = 0.04$	(W/ 5.4				kJ/K (27)
<b>ELEMENT</b> Gross area (m²) Windows Type 1 Windows Type 2	Openings	A ,n 4.72 2.29	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+	2K $0.04 = 0.$	(W/ 5.4 2.62				kJ/K (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3	Openings	A ,r 4.72 2.29 4.51	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K $0.04 = 0.$	(W/ 5.4 2.62 5.16				(27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Openings m <sup>2</sup>	A ,n 4.72 2.29 4.51 2.26	x10 x10 x10 x10 x10	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K 0.04] =   0.04] =   0.04] =   0.04] =	(W/ 5.4 2.62 5.16 2.59				(27) (27) (27) (27) (27)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Walls Type1 70.79	Openings m²	A ,n 4.72 2.29 4.51 2.26	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =	(W/ 5.4 2.62 5.16 2.59 9				(27) (27) (27) (27) (27) (29)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Walls Type1 70.79  Walls Type2 4.01	Openings m²  20.79  0	A ,n 4.72 2.29 4.51 2.26 50 4.01	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =	(W/ 5.4 2.62 5.16 2.59 9 0.91				(27) (27) (27) (27) (27) (29) (29) (30)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Walls Type1 70.79  Walls Type2 4.01  Roof Type1 6.58	20.79  0 0	A ,n 4.72 2.29 4.51 2.26 50 4.01 6.58	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =	(W/ 5.4 2.62 5.16 2.59 9 0.91 0.86				(27) (27) (27) (27) (27) (29)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Walls Type1 70.79  Walls Type2 4.01  Roof Type1 6.58  Roof Type2 62.48  Total area of elements, m²	20.79  0 0	A ,n 4.72 2.29 4.51 2.26 50 4.01 6.58 62.48	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =	(W/ 5.4 2.62 5.16 2.59 9 0.91 0.86 8.12				(27) (27) (27) (27) (29) (29) (30) (30) (31)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Walls Type1 70.79  Walls Type2 4.01  Roof Type1 6.58  Roof Type2 62.48  Total area of elements, m²  Party wall  * for windows and roof windows, use elements	Openings m²  20.79  0  0  offective window U	A ,n  4.72  2.29  4.51  2.26  50  4.01  6.58  62.48  143.80  109.79	x1/2 x1/2 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4 x1/4	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	(W/ 5.4 2.62 5.16 2.59 9 0.91 0.86 8.12	K)	kJ/m²-	k	(27) (27) (27) (27) (29) (29) (30) (30)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type 1  Walls Type 2  Walls Type 2  Walls Type 2  Roof Type 1  Roof Type 1  Roof Type 2  G2.48  Total area of elements, m²  Party wall	Openings m²  20.79  0  0  offective window Uniternal walls and p	A ,n  4.72  2.29  4.51  2.26  50  4.01  6.58  62.48  143.80  109.79	x1/2 x1/2 x1/4 x1/4 x x x x x x x x x x x x atted using	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	(W/ 5.4 2.62 5.16 2.59 9 0.91 0.86 8.12	K)	kJ/m²-	k	(27) (27) (27) (27) (29) (29) (30) (30) (31)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Walls Type1 70.79  Walls Type2 4.01  Roof Type1 6.58  Roof Type2 62.48  Total area of elements, m²  Party wall  * for windows and roof windows, use e ** include the areas on both sides of in	Openings m²  20.79  0  0  offective window Uniternal walls and p	A ,n  4.72  2.29  4.51  2.26  50  4.01  6.58  62.48  143.80  109.79	x1/2 x1/2 x1/4 x1/4 x x x x x x x x x x x x atted using	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   -	(W/ 5.4 2.62 5.16 2.59 9 0.91 0.86 8.12 0	K)	kJ/m²-	n 3.2	(27) (27) (27) (27) (29) (29) (30) (31) (32)
ELEMENT Gross area (m²)  Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Walls Type1 70.79  Walls Type2 4.01  Roof Type1 6.58  Roof Type2 62.48  Total area of elements, m²  Party wall  * for windows and roof windows, use e ** include the areas on both sides of infinity facility.	Openings m²  20.79  0  0  offective window Uniternal walls and p	A ,n  4.72  2.29  4.51  2.26  50  4.01  6.58  62.48  143.80  109.79  -value calcularitions	x1/ x1/ x1/ x1/ x1/ x x x x x x x x x x	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =	(W/ 5.4 2.62 5.16 2.59 9 0.91 0.86 8.12 0	K)	kJ/m²-	n 3.2	(27) (27) (27) (27) (29) (29) (30) (31) (32)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type 1 Roof Type 1 Roof Type 1 Roof Type 2 62.48 Total area of elements, m² Party wall * for windows and roof windows, use e ** include the areas on both sides of infabric heat loss, W/K = S (A x Heat capacity Cm = S(A x k) Thermal mass parameter (TMF For design assessments where the de	Openings m²  20.79  0  0  offective window Uniternal walls and puternal walls and puternal walls and puternal walls of the construction.	A ,n 4.72 2.29 4.51 2.26 50 4.01 6.58 62.48 143.8 109.79 -value calcularitions	x1/2 x1/2 x1/4 x1/4 x x x x x x x x x x x x x attend using	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   - 0	(W/ 5.4 2.62 5.16 2.59 9 0.91 0.86 8.12 0 ue)+0.04] a	K)	kJ/m²-l	7 3.2 42.69 8802.69	(27) (27) (27) (27) (29) (29) (30) (30) (31) (32)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type 1 Roof Type 1 Roof Type 1 Roof Type 2 6.58 Roof Type 2 62.48 Total area of elements, m² Party wall * for windows and roof windows, use e ** include the areas on both sides of in Fabric heat loss, W/K = S (A x Heat capacity Cm = S(A x k) Thermal mass parameter (TMF)	Openings m²  20.79  0  0  0  tflective window Uniternal walls and put the construction.	A ,n  4.72  2.29  4.51  2.26  50  4.01  6.58  62.48  143.80  109.79  -value calcularitions  in kJ/m²K	x1/x1/x1/x1/xx1/xxx/xxxxxxxxxxxxxxxxxx	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   - 0	(W/ 5.4 2.62 5.16 2.59 9 0.91 0.86 8.12 0 ue)+0.04] a	K)	kJ/m²-l	7 3.2 42.69 8802.69	(27) (27) (27) (27) (29) (29) (30) (30) (31) (32)

if details of therm	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total fabric he	at loss							(33) +	(36) =			62.33	(37)
Ventilation hea	at loss ca	alculated	l monthly	/				·	= 0.33 × (	(25)m x (5)		İ	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 34.85	34.5	34.15	32.41	32.06	30.32	30.32	29.97	31.01	32.06	32.76	33.46		(38)
Heat transfer	coefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m= 97.18	96.83	96.48	94.73	94.39	92.64	92.64	92.29	93.34	94.39	95.08	95.78		
Heat loss para	ameter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> , - (4)	12 /12=	94.65	(39)
(40)m= 0.82	0.81	0.81	0.8	0.79	0.78	0.78	0.77	0.78	0.79	0.8	0.8		
	•					•			Average =	Sum(40) <sub>1</sub>	12 /12=	0.79	(40)
Number of day	ys in moi	nth (Tab	le 1a)									Ī	
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	ear:	
A I		\ 1										ı	
Assumed occu if TFA > 13.			[1 - evn	( <u>-</u> 0 0003	2/0 v /TF	-Δ -13 Θ	)2)] + O (	1013 v (	Γ <b>Γ</b> Δ <sub>-</sub> 13		86		(42)
if TFA £ 13.		T 1.70 X	Γι - <del>c</del> xb	(-0.0003	545 X (11	A - 13.9	)Z)] + 0.0	JO13 X (	11 7 - 13	.9)			
Annual averag	,	ater usaç	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		102	2.12		(43)
Reduce the annual	_				_	-	to achieve	a water us	se target o	of <sup>L</sup>		l	
not more that 125		person per	r aay (all w r	ater use, i	not and co	ia)				1	ı	l	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	ın litres per	day for ea	ach month	Vd,m = fa	ctor from	l able 1c x	(43)						
(44)m= 112.33	108.25	104.16	100.08	95.99	91.91	91.91	95.99	100.08	104.16	108.25	112.33		_
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1225.42	(44)
(45)m= 166.58	145.69	150.34	131.07	125.77	108.53	100.57	115.4	116.78	136.1	148.56	161.33		
						•			Total = Su	m(45) <sub>112</sub> =	=	1606.72	(45)
If instantaneous v	vater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)					
(46)m= 24.99	21.85	22.55	19.66	18.87	16.28	15.09	17.31	17.52	20.41	22.28	24.2		(46)
Water storage		مالد داد مال			/\/\ IDC				1			ı	
Storage volum	, ,		•			•		ame ves	sei		0		(47)
If community h	_			_			, ,	oro) onto	or (O) in (	'4 <b>7</b> \			
Otherwise if no Water storage		not wate	er (triis ir	iciuaes i	nstantar	ieous co	ווסם ומוזונ	ers) ente	er O in (	(47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
Temperature f					`	,					0		(49)
Energy lost fro				ar			(48) x (49)	) <u> </u>					(50)
b) If manufac		•	-		or is not		(40) X (40)	, –		1	10		(50)
Hot water stor			-							0.	02		(51)
If community h	neating s	ee secti	on 4.3									l	
Volume factor										1.	03		(52)
Temperature f	factor fro	m Table	2b							0	.6		(53)
Energy lost fro	om water	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 f	for each	month			((56)m = (	55) × (41)ı	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)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	t loss cal	culated t	for each	month (	59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by	/ factor f	rom 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 ca	lculated	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 req	uired 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	
(62)m= 221.86	195.62	205.62	184.57	181.04	162.02	155.84	170.68	170.27	191.37	202.05	216.6		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additiona	I lines if	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 w	ater hea	ter				-				-	-		
(64)m= 221.86	195.62	205.62	184.57	181.04	162.02	155.84	170.68	170.27	191.37	202.05	216.6		
	•						Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2257.56	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m= 99.61	88.39	94.21	86.38	00.04	70.00					I	1		(05)
` '	1	34.21	00.30	86.04	78.88	77.66	82.59	81.62	89.47	92.19	97.86		(65)
include (57)	m in cal	<u> </u>				<u> </u>		<u> </u>		<u> </u>	<u> </u>	eating	(65)
` '		culation o	of (65)m	only if c		<u> </u>		<u> </u>		<u> </u>	<u> </u>	eating	(65)
include (57) 5. Internal g	ains (see	culation of Table 5	of (65)m and 5a	only if c		<u> </u>		<u> </u>		<u> </u>	<u> </u>	eating	(65)
include (57)	ains (see	culation of Table 5	of (65)m and 5a	only if c		<u> </u>		or hot w		<u> </u>	<u> </u>	eating	(65)
include (57) 5. Internal g	ains (see	culation of Table 5	of (65)m and 5a	only if c	ylinder is	s in the o	dwelling	<u> </u>	ater is fr	om com	munity h	eating	(66)
include (57)  5. Internal gradients  Metabolic gair  Jan  (66)m= 142.99	ns (Table Feb 142.99	E Table 5 5), Wat Mar 142.99	of (65)m 5 and 5a ts Apr 142.99	only if constant of the consta	ylinder is Jun 142.99	Jul 142.99	Aug 142.99	or hot w Sep 142.99	ater is fr	om com	munity h	eating	
include (57)  5. Internal games  Metabolic gain  Jan	ns (Table Feb 142.99	E Table 5 5), Wat Mar 142.99	of (65)m 5 and 5a ts Apr 142.99	only if constant of the consta	ylinder is Jun 142.99	Jul 142.99	Aug 142.99	or hot w Sep 142.99	ater is fr	om com	munity h	eating	
include (57)  5. Internal games  Metabolic gain  Jan  (66)m= 142.99  Lighting gains (67)m= 25.99	res (Table Feb 142.99 (calcula 23.09	ETable 5 E Table 5 E 5), Wat Mar 142.99 ted in Ap 18.78	of (65)m 6 and 5a ts Apr 142.99 opendix	only if construction in the construction in th	Jun 142.99 ion L9 or	Jul 142.99 r L9a), a	Aug 142.99 Iso see	Sep 142.99 Table 5	Oct 142.99	Nov	Dec	eating	(66)
include (57)  5. Internal gradients  Metabolic gair  Jan  (66)m= 142.99  Lighting gains  (67)m= 25.99  Appliances ga	res (Table Feb 142.99 (calcula 23.09	ETable 5 E Table 5 E 5), Wat Mar 142.99 ted in Ap 18.78	of (65)m 6 and 5a ts Apr 142.99 opendix	only if construction in the construction in th	Jun 142.99 ion L9 or	Jul 142.99 r L9a), a	Aug 142.99 Iso see	Sep 142.99 Table 5	Oct 142.99	Nov	Dec	eating	(66)
include (57)  5. Internal given by the second of the secon	res (Table Feb 142.99 (calcula 23.09 ins (calcula 286.97	ted in Apulated in 279.54	of (65)m 5 and 5a ts Apr 142.99 opendix 14.21 Appendix 263.73	only if construction in the construction in th	Jun 142.99 ion L9 of 8.97 uation L	Jul 142.99 r L9a), a 9.69 13 or L1 212.48	Aug 142.99 lso see 12.6 3a), also 209.54	Sep 142.99 Table 5 16.91 see Tal 216.96	Oct 142.99 21.47 ble 5 232.77	Nov 142.99 25.06	Dec 142.99	eating	(66) (67)
include (57)  5. Internal gradients  Metabolic gair  Jan  (66)m= 142.99  Lighting gains  (67)m= 25.99  Appliances ga	res (Table Feb 142.99 (calcula 23.09 ins (calcula 286.97	ted in Apulated in 279.54	of (65)m 5 and 5a ts Apr 142.99 opendix 14.21 Appendix 263.73	only if construction in the construction in th	Jun 142.99 ion L9 of 8.97 uation L	Jul 142.99 r L9a), a 9.69 13 or L1 212.48	Aug 142.99 lso see 12.6 3a), also 209.54	Sep 142.99 Table 5 16.91 see Tal 216.96	Oct 142.99 21.47 ble 5 232.77	Nov 142.99 25.06	Dec 142.99	eating	(66) (67)
include (57)  5. Internal graph of the second of the secon	res (Table Feb 142.99 (calcula 23.09 ins (calcula 286.97 c (calcula 37.3	ted in Apulated in	of (65)m ts Apr 142.99 opendix 14.21 Append 263.73 opendix 37.3	May 142.99 L, equati 10.63 dix L, equati 243.77 L, equat	Jun 142.99 ion L9 or 8.97 uation L 225.02	Jul 142.99 r L9a), a 9.69 13 or L1 212.48 or L15a)	Aug 142.99 lso see 12.6 3a), also 209.54	Sep 142.99 Table 5 16.91 See Tal 216.96 ee Table	Oct 142.99 21.47 ble 5 232.77 5	Nov 142.99 25.06	Dec 142.99 26.72 271.49	eating	(66) (67) (68)
include (57)  5. Internal gradients  Metabolic gair  Jan  (66)m= 142.99  Lighting gains  (67)m= 25.99  Appliances gains  (68)m= 284.02  Cooking gains  (69)m= 37.3	res (Table Feb 142.99 (calcula 23.09 ins (calcula 286.97 c (calcula 37.3	ted in Apulated in	of (65)m ts Apr 142.99 opendix 14.21 Append 263.73 opendix 37.3	May 142.99 L, equati 10.63 dix L, equati 243.77 L, equat	Jun 142.99 ion L9 or 8.97 uation L 225.02	Jul 142.99 r L9a), a 9.69 13 or L1 212.48 or L15a)	Aug 142.99 lso see 12.6 3a), also 209.54	Sep 142.99 Table 5 16.91 See Tal 216.96 ee Table	Oct 142.99 21.47 ble 5 232.77 5	Nov 142.99 25.06	Dec 142.99 26.72 271.49	eating	(66) (67) (68)
include (57)  5. Internal graph of the following gains (66)m= 25.99  Appliances gains (68)m= 284.02  Cooking gains (69)m= 37.3  Pumps and fains (70)m= 0	res (Table Feb 142.99 (calcula 23.09 ins (calcula 37.3 rs gains 0	ted in Apulated in	of (65)m ts Apr 142.99 ppendix 14.21 Appendix 263.73 ppendix 37.3 5a) 0	only if construction only if c	Jun 142.99 ion L9 of 8.97 uation L 225.02 ion L15 37.3	Jul 142.99 r L9a), a 9.69 13 or L1 212.48 or L15a) 37.3	Aug 142.99 lso see 12.6 3a), also 209.54 , also se 37.3	Sep 142.99 Table 5 16.91 see Tal 216.96 ee Table 37.3	Oct 142.99  21.47 ble 5 232.77 5 37.3	Nov 142.99 25.06 252.73	Dec 142.99 26.72 271.49 37.3	eating	(66) (67) (68) (69)
include (57)  5. Internal given by the second of the secon	res (Table Feb 142.99 (calcula 23.09 ins (calcula 37.3 res gains 0 vaporatio	ted in Apulated in	of (65)m ts Apr 142.99 ppendix 14.21 Appendix 263.73 ppendix 37.3 5a) 0	only if construction only if c	Jun 142.99 ion L9 of 8.97 uation L 225.02 ion L15 37.3	Jul 142.99 r L9a), a 9.69 13 or L1 212.48 or L15a) 37.3	Aug 142.99 lso see 12.6 3a), also 209.54 , also se 37.3	Sep 142.99 Table 5 16.91 see Tal 216.96 ee Table 37.3	Oct 142.99  21.47 ble 5 232.77 5 37.3	Nov 142.99 25.06 252.73	Dec 142.99 26.72 271.49 37.3	eating	(66) (67) (68) (69)
include (57)  5. Internal gradients  Metabolic gain  Jan  (66)m= 142.99  Lighting gains  (67)m= 25.99  Appliances gains  (68)m= 284.02  Cooking gains  (69)m= 37.3  Pumps and fait  (70)m= 0  Losses e.g. even	res (Table Feb 142.99 (calcula 23.09 ins (calcula 37.3 rs gains 0 raporatio -114.39	ted in Ap 18.78 ulated in Ap 179.54 ted in Ap 179.55 ted	of (65)m s and 5a ts Apr 142.99 opendix 14.21 n Append 263.73 opendix 37.3 5a) 0 tive valu	only if construction only if c	Jun 142.99 ion L9 or 8.97 uation L 225.02 ion L15 37.3	Jul 142.99 r L9a), a 9.69 13 or L1 212.48 or L15a) 37.3	Aug 142.99 Iso see 12.6 3a), also 209.54 , also se 37.3	Sep 142.99 Table 5 16.91 216.96 ee Table 37.3	Oct 142.99 21.47 ble 5 232.77 5 37.3	Nov 142.99 25.06 252.73	Dec 142.99 26.72 271.49 37.3	eating	(66) (67) (68) (69)
include (57)  5. Internal given by the second secon	res (Table Feb 142.99 (calcula 23.09 ins (calcula 37.3 rs gains 0 raporatio -114.39	ted in Ap 18.78 ulated in Ap 179.54 ted in Ap 179.55 ted	of (65)m s and 5a ts Apr 142.99 opendix 14.21 n Append 263.73 opendix 37.3 5a) 0 tive valu	only if construction only if c	Jun 142.99 ion L9 or 8.97 uation L 225.02 ion L15 37.3	Jul 142.99 r L9a), a 9.69 13 or L1 212.48 or L15a) 37.3	Aug 142.99 Iso see 12.6 3a), also 209.54 , also se 37.3	Sep 142.99 Table 5 16.91 see Tal 216.96 ee Table 37.3	Oct 142.99 21.47 ble 5 232.77 5 37.3	Nov 142.99 25.06 252.73	Dec 142.99 26.72 271.49 37.3	eating	(66) (67) (68) (69)
include (57)  5. Internal graph of the first state	res (Table Feb 142.99 (calcula 23.09 ins (calcula 37.3 res gains 0 vaporatio 131.53	ted in Apulated in 279.54 (Table 5 on (negation) 126.63	of (65)m ts Apr 142.99 ppendix 14.21 Appendix 37.3 ppendix 37.3 tive valu -114.39	only if constructions only its constructions only in constructions	Jun 142.99 ion L9 of 8.97 uation L 225.02 ion L15 37.3  0 le 5) -114.39	Jul 142.99 r L9a), a 9.69 13 or L1 212.48 or L15a) 37.3	Aug 142.99 Iso see 12.6 3a), also 209.54 , also se 37.3	Sep 142.99 Table 5 16.91 216.96 ee Table 37.3	Oct 142.99 21.47 ble 5 232.77 5 37.3	Nov 142.99 25.06 252.73 37.3	Dec 142.99 26.72 271.49 37.3 0	eating	(66) (67) (68) (69) (70) (71)
include (57)  5. Internal gram  Metabolic gair  Jan  (66)m= 142.99  Lighting gains  (67)m= 25.99  Appliances ga  (68)m= 284.02  Cooking gains  (69)m= 37.3  Pumps and fa  (70)m= 0  Losses e.g. ev  (71)m= -114.39  Water heating  (72)m= 133.88	res (Table Feb 142.99 (calcula 23.09 ins (calcula 37.3 res gains 0 vaporatio 131.53	ted in Apulated in 279.54 (Table 5 on (negation) 126.63	of (65)m ts Apr 142.99 ppendix 14.21 Appendix 37.3 ppendix 37.3 tive valu -114.39	only if constructions only its constructions only in constructions	Jun 142.99 ion L9 of 8.97 uation L 225.02 ion L15 37.3  0 le 5) -114.39	Jul 142.99 r L9a), a 9.69 13 or L1 212.48 or L15a) 37.3	Aug 142.99 Iso see 12.6 3a), also 209.54 , also se 37.3	Sep 142.99 Table 5 16.91 216.96 ee Table 37.3  0  -114.39	Oct 142.99 21.47 ble 5 232.77 5 37.3	Nov 142.99 25.06 252.73 37.3	Dec 142.99 26.72 271.49 37.3 0	eating	(66) (67) (68) (69) (70) (71)

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

Orientation	n:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East (	).9x	1	X	4.51	x	19.64	x	0.5	x	0.7	] =	21.48	(76)
East (	).9x	1	x	2.26	x	19.64	x	0.5	x	0.7	<b>=</b>	10.77	(76)
East (	).9x	1	x	4.51	x	38.42	x	0.5	x	0.7	<u> </u>	42.03	(76)
East (	).9x	1	x	2.26	x	38.42	х	0.5	x	0.7	] =	21.06	(76)
East (	).9x	1	x	4.51	x	63.27	x	0.5	x	0.7	<b>=</b>	69.21	(76)
East (	).9x	1	x	2.26	X	63.27	X	0.5	x	0.7	=	34.68	(76)
East (	).9x	1	x	4.51	X	92.28	x	0.5	x	0.7	=	100.95	(76)
East (	).9x	1	x	2.26	x	92.28	x	0.5	x	0.7	=	50.58	(76)
East (	).9x	1	x	4.51	x	113.09	x	0.5	x	0.7	=	123.71	(76)
East (	).9x	1	x	2.26	x	113.09	x	0.5	x	0.7	=	61.99	(76)
East (	).9x	1	x	4.51	x	115.77	x	0.5	x	0.7	=	126.64	(76)
East (	).9x	1	x	2.26	x	115.77	x	0.5	x	0.7	=	63.46	(76)
East (	).9x	1	x	4.51	x	110.22	x	0.5	x	0.7	=	120.57	(76)
East (	).9x	1	x	2.26	x	110.22	x	0.5	x	0.7	=	60.42	(76)
East (	).9x	1	x	4.51	x	94.68	x	0.5	x	0.7	=	103.57	(76)
East (	).9x	1	x	2.26	x	94.68	x	0.5	x	0.7	=	51.9	(76)
East (	).9x	1	x	4.51	x	73.59	x	0.5	x	0.7	=	80.5	(76)
East (	).9x	1	x	2.26	x	73.59	x	0.5	x	0.7	=	40.34	(76)
East (	).9x	1	x	4.51	x	45.59	x	0.5	x	0.7	=	49.87	(76)
East (	).9x	1	x	2.26	x	45.59	x	0.5	x	0.7	=	24.99	(76)
East (	).9x	1	x	4.51	x	24.49	x	0.5	x	0.7	=	26.79	(76)
East (	).9x	1	x	2.26	X	24.49	X	0.5	X	0.7	=	13.42	(76)
East (	).9x	1	X	4.51	X	16.15	X	0.5	X	0.7	=	17.67	(76)
East (	).9x	1	X	2.26	X	16.15	X	0.5	X	0.7	=	8.85	(76)
West (	).9x	0.77	X	4.72	X	19.64	X	0.5	X	0.7	=	44.97	(80)
West (	).9x	0.77	X	2.29	x	19.64	x	0.5	X	0.7	=	21.82	(80)
West (	).9x	0.77	X	4.72	X	38.42	X	0.5	X	0.7	=	87.97	(80)
West (	).9x	0.77	X	2.29	X	38.42	X	0.5	X	0.7	=	42.68	(80)
West (	).9x	0.77	X	4.72	x	63.27	x	0.5	X	0.7	=	144.87	(80)
West (	).9x	0.77	X	2.29	X	63.27	X	0.5	X	0.7	=	70.29	(80)
West (	).9x	0.77	X	4.72	x	92.28	x	0.5	X	0.7	=	211.29	(80)
West (	).9x	0.77	X	2.29	x	92.28	x	0.5	X	0.7	=	102.51	(80)
West (	).9x	0.77	X	4.72	x	113.09	x	0.5	X	0.7	=	258.95	(80)
West (	).9x	0.77	X	2.29	X	113.09	X	0.5	X	0.7	=	125.63	(80)
West (	).9x	0.77	X	4.72	X	115.77	X	0.5	X	0.7	=	265.08	(80)
West (	).9x	0.77	X	2.29	X	115.77	x	0.5	X	0.7	=	128.61	(80)
West (	).9x	0.77	X	4.72	x	110.22	x	0.5	x	0.7	=	252.36	(80)
West (	).9x	0.77	X	2.29	x	110.22	x	0.5	x	0.7	=	122.44	(80)
West (	).9x	0.77	X	4.72	x	94.68	X	0.5	X	0.7	] =	216.78	(80)

	_					_									_	_
West	0.9x	0.77	X	2.2	29	x	9	4.68	X		0.5	X	0.7	=	105.17	(80)
West	0.9x	0.77	X	4.7	72	x	7	3.59	X		0.5	x	0.7	=	168.5	(80)
West	0.9x	0.77	X	2.2	29	x [	7	3.59	X		0.5	x	0.7		81.75	(80)
West	0.9x	0.77	X	4.7	72	x	4	5.59	х		0.5	х	0.7	-	104.38	(80)
West	0.9x	0.77	x	2.2	29	x [	4	5.59	х		0.5	_ x [	0.7		50.64	(80)
West	0.9x	0.77	x	4.7	<b>7</b> 2	×	2	4.49	х		0.5	_ x	0.7		56.07	(80)
West	0.9x	0.77	X	2.2	29	x [	2	4.49	х		0.5	x	0.7		27.2	(80)
West	0.9x	0.77	x	4.7	72	×	1	6.15	х		0.5	_ x [	0.7		36.98	(80)
West	0.9x	0.77	x	2.2	29	x [	1	6.15	х		0.5	x	0.7		17.94	(80)
	_					_									•	
Solar	gains in	watts, ca	alculated	for eac	h month	ı			(83)m	= Su	ım(74)m .	(82)m				
(83)m=	99.04	193.74	319.06	465.33	570.28	$\overline{}$	3.79	555.79	477.	.41	371.08	229.89	123.49	81.44	$\neg$	(83)
Total g	gains – i	nternal a	nd solai	(84)m =	= (73)m	+ (8	3)m	, watts					1		_	
(84)m=	608.84	701.22	809.9	929.14	1006.22	99	3.22	948.24	876.	.46	784.22	670.29	595.22	577.08		(84)
7 Me	an inter	nal temp	erature	(heating	season	)										
		during h				<i></i>	aroa f	rom Tah	مام ۵	Th1	I (°C\				21	(85)
		_	•			_			ле э,	1111	i ( C)				21	(00)
Utilisa		tor for g			l e	Ė			Λ.		0	0-4	Navi		7	
(2.2)	Jan	Feb	Mar	Apr	May	+-	Jun	Jul	Αι	<del>-  </del>	Sep	Oct	Nov	Dec	<del>-</del>	(00)
(86)m=	0.97	0.96	0.92	0.84	0.71	0	.55	0.42	0.4	6	0.69	0.89	0.96	0.98		(86)
Mean	interna	I temper	ature in	living are	ea T1 (f	ollov	w ste	ps 3 to 7	in T	able	9c)					
(87)m=	19.25	19.49	19.89	20.38	20.73	20	0.92	20.98	20.9	97	20.82	20.34	19.72	19.22		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwe	elling	from Ta	ıble 9	), Th	2 (°C)					
(88)m=	20.24	20.24	20.24	20.26	20.26	_	0.27	20.27	20.2	_	20.27	20.26	20.25	20.25	7	(88)
l Itilie	ation fac	tor for g	aine for	rest of d	welling	h2 r	m /so	o Table	02)	•					_	
(89)m=	0.97	0.95	0.91	0.82	0.68	_	0.5	0.35	9 <i>a)</i> 0.4	1	0.64	0.87	0.95	0.98	7	(89)
, ,		<u> </u>				<u> </u>							0.00	0.00		(00)
		l temper			r	Ť			<del></del>	$\overline{}$					¬	
(90)m=	17.86	18.21	18.78	19.47	19.95	2	0.2	20.26	20.2	25	20.08	19.44	18.55	17.82		(90)
											f	LA = Livir	ng area ÷ (4	4) =	0.23	(91)
Mean	interna	I temper	ature (fo	r the wh	ole dwe	lling	a) = fL	_A × T1	+ (1 -	– fL/	A) × T2					
(92)m=	18.18	18.51	19.04	19.68	20.13	T	0.36	20.42	20.4		20.25	19.65	18.82	18.14	7	(92)
Apply	∟—— ⁄ adiustn	nent to th	ne mear	interna	l temper	atur	re fro	m Table	<u></u> 4e. ۱	whe	re appro	poriate	Ţ		_	
(93)m=	18.18	18.51	19.04	19.68	20.13	_	0.36	20.42	20.4	$\overline{}$	20.25	19.65	18.82	18.14	$\neg$	(93)
8. Sp	ace hea	ting requ	iirement											<u> </u>		
•		mean int			re obtair	ned	at ste	ep 11 of	Table	e 9b	so tha	t Ti.m=	76)m an	d re-ca	lculate	
		factor fo					G. 1 G. 1			0.0	, 00	, ,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	:	
Utilisa	ation fac	tor for g	ains, hm	):											_	
(94)m=	0.96	0.94	0.89	0.8	0.67	C	).5	0.36	0.4	1	0.64	0.85	0.94	0.96		(94)
Usefu	ıl gains,	hmGm ,	W = (9	4)m x (8	4)m	•									_	
(95)m=	583.19	656.71	722.67	747.03	676.48	50	1.49	346.05	358.	.74	501.85	571.44	558.15	555.99		(95)
Montl	hly aver	age exte	rnal tem	perature	from T	able	8			•			•		_	
(96)m=	4.3	4.9	6.5	8.9	11.7	1.	4.6	16.6	16.	4	14.1	10.6	7.1	4.2	7	(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93	3)m-	- (96)m	]		•	_	
(97)m=	1349.07	1317.53	1209.82	1021.64	795.49	53	33.9	354.1	370.	.57	574.49	853.92	1114.12	1335.3	9	(97)
				•		•							•	•	<del>-</del>	

Space heating requirement for each month, kWh/month = 0.024	1 x [(97	)m – (95	5)ml x (41	I)m		
(98)m= 569.81 444.07 362.44 197.72 88.55 0 0	0	0	210.17	400.3 579.87		
	Tota	l per year	(kWh/year	) = Sum(98) <sub>15,912</sub> =	2852.92	(98)
Space heating requirement in kWh/m²/year					23.96	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (T				unity scheme.	0	(301)
Fraction of space heat from community system 1 – (301) =		,			1	(302)
The community scheme may obtain heat from several sources. The procedure al	llows for	CHP and	up to four o	L other heat sources; th	e latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. So Fraction of heat from Community heat pump	ee Appei	ndix C.		Г	0.5	(303a)
Fraction of community heat from heat source 2				L T	0.5	(303b)
Fraction of total space heat from Community heat pump			(3)	02) x (303a) =	0.5	(304a)
Fraction of total space heat from community heat source 2				(303b) =	0.5	(304b)
Factor for control and charging method (Table 4c(3)) for commur	nity hea	ntina svs	•		1	(305)
Distribution loss factor (Table 12c) for community heating system	•	unig oye		L	1.05	(306)
Space heating				L	kWh/yea	
Annual space heating requirement				ſ	2852.92	<u> </u>
Space heat from Community heat pump		(98) x (3	04a) x (305	5) x (306) =	1497.78	(307a)
Space heat from heat source 2		(98) x (3	04b) x (305	5) x (306) =	1497.78	(307b)
Efficiency of secondary/supplementary heating system in % (from	n Table	4a or <i>A</i>	Appendix	E) [	0	(308
Space heating requirement from secondary/supplementary syste	em	(98) x (3	01) x 100 ÷	- (308) =	0	(309)
Water heating Annual water heating requirement				Г	2257.56	$\neg$
If DHW from community scheme:				L	2237.30	
Water heat from Community heat pump		(64) x (3	03a) x (305	5) x (306) =	1185.22	(310a)
Water heat from heat source 2		(64) x (3	03b) x (305	5) x (306) =	1185.22	(310b)
Electricity used for heat distribution	0.01	× [(307a)	(307e) +	(310a)(310e)] =	53.66	(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 continuous continu	outside			Γ	425.03	(330a)
warm air heating system fans				Ī	0	(330b)
pump for solar water heating				<u> </u>	0	(330g)
Total electricity for the above, kWh/year		=(330a)	+ (330b) +	(330g) =	425.03	(331)
Energy for lighting (calculated in Appendix L)				Ì	459.05	(332)
Electricity generated by PVs (Appendix M) (negative quantity)					-727.02	(333)

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 (%) 425 (367a) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 2 (%) (367b) 91 CO2 associated with heat source 1  $[(307b)+(310b)] \times 100 \div (367b) \times$ (367)0.52 327.64 CO2 associated with heat source 2  $[(307b)+(310b)] \times 100 \div (367b) \times$ (368)0.22 636.84 Electrical energy for heat distribution [(313) x (372)0.52 27.85 Total CO2 associated with community systems (363)...(366) + (368)...(372)992.34 (373)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 (376)(373) + (374) + (375) =992.34 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378)0.52 220.59 CO2 associated with electricity for lighting (379)(332))) x 0.52 238.25 Energy saving/generation technologies (333) to (334) as applicable x 0.01 =Item 1 (380) 0.52 -377.32 sum of (376)...(382) = Total CO2, kg/year (383)1073.85  $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)9.02

El rating (section 14)

91.23

(385)

		ا	Jser De	etails:					
Assessor Name:	Joseph Treanor			Strom	a Num	ber:	STRO	032062	
Software Name:	Stroma FSAP 2		;	Softwa	are Ve	rsion:	Versio	n: 1.0.4.14	
		Pro	perty A	Address	: P12				
Address :	, Gondar Gardens	s, London, N	W6 1H	G					
1. Overall dwelling dimens	sions:								
			Area	(m²)		Av. Heigl	ht(m)	Volume(m³	)
Ground floor			45	5.01	(1a) x	2.55	(2a) =	114.78	(3a)
First floor			71	1.14	(1b) x	3	(2b) =	213.42	(3b)
Total floor area TFA = (1a)	+(1b)+(1c)+(1d)+(	1e)+(1n)	11	6.15	(4)				
Dwelling volume					(3a)+(3b	)+(3c)+(3d)+(	(3e)+(3n) =	328.2	(5)
2. Ventilation rate:									
	main heating	secondary 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 fans	3					0	x 10 =	0	(7a)
Number of passive vents						0	x 10 =	0	(7b)
Number of flueless gas fire	s				Ī	0	x 40 =	0	(7c)
					_			anges per ho	<u> </u>
Infiltration due to chimneys	fluos and fans –	(62)+(6b)+(72)	1±(7h)±(7	(c) -	Г		_		_
If a pressurisation test has bee					continue fi	0 rom (9) to (16	÷ (5) =	0	(8)
Number of storeys in the	dwelling (ns)							0	(9)
Additional infiltration							[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.2	5 for steel or timbe	er frame or 0	.35 for	mason	ry const	ruction		0	(11)
if both types of wall are pres deducting areas of openings		responding to th	he greate	er wall are	ea (after		'		_
If suspended wooden flo		ealed) or 0.1	(sealed	d), else	enter 0			0	(12)
If no draught lobby, ente	r 0.05, else enter (	0						0	(13)
Percentage of windows a	and doors draught	stripped						0	(14)
Window infiltration			(	0.25 - [0.2	2 x (14) ÷ 1	100] =		0	(15)
Infiltration rate			(	(8) + (10)	+ (11) + (	12) + (13) + (1	15) =	0	(16)
Air permeability value, q	50, expressed in c	ubic metres	per ho	ur per s	quare m	etre of env	elope area	3	(17)
If based on air permeability	v value, then (18) =	[(17) ÷ 20]+(8),	otherwis	se (18) =	(16)			0.15	(18)
Air permeability value applies i	f a pressurisation test	has been done	or a deg	ree air pe	rmeability	is being used	1		
Number of sides sheltered				(00)		40)1		2	(19)
Shelter factor					[0.075 x (	19)] =		0.85	(20)
Infiltration rate incorporatin	_		(	(21) = (18	) x (20) =			0.13	(21)
Infiltration rate modified for	<del></del>	1			1	<del>                                     </del>	1	l	
Jan Feb M	lar Apr Ma	y Jun	Jul	Aug	Sep	Oct	Nov Dec		
Monthly average wind spee	ed from Table 7								

4.3

3.8

3.8

3.7

4.3

4.5

Wind Factor (22a)m =	<del>ì ´</del>			T	T	T	Ι.	T	1	T	1	
(22a)m= 1.27 1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	
Adjusted infiltration rat	te (allowi	ng for sh	elter 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 effective air If mechanical ventila	-	rate for ti	he appli	cable ca	ise						0.5	(23a)
If exhaust air heat pump		endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23b)
If balanced with heat reco								, , ,			68.85	(23c)
a) If balanced mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2:	2b)m + (	23b) × [	1 – (23c)		(C-0.0)
(24a)m= 0.32 0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	j ,	(24a)
b) If balanced mech	anical ve	ntilation	without	heat red	covery (N	л ЛV) (24k	m = (22)	2b)m + (	23b)		J	
(24b)m = 0 0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If whole house ex	tract ven	tilation o	r positiv	e input v	ventilatio	n from o	outside	•			•	
if (22b)m < 0.5 >	× (23b), t	hen (24c	= (23b)	); other	wise (24	c) = (22l	b) m + 0.	.5 × (23k	p)		-	
(24c)m = 0 0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural ventilation			•	•				0.51				
if $(22b)m = 1$ , th (24d)m = 0 0	0	0	0	0	0	$\frac{0.5 + [(2)]}{0}$	120)III- X	0.5]	0	0	1	(24d)
Effective air change			-							1 0	J	(214)
(25)m= 0.32 0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	1	(25)
(20)	""	_ v.v	00	1 0.20	1 0.20		1 00	00	1 0.0	1 0.0.		( - /
						l	1				<b>4</b>	
3. Heat losses and he	•			NI a t A u				A V 11		leli		A V I-
<b>ELEMENT</b> Gros	•	oaramete Opening m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
<b>ELEMENT</b> Gros	SS	Openin	gs		m²		2K					
<b>ELEMENT</b> Gros	SS	Openin	gs	A ,r	m <sup>2</sup> x <sup>1</sup>	W/m2	2K · 0.04] =	(W/				kJ/K
ELEMENT Gros area Windows Type 1	SS	Openin	gs	A ,r	m² x1 x1	W/m2 /[1/( 1.2 )+	2K $0.04 = 0.04 = 0.04 = 0.04$	(W/ 5.4				kJ/K (27)
ELEMENT Gros area Windows Type 1 Windows Type 2	SS	Openin	gs	A ,r 4.72 2.29	m <sup>2</sup> x1 x1 x1	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+	2K $0.04 = 0.$	(W/ 5.4 2.62				kJ/K (27) (27)
ELEMENT Gros area Windows Type 1 Windows Type 2 Windows Type 3	ss (m²)	Openin	gs 2	A ,r 4.72 2.29 4.51	m <sup>2</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K $0.04 = 0.$	(W/ 5.4 2.62 5.16				kJ/K (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	ss (m²)	Openin m	gs 2	A ,r 4.72 2.29 4.51 2.26	m <sup>2</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K · 0.04] =   · 0.04] =   · 0.04] =	(W/ 5.4 2.62 5.16 2.59				(27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type1  67.2	ss (m²)	Opening m	gs 2	A ,r 4.72 2.29 4.51 2.26 46.5	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =	(W/ 5.4 2.62 5.16 2.59 8.37				(27) (27) (27) (27) (27) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type1 Walls Type2  55.8	29 39	20.79	gs 2	A ,r 4.72 2.29 4.51 2.26 46.5 55.89	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =	(W/ 5.4 2.62 5.16 2.59 8.37 12.62				(27) (27) (27) (27) (27) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type1 Walls Type2 Roof Type1 4.2	29 39 4	20.79 0	gs 2	A ,r 4.72 2.29 4.51 2.26 46.5 55.89 4.24	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =	(W/ 5.4 2.62 5.16 2.59 8.37 12.62 0.55				(27) (27) (27) (27) (29) (29) (30)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type1 Walls Type2 Roof Type1 Roof Type2 71.	29 39 4	20.79 0	gs 2	A ,r  4.72  2.29  4.51  2.26  46.5  55.89  4.24  71.14	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =	(W/ 5.4 2.62 5.16 2.59 8.37 12.62 0.55 9.25				(27) (27) (27) (27) (29) (29) (30) (30) (31)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type 1 Walls Type 2 S5.8 Roof Type 1 A.2 Roof Type 2 Total area of elements Party wall * for windows and roof wind	29 39 4 14 5, m <sup>2</sup>	20.79 0 0 ffective win	gs 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	A ,r  4.72  2.29  4.51  2.26  46.5  55.89  4.24  71.14  198.5  69.63  alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	(W/ 5.4 2.62 5.16 2.59 8.37 12.62 0.55 9.25	K)	kJ/m²-	к 	(27) (27) (27) (27) (29) (29) (30) (30)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type 1 Walls Type 2 S5.8 Roof Type 1 Roof Type 2 Total area of elements Party wall * for windows and roof wind ** include the areas on both	29 39 4 14 5, m <sup>2</sup> lows, use e	20.79 0 0 ffective winternal wall	gs 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	A ,r  4.72  2.29  4.51  2.26  46.5  55.89  4.24  71.14  198.5  69.63  alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	(W/ 5.4 2.62 5.16 2.59 8.37 12.62 0.55 9.25	K)	kJ/m²-	K	(27) (27) (27) (27) (29) (29) (30) (30) (31)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type 1 Walls Type 2 Food Type 1  Word Type 2  Walls Type 2  Roof Type 1  Total area of elements Party wall  * for windows and roof wind ** include the areas on both Fabric heat loss, W/K	29 39 4 14 5, m <sup>2</sup> dows, use e	20.79 0 0 ffective winternal wall	gs 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	A ,r  4.72  2.29  4.51  2.26  46.5  55.89  4.24  71.14  198.5  69.63  alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K · 0.04] =   · 0.04] =   · 0.04] =   · 0.04] =   =   =   =   //[(1/U-value) ) + (32) =	(W/ 5.4 2.62 5.16 2.59 8.37 12.62 0.55 9.25	K)	kJ/m²-	h 3.2	(27) (27) (27) (27) (29) (30) (31) (32)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type 1  Walls Type 2  Roof Type 2  Total area of elements Party wall  * for windows and roof wind ** include the areas on both Fabric heat loss, W/K Heat capacity Cm = Si	29 39 4 14 5, m <sup>2</sup> lows, use e a sides of in = S (A x (A x k)	20.79 0 0 ffective wir	gs 2 Indow U-va s and part	A ,r  4.72  2.29  4.51  2.26  46.5  55.89  4.24  71.14  198.5  69.63  alue calcultitions	x1 x1 x1 x1 x x x x x x x x x x x x x x	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =   -   -   -   -   -   -   -   -	(W/ 5.4 2.62 5.16 2.59 8.37 12.62 0.55 9.25 0 ue)+0.04] a	K)	kJ/m²-	h 3.2 54.59	(27) (27) (27) (27) (29) (29) (30) (30) (31) (32)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type 1 Walls Type 2 Food Type 1  Walls Type 2  Roof Type 2  Total area of elements Party wall  * for windows and roof wind ** include the areas on both Fabric heat loss, W/K Heat capacity Cm = Si Thermal mass parame	29 39 4 14 5, m <sup>2</sup> lows, use e a sides of in = S (A x (A x k ) eter (TMF	Opening m  20.79 0 0 0 ffective winternal wall U)  P = Cm ÷	gs 2 3 3 3 3 4 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	A ,r  4.72  2.29  4.51  2.26  46.5  55.89  4.24  71.14  198.5  69.63  alue calcul titions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =    - 0.04]	(W/ 5.4 2.62 5.16 2.59 8.37 12.62 0.55 9.25 0 ue)+0.04] a	K)  as given in  2) + (32a)	kJ/m²-	h 3.2	kJ/K (27) (27) (27) (29) (30) (30) (31) (32)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Walls Type 1  Walls Type 2  Roof Type 2  Total area of elements Party wall  * for windows and roof wind ** include the areas on both Fabric heat loss, W/K Heat capacity Cm = Si	29 39 4 14 3, m² lows, use end sides of interpretation (A x k) eter (TMF) here the definition of the d	Opening m  20.79  0  0  ffective win ternal wall U)  P = Cm ÷ tails of the	gs 2 3 3 3 3 4 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	A ,r  4.72  2.29  4.51  2.26  46.5  55.89  4.24  71.14  198.5  69.63  alue calcul titions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =    - 0.04]	(W/ 5.4 2.62 5.16 2.59 8.37 12.62 0.55 9.25 0 ue)+0.04] a	K)  as given in  2) + (32a)	kJ/m²-	h 3.2 54.59	(27) (27) (27) (27) (29) (29) (30) (30) (31) (32)

if details of therm	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total fabric he	at loss							(33) +	(36) =			75.37	(37)
Ventilation hea	at loss ca	alculated	l monthly	/				(38)m	$= 0.33 \times ($	(25)m x (5)		Ī	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 34.47	34.13	33.78	32.06	31.71	29.99	29.99	29.64	30.68	31.71	32.4	33.09		(38)
Heat transfer	coefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m= 109.84	109.5	109.15	107.43	107.08	105.36	105.36	105.01	106.05	107.08	107.77	108.46		
Heat loss para	ameter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> , - (4)	12 /12=	107.34	(39)
(40)m= 0.95	0.94	0.94	0.92	0.92	0.91	0.91	0.9	0.91	0.92	0.93	0.93		
									Average =	Sum(40) <sub>1</sub>	12 /12=	0.92	(40)
Number of day	ys in mor	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	tina ener	rav reaui	rement:								kWh/ye	ear:	
Assumed occi			[4	( 0 0000	140 v /TF	-	\0\1 · 0 (	2042 v /	TEA 40		85		(42)
if TFA > 13. if TFA £ 13.		+ 1.76 X	[1 - exp	(-0.0003	349 X (11	-A -13.9	)2)] + 0.0	JU13 X (	IFA -13.	.9)			
Annual average	•	ater usad	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		10	1.82		(43)
Reduce the annu-	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		1.02	I	( - /
not more that 125	litres per p	person per	day (all w	ater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)			_	_		
(44)m= 112	107.93	103.86	99.78	95.71	91.64	91.64	95.71	99.78	103.86	107.93	112		
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1221.83	(44)
(45)m= 166.09	145.27	149.9	130.69	125.4	108.21	100.27	115.06	116.44	135.7	148.12	160.85		
					Į.		1	-	rotal = Su	m(45) <sub>112</sub> =	! =	1602.01	(45)
If instantaneous v	vater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)	) to (61)					_
(46)m= 24.91	21.79	22.49	19.6	18.81	16.23	15.04	17.26	17.47	20.35	22.22	24.13		(46)
Water storage					•	•	•	•	•		•	•	
Storage volum	ne (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•			_			• •						
Otherwise if n		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage		a alara d I	aaa faat	or io kno	(Id\A/k	2/d0x/\					_	l	(40)
a) If manufac				DI IS KIIO	WII (KVVI	i/day).					0		(48)
Temperature f											0		(49)
Energy lost fro		•	-		aria nat		(48) x (49)	) =		1	10		(50)
b) If manufact Hot water stor			-								00	1	(51)
If community h	_			0 2 (100)	11/11110/00	<b>4 y</b> <i>)</i>				0.	02	l	(31)
Volume factor	-									1.	03		(52)
												i	( - /
Temperature f	actor fro	m Table	2b							0	.6		(53)
·				ear			(47) x (51)	) x (52) x (	53) =				, ,
Energy lost fro Enter (50) or	om water	storage		ear			(47) x (51)	) x (52) x (	53) =	1.	.6 03 03		(53) (54) (55)

	calculated	for each	month			((56)m = (	55) × (41)r	m				
(56)m= 32.01 28.	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains ded	ated solar sto	orage, (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= 32.01 28.	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) fr	om Table	3							0		(58)
Primary circuit loss	calculated	for each	month (	59)m = (	(58) ÷ 36	5 × (41)	m				•	
(modified by fact	or from Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26 21.	1 23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calcula	ed for each	n month (	(61)m =	(60) ÷ 36	65 × (41)	m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat required	for water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 221.37 195	19 205.18	184.18	180.68	161.7	155.55	170.34	169.93	190.97	201.62	216.13		(62)
Solar DHW input calcul	ted using Apr	pendix G o	Appendix	H (negati	ve quantity	) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additional line	if FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water	neater								<u>.</u>	!	•	
(64)m= 221.37 195		184.18	180.68	161.7	155.55	170.34	169.93	190.97	201.62	216.13		
L		!		<u> </u>		Outp	out from wa	ater heate	<u>.                                    </u>	12	2252.85	(64)
Heat gains from wa	ter heating	. kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	nl + 0.8 x	([(46)m	+ (57)m	+ (59)m	1	-
(65)m= 99.45 88.	<del></del>	86.25	85.92	78.77	77.56	82.48	81.51	89.34	92.05	97.71	ĺ	(65)
include (57)m in	 ralculation	of (65)m	only if c	vlinder i	s in the o	lwelling Iwelling	or hot w	ater is fr	om com	nunity h	l Jeating	
5. Internal gains		. ,	o, o	yao		g	0	a.oo	0		9	
o. Internal gains		5 and 5a	١-									
<b>.</b>			):									
Metabolic gains (T	ıble 5), Wa	tts		lun	1, ,1	Aug	Con	Oct	Nov	Doo		
Jan F	ble 5), Wa	tts Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec 142.36		(66)
(66)m=	able 5), War ab Mar 36 142.36	Apr 142.36	May 142.36	142.36	142.36	142.36	142.36	Oct 142.36	Nov 142.36	Dec 142.36		(66)
Jan         F           (66)m=         142.36         142           Lighting gains (calcollection)         142         142	ble 5), Wa b Mar 36 142.36 ulated in A	Apr 142.36 ppendix	May 142.36 L, equat	142.36 ion L9 o	142.36 r L9a), a	142.36 Iso see	142.36 Table 5	142.36	142.36	142.36		, ,
Jan   F	ble 5), War b Mar 36 142.36 ulated in A 67 18.44	Apr 142.36 ppendix 13.96	May 142.36 L, equati	142.36 ion L9 o 8.81	142.36 r L9a), a 9.52	142.36 Iso see	142.36 Table 5	142.36 21.09				(66) (67)
Jan     F       (66)m=     142.36     142       Lighting gains (cale     (67)m=     25.53     22       Appliances gains (	able 5), War b Mar 36 142.36 ulated in A 67 18.44	Apr 142.36 ppendix 13.96	May 142.36 L, equati 10.44 dix L, eq	142.36 ion L9 o 8.81 uation L	142.36 r L9a), a 9.52 13 or L1	142.36 Iso see 12.37 3a), also	142.36 Table 5 16.61 see Tal	142.36 21.09 ble 5	142.36 24.61	142.36 26.24		(67)
Jan F (66)m= 142.36 142 Lighting gains (calc (67)m= 25.53 22 Appliances gains ( (68)m= 280.11 283	ble 5), War b Mar 36 142.36 ulated in A 67 18.44 alculated in 02 275.69	Apr 142.36 ppendix 13.96 Append 260.1	May 142.36 L, equati 10.44 dix L, eq 240.42	142.36 ion L9 o 8.81 uation L 221.92	142.36 r L9a), a 9.52 13 or L1 209.56	142.36 Iso see 12.37 3a), also 206.65	142.36 Table 5 16.61 see Tal 213.98	21.09 ble 5 229.57	142.36	142.36		, ,
Jan     F       (66)m=     142.36     142       Lighting gains (cale     (67)m=     25.53     22       Appliances gains (	ble 5), War b Mar 36 142.36 ulated in A 67 18.44 alculated in 02 275.69	Apr 142.36 ppendix 13.96 Append 260.1	May 142.36 L, equati 10.44 dix L, eq 240.42	142.36 ion L9 of 8.81 uation L 221.92 ion L15	142.36 r L9a), a 9.52 13 or L1 209.56	142.36 Iso see 12.37 3a), also 206.65	142.36 Table 5 16.61 see Tal 213.98	21.09 ble 5 229.57	142.36 24.61	142.36 26.24		(67) (68)
Jan F (66)m= 142.36 142 Lighting gains (calc (67)m= 25.53 22 Appliances gains ( (68)m= 280.11 283	ble 5), War b Mar 36 142.36 ulated in A 67 18.44 calculated in 02 275.69	Apr 142.36 ppendix 13.96 Append 260.1	May 142.36 L, equati 10.44 dix L, eq 240.42	142.36 ion L9 o 8.81 uation L 221.92	142.36 r L9a), a 9.52 13 or L1 209.56	142.36 Iso see 12.37 3a), also 206.65	142.36 Table 5 16.61 see Tal 213.98	21.09 ble 5 229.57	142.36 24.61	142.36 26.24		(67)
Jan F (66)m= 142.36 142 Lighting gains (calc (67)m= 25.53 22 Appliances gains ( (68)m= 280.11 283 Cooking gains (calc	ble 5), War b Mar 36 142.36 ulated in A 37 18.44 calculated in 02 275.69 culated in A 24 37.24	Apr 142.36 ppendix 13.96 n Appendix 260.1 ppendix 37.24	May 142.36 L, equati 10.44 dix L, eq 240.42 L, equat	142.36 ion L9 of 8.81 uation L 221.92 ion L15	142.36 r L9a), a 9.52 13 or L1 209.56 or L15a)	142.36 Iso see 12.37 3a), also 206.65	142.36 Table 5 16.61 0 see Tal 213.98 ee Table	142.36 21.09 ble 5 229.57 5	142.36 24.61 249.25	142.36 26.24 267.75		(67) (68)
Jan   F	ble 5), War h Mar h 142.36  ulated in A h 18.44 halculated ii h 27 h 275.69  culated in A h 37.24 h 37.24 h 37.24	Apr 142.36 ppendix 13.96 n Appendix 260.1 ppendix 37.24	May 142.36 L, equati 10.44 dix L, eq 240.42 L, equat	142.36 ion L9 of 8.81 uation L 221.92 ion L15	142.36 r L9a), a 9.52 13 or L1 209.56 or L15a)	142.36 Iso see 12.37 3a), also 206.65	142.36 Table 5 16.61 0 see Tal 213.98 ee Table	142.36 21.09 ble 5 229.57 5	142.36 24.61 249.25	142.36 26.24 267.75		(67) (68)
Jan F (66)m= 142.36 142 Lighting gains (calc (67)m= 25.53 22 Appliances gains ( (68)m= 280.11 283 Cooking gains (calc (69)m= 37.24 37 Pumps and fans ga	ble 5), War had Mar had 142.36  ulated in A had 18.44 had ladeled in A had 27 had 37.24 had 37.24 had 1000 had 18.44	Apr 142.36 ppendix 13.96 n Append 260.1 ppendix 37.24 5a) 0	May 142.36 L, equati 10.44 dix L, equ 240.42 L, equat 37.24	142.36 ion L9 of 8.81 uation L 221.92 tion L15 37.24	142.36 r L9a), a 9.52 13 or L1: 209.56 or L15a) 37.24	142.36 Iso see 1 12.37 3a), also 206.65 , also se 37.24	142.36 Table 5 16.61 see Tal 213.98 ee Table 37.24	21.09 ble 5 229.57 5 37.24	142.36 24.61 249.25 37.24	26.24 267.75 37.24		(67) (68) (69)
Jan   F	ble 5), War b Mar alculated in A alc	Apr 142.36 ppendix 13.96 Appendix 260.1 Appendix 37.24 5a) 0 utive value	May 142.36 L, equati 10.44 dix L, equ 240.42 L, equat 37.24	142.36 ion L9 of 8.81 uation L 221.92 tion L15 37.24	142.36 r L9a), a 9.52 13 or L1: 209.56 or L15a) 37.24	142.36 Iso see 1 12.37 3a), also 206.65 , also se 37.24	142.36 Table 5 16.61 see Tal 213.98 ee Table 37.24	21.09 ble 5 229.57 5 37.24	142.36 24.61 249.25 37.24	26.24 267.75 37.24		(67) (68) (69)
Jan F (66)m= 142.36 142 Lighting gains (calc (67)m= 25.53 22 Appliances gains ( (68)m= 280.11 283 Cooking gains (calc (69)m= 37.24 37 Pumps and fans ga (70)m= 0 ( Losses e.g. evapor (71)m= -113.89 -113	ble 5), War b Mar 36 142.36 ulated in A 37 18.44 calculated in A 24 37.24 ins (Table a 3 13.89	Apr 142.36 ppendix 13.96 Appendix 260.1 Appendix 37.24 5a) 0 utive value	May 142.36 L, equati 10.44 dix L, equati 240.42 L, equati 37.24  0 es) (Tab	142.36 ion L9 o 8.81 uation L 221.92 ion L15 37.24  0 lle 5)	142.36 r L9a), a 9.52 13 or L1 209.56 or L15a) 37.24	142.36 Iso see 12.37 3a), also 206.65 , also se 37.24	142.36 Table 5 16.61 see Tal 213.98 ee Table 37.24	142.36  21.09 ble 5  229.57  5  37.24	142.36 24.61 249.25 37.24	142.36 26.24 267.75 37.24		(67) (68) (69) (70)
Jan F  (66)m= 142.36 142  Lighting gains (calc (67)m= 25.53 22  Appliances gains ( (68)m= 280.11 283  Cooking gains (calc (69)m= 37.24 37.  Pumps and fans ga (70)m= 0 (calc (cosses e.g. evapor	ble 5), War b Mar 36 142.36 ulated in A 37 18.44 calculated in A 24 37.24 ins (Table 0 ation (nega 89 -113.89	Apr 142.36 ppendix 13.96 Appendix 260.1 ppendix 37.24 5a) 0 tive valu -113.89	May 142.36 L, equati 10.44 dix L, equati 240.42 L, equati 37.24  0 es) (Tab	142.36 ion L9 o 8.81 uation L 221.92 ion L15 37.24  0 lle 5)	142.36 r L9a), a 9.52 13 or L1 209.56 or L15a) 37.24	142.36 Iso see 12.37 3a), also 206.65 , also se 37.24	142.36 Table 5 16.61 see Tal 213.98 ee Table 37.24	142.36  21.09 ble 5  229.57  5  37.24	142.36 24.61 249.25 37.24	142.36 26.24 267.75 37.24		(67) (68) (69) (70)
Jan F  (66)m= 142.36 142  Lighting gains (calc (67)m= 25.53 22  Appliances gains ( (68)m= 280.11 283  Cooking gains (calc (69)m= 37.24 37  Pumps and fans gains (70)m= 0 0  Losses e.g. evapor (71)m= -113.89 -113  Water heating gains (72)m= 133.67 131	ble 5), War b Mar 36 142.36 ulated in A 67 18.44 calculated in 02 275.69 culated in A 24 37.24 ins (Table a 0 ation (nega 89 -113.89 s (Table 5) 31 126.43	Apr 142.36 ppendix 13.96 Appendix 260.1 ppendix 37.24 5a) 0 tive valu -113.89	May 142.36 L, equati 10.44 dix L, equ 240.42 L, equat 37.24  0 es) (Tab	142.36 ion L9 o 8.81 uation L 221.92 ion L15 37.24  0 lle 5) -113.89	142.36 r L9a), a 9.52 13 or L1 209.56 or L15a) 37.24 0 -113.89	142.36 Iso see 12.37 3a), also 206.65 , also se 37.24 0	142.36 Table 5 16.61 See Tal 213.98 ee Table 37.24 0	142.36  21.09 ble 5  229.57  5  37.24  0  -113.89	142.36 24.61 249.25 37.24 0 -113.89	142.36 26.24 267.75 37.24 0		(67) (68) (69) (70) (71)
Jan F  (66)m= 142.36 142  Lighting gains (calc (67)m= 25.53 22  Appliances gains ( (68)m= 280.11 283  Cooking gains (calc (69)m= 37.24 37  Pumps and fans gains (70)m= 0 (71)m= -113.89 -113  Water heating gain	ble 5), War b Mar 36 142.36  ulated in A 37 18.44  calculated in A 24 37.24  ins (Table 1)  ation (negatio	Apr 142.36 ppendix 13.96 Appendix 260.1 ppendix 37.24 5a) 0 tive valu -113.89	May 142.36 L, equati 10.44 dix L, equ 240.42 L, equat 37.24  0 es) (Tab	142.36 ion L9 o 8.81 uation L 221.92 ion L15 37.24  0 lle 5) -113.89	142.36 r L9a), a 9.52 13 or L1 209.56 or L15a) 37.24 0 -113.89	142.36 Iso see 12.37 3a), also 206.65 , also se 37.24 0	142.36 Table 5 16.61 see Tal 213.98 ee Table 37.24 0 -113.89	142.36  21.09 ble 5  229.57  5  37.24  0  -113.89	142.36 24.61 249.25 37.24 0 -113.89	142.36 26.24 267.75 37.24 0		(67) (68) (69) (70) (71)

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

Orientation	n:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East (	).9x	1	X	4.51	x	19.64	x	0.5	x	0.7	] =	21.48	(76)
East (	).9x	1	x	2.26	x	19.64	x	0.5	x	0.7	<b>=</b>	10.77	(76)
East (	).9x	1	x	4.51	x	38.42	x	0.5	x	0.7	<u> </u>	42.03	(76)
East (	).9x	1	x	2.26	x	38.42	х	0.5	x	0.7	] =	21.06	(76)
East (	).9x	1	x	4.51	x	63.27	x	0.5	x	0.7	<b>=</b>	69.21	(76)
East (	).9x	1	x	2.26	X	63.27	X	0.5	x	0.7	=	34.68	(76)
East (	).9x	1	x	4.51	X	92.28	x	0.5	x	0.7	=	100.95	(76)
East (	).9x	1	x	2.26	x	92.28	x	0.5	x	0.7	=	50.58	(76)
East (	).9x	1	x	4.51	x	113.09	x	0.5	x	0.7	=	123.71	(76)
East (	).9x	1	x	2.26	x	113.09	x	0.5	x	0.7	=	61.99	(76)
East (	).9x	1	x	4.51	x	115.77	x	0.5	x	0.7	=	126.64	(76)
East (	).9x	1	x	2.26	x	115.77	x	0.5	x	0.7	=	63.46	(76)
East (	).9x	1	x	4.51	x	110.22	x	0.5	x	0.7	=	120.57	(76)
East (	).9x	1	x	2.26	x	110.22	x	0.5	x	0.7	=	60.42	(76)
East (	).9x	1	x	4.51	x	94.68	x	0.5	x	0.7	=	103.57	(76)
East (	).9x	1	x	2.26	x	94.68	x	0.5	x	0.7	=	51.9	(76)
East (	).9x	1	x	4.51	x	73.59	x	0.5	x	0.7	=	80.5	(76)
East (	).9x	1	x	2.26	x	73.59	x	0.5	x	0.7	=	40.34	(76)
East (	).9x	1	x	4.51	x	45.59	x	0.5	x	0.7	=	49.87	(76)
East (	).9x	1	x	2.26	x	45.59	x	0.5	x	0.7	=	24.99	(76)
East (	).9x	1	x	4.51	x	24.49	x	0.5	x	0.7	=	26.79	(76)
East (	).9x	1	x	2.26	X	24.49	X	0.5	X	0.7	=	13.42	(76)
East (	).9x	1	X	4.51	X	16.15	X	0.5	X	0.7	=	17.67	(76)
East (	).9x	1	X	2.26	X	16.15	X	0.5	X	0.7	=	8.85	(76)
West (	).9x	0.77	X	4.72	X	19.64	X	0.5	X	0.7	=	44.97	(80)
West (	).9x	0.77	X	2.29	x	19.64	x	0.5	X	0.7	=	21.82	(80)
West (	).9x	0.77	X	4.72	X	38.42	X	0.5	X	0.7	=	87.97	(80)
West (	).9x	0.77	X	2.29	X	38.42	X	0.5	X	0.7	=	42.68	(80)
West (	).9x	0.77	X	4.72	x	63.27	x	0.5	x	0.7	=	144.87	(80)
West (	).9x	0.77	X	2.29	X	63.27	X	0.5	X	0.7	=	70.29	(80)
West (	).9x	0.77	X	4.72	x	92.28	x	0.5	X	0.7	=	211.29	(80)
West (	).9x	0.77	X	2.29	x	92.28	x	0.5	X	0.7	=	102.51	(80)
West (	).9x	0.77	X	4.72	x	113.09	x	0.5	X	0.7	=	258.95	(80)
West (	).9x	0.77	X	2.29	X	113.09	X	0.5	X	0.7	=	125.63	(80)
West (	).9x	0.77	X	4.72	X	115.77	X	0.5	X	0.7	=	265.08	(80)
West (	).9x	0.77	X	2.29	X	115.77	x	0.5	X	0.7	=	128.61	(80)
West (	).9x	0.77	X	4.72	x	110.22	x	0.5	x	0.7	=	252.36	(80)
West (	).9x	0.77	X	2.29	x	110.22	x	0.5	x	0.7	=	122.44	(80)
West (	).9x	0.77	X	4.72	x	94.68	X	0.5	X	0.7	] =	216.78	(80)

West	0.9x	0.77	X	2.2	29	x	9	4.68	X		0.5	X	0.7	=	105.17	(80)
West	0.9x	0.77	Х	4.7	72	x	7	3.59	X		0.5	x [	0.7	=	168.5	(80)
West	0.9x	0.77	X	2.2	29	x	7	3.59	X		0.5	x	0.7	=	81.75	(80)
West	0.9x	0.77	X	4.7	72	x	4	5.59	x		0.5	x [	0.7	=	104.38	(80)
West	0.9x	0.77	Х	2.2	29	x	4	5.59	X		0.5	x [	0.7	=	50.64	(80)
West	0.9x	0.77	X	4.7	72	x	2	4.49	x		0.5	x [	0.7	=	56.07	(80)
West	0.9x	0.77	X	2.2	29	x	2	4.49	x		0.5	x [	0.7	=	27.2	(80)
West	0.9x	0.77	х	4.7	72	x	1	6.15	x		0.5	x	0.7	=	36.98	(80)
West	0.9x	0.77	x	2.2	29	x	1	6.15	x		0.5	x	0.7	=	17.94	(80)
	_					•								<del></del>		<del></del>
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m			_	
(83)m=	99.04	193.74	319.06	465.33	570.28	58	33.79	555.79	477	.41	371.08	229.89	123.49	81.44		(83)
Total g	ains – ir	nternal a	nd solai	(84)m =	= (73)m ·	+ (8	33)m	, watts	_						_	
(84)m=	604.05	696.45	805.33	924.89	1002.32	98	39.63	944.82	873	.01	780.58	666.33	590.9	572.47		(84)
7. Me	an inter	nal temp	erature	(heating	season	)										
Temp	erature	during h	eating p	eriods ir	n the livii	ng a	area f	from Tab	ole 9	, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(se	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May	,	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	0.97	0.96	0.93	0.86	0.75		0.6	0.46	0.5	51	0.73	0.9	0.96	0.98		(86)
Mean	interna	temper	ature in	living ar	ea T1 (fo	ollo:	w ste	ns 3 to 7	in T	able	e 9c)		•	•	_	
(87)m=	18.94	19.19	19.62	20.16	20.59	_	0.86	20.95	20.	_	20.72	20.14	19.45	18.9	7	(87)
Tomp	oroturo	during h	ooting r	oriodo i	root of	طيد	ماانم	from To	مام (		22 (°C)		1	l	_	
(88)m=	20.13	20.13	20.13	20.15	20.15	_	0.16	20.16	20.	$\overline{}$	20.16	20.15	20.14	20.14	7	(88)
					<u> </u>	<u> </u>			<u> </u>		20.10		1			()
					welling,	_			<del>_</del>	10 1	0.07	0.00	1 000	0.07	7	(00)
(89)m=	0.97	0.95	0.92	0.84	0.71		).54	0.38	0.4	+3	0.67	0.88	0.96	0.97		(89)
			r	r	of dwelli	Ť	<u> </u>		<del>i                                     </del>	$\overline{}$		<u> </u>	,		7	
(90)m=	17.34	17.7	18.32	19.09	19.68	2	0.03	20.13	20.	11	19.87	19.09	18.09	17.29		(90)
											f	LA = Livii	ng area ÷ (	4) =	0.26	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling	g) = fl	_A × T1	+ (1	– fL	A) × T2				_	
(92)m=	17.76	18.09	18.66	19.37	19.92	2	0.25	20.35	20.	33	20.1	19.37	18.45	17.72		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	atu	re fro	m Table	4e,	whe	re appro	priate	•		_	
(93)m=	17.76	18.09	18.66	19.37	19.92	2	0.25	20.35	20.	33	20.1	19.37	18.45	17.72		(93)
•			uirement													
				•		ed	at ste	ep 11 of	Tabl	le 9b	o, so tha	t Ti,m=	(76)m an	d re-cal	culate	
ine ui	Jan	Feb	or gains Mar	Apr	May	Γ	Jun	Jul	Ι	ug	Sep	Oct	Nov	Dec	1	
Utilisa			ains, hm	<u> </u>	Iviay	<u></u>	Juli	Jui		ug [	Sep	Oct	INOV	Dec		
(94)m=	0.96	0.94	0.9	0.82	0.7	C	).54	0.4	0.4	15	0.67	0.86	0.94	0.96	1	(94)
			, W = (9	l	L 4)m	<u> </u>			<u> </u>				<u> </u>	<u> </u>	_	
(95)m=	578	652.53	722.1	756.8	701.51	53	36.99	377.98	389	.53	523.27	574.03	554.38	550.84	]	(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able	e 8	I					1	1	_	
(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 mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m	x [(9	3)m-	– (96)m	]			_	
(97)m=	1478.47	1444.48	1327.31	1125.29	880.2	59	94.84	394.61	412	.85	636.05	938.75	1223.31	1465.9		(97)
'																

Space heating requir	ement fo	or each n	nonth, kV	Vh/mon	th = 0.0	24 x [(97	')m – (9	5)m] x (4	1)m		
(98)m= 669.94 532.19	450.28	265.31	132.94	0	0	0	0	271.35	481.63 680.8		
						Tota	al per yea	r (kWh/yeai	r) = Sum(98) <sub>15,912</sub> =	3484.45	(98)
Space heating requir	ement in	kWh/m²	²/year							30	(99)
9b. Energy requireme			Ĭ								
This part is used for s Fraction of space hea									unity scheme.	0	(301)
Fraction of space hea	t from co	mmunity	system	1 – (30	1) =					1	(302)
The community scheme ma	•							up to four	other heat sources; th	he latter	
Fraction of heat from	-			,		7-7-				0.5	(303a)
Fraction of community	heat fro	m heat s	source 2							0.5	(303b)
Fraction of total space	heat fro	m Comn	nunity he	at pum	р			(3	02) x (303a) =	0.5	(304a)
Fraction of total space	heat fro	m comm	nunity hea	at sourc	ce 2			(3	02) x (303b) =	0.5	(304b)
Factor for control and	charging	method	l (Table 4	lc(3)) fc	r comm	unity hea	ating sys	stem		1	(305)
Distribution loss factor	(Table 1	12c) for (	communi	ty heati	ng syste	em				1.05	(306)
Space heating									Ī	kWh/yea	<u>r</u>
Annual space heating	•									3484.45	<b>_</b>
Space heat from Com	•	•	р						5) x (306) =	1829.34	(307a)
Space heat from heat					. 0/ /	<b>-</b>			5) x (306) =	1829.34	(307b)
Efficiency of secondar		•	•	•	,				, i	0	(308
Space heating require	ment fro	m secon	idary/sup	plemen	itary sys	stem	(98) x (3	301) x 100 ·	÷ (308) =	0	(309)
Water heating Annual water heating	requirem	ent								2252.85	7
If DHW from commun Water heat from Com	•		2				(64) y (3	2022) v (20	5) x (306) =	4400.75	
Water heat from heat	•		J						5) x (306) =	1182.75	(310b)
Electricity used for he						0.01			· (310a)(310e)] =	60.24	(313)
Cooling System Energ			0			0.01	× [(5074	)(5070) 1	(0100)(0100)] =	0	(314)
Space cooling (if there		•		if not	enter (1)		= (107)	÷ (314) =		0	(315)
Electricity for pumps a					,		-(107)	. (014) =		0	(010)
mechanical ventilation						outside				420.42	(330a)
warm air heating syste	em fans									0	(330b)
pump for solar water h	neating									0	(330g)
Total electricity for the	above, I	kWh/yea	ır				=(330a)	+ (330b) +	(330g) =	420.42	(331)
Energy for lighting (ca	Iculated i	in Apper	ndix L)							450.84	(332)
Electricity generated by	y PVs (A	Appendix	(M) (neg	ative qu	uantity)					-708.9	(333)

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 (%) 425 (367a) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 2 (%) (367b) 91 CO2 associated with heat source 1  $[(307b)+(310b)] \times 100 \div (367b) \times$ (367)0.52 367.83 CO2 associated with heat source 2  $[(307b)+(310b)] \times 100 \div (367b) \times$ (368)0.22 714.96 Electrical energy for heat distribution [(313) x (372)0.52 31.27 Total CO2 associated with community systems (363)...(366) + (368)...(372)(373)1114.05 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 (376)(373) + (374) + (375) =1114.05 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378)0.52 218.2 CO2 associated with electricity for lighting (379)(332))) x 0.52 233.99 Energy saving/generation technologies (333) to (334) as applicable x 0.01 =Item 1 (380) 0.52 -367.92 sum of (376)...(382) = Total CO2, kg/year (383)1198.31  $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)10.32

El rating (section 14)

90.04

(385)

			5							
			User D	etails:						
Assessor Name:	Joseph Treand			Strom	a Num	ber:			032062	
Software Name:	Stroma FSAP	2012		Softwa	are Ve	rsion:		Versio	n: 1.0.4.14	
				Address	: P13					
Address :	, Gondar Garde	ns, London, N	1W6 1F	HG						
Overall dwelling dimens	nsions:		_							
Ground floor			_	a(m²) 5.86	(1a) x	Av. Hei	ght(m) 55	(2a) =	Volume(m³)	(3a)
First floor				8.47	(1b) x		3		265.41	](3b)
Total floor area TFA = (1a	)\_(1b)\_(1c)\_(1d)-	۱(1۵) بـ (1n)		34.33	<u>.</u>		<u> </u>	(20) =	205.41	
·	()+(1b)+(1c)+(1d)	r(16)+(111)	1.	34.33	(4)	) (a ) (a !	\	(a.)		_
Dwelling volume					(3a)+(3b	)+(3c)+(3d)	)+(3e)+	(3n) =	382.35	(5)
2. Ventilation rate:		_								
	main heating	secondary heating	<i>'</i>	other		total			m³ per hour	
Number of chimneys	0		] + [	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0	0	+ [	0	_ = [	0	X	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 fir	es					0	X	40 =	0	(7c)
					_		<del></del>	۸ : ام		_
Infiltration due to chimne	ro fluor and fano	(6a) ((6b) (7a	s)	7c) –	Г		_	ī	anges per ho	_
Infiltration due to chimney  If a pressurisation test has be	•				continue fr	0 rom (9) to (		÷ (5) =	0	(8)
Number of storeys in th		ioriada, produca	10 (11),	5410111100	oonanao n	0111 (0) 10 (	. 0)		0	(9)
Additional infiltration	3 ( )						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or tim	ber frame or	0.35 foı	r mason	ry consti	ruction			0	(11)
if both types of wall are pro deducting areas of opening			the great	er wall are	ea (after			'		_
If suspended wooden fl			1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else ente	r 0							0	(13)
Percentage of windows	and doors draugl	nt stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	100] =		-	0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13) +	- (15) =		0	(16)
Air permeability value, o	q50, expressed in	cubic metres	per ho	our per s	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabili	ty value, then (18)	$= [(17) \div 20] + (8)$	), otherwi	ise (18) =	(16)				0.15	(18)
Air permeability value applies		st has been done	or a deg	gree air pe	ermeability	is being us	sed			_
Number of sides sheltered	b			(20) 4	10.075 × //	10\]			2	(19)
Shelter factor					[0.075 x (*	19)] =			0.85	(20)
Infiltration rate incorporati				(21) = (18	o) x (20) =				0.13	(21)
Infiltration rate modified fo	<del></del>	1 1		l .	<u> </u>					
		lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7									

4.9

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
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	•					- 	(220
If exhaust air he			endix N (2	3h) = (23a	a) × Fmv (e	equation (	N5)) othe	rwise (23h	n) = (23a)			0.5	(23a) (23b)
If balanced with									(200)			68.85	(230)
a) If balance		•	•	_		,		•	2h)m + (	23h) <b>x</b> [	1 – (23c)		(230)
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(24a)
b) If balance	d mecha	anical ve	entilation	without	heat red	covery (I	л МV) (24k	p)m = (2)	2b)m + (	23b)	Į	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24b
c) If whole h	ouse ex	tract ver	ntilation o	or positiv	e input	ventilatio	on from (	outside				1	
if (22b)m				-	-				.5 × (23b	o)		_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural													
if (22b)m		<del>`</del>	<u> </u>		<u> </u>	<del>'</del>	<del></del>	<del>-                                    </del>	<del></del>	Ι .	Ι.,	1	(244
(24d)m= 0	. 0	0	0	0	0	0	0	0 (2.5)	0	0	0	J	(24d
Effective air (25)m= 0.32	change 0.32	rate - er 0.31	iter (24a 0.3	) or (24b 0.29	0.28 or 0.28	c) or (24 0.28	(d) in bo	x (25) 0.28	0.29	0.3	0.04	1	(25)
(25)m= 0.32	0.32	0.31	0.3	0.29	0.26	0.20	0.27	0.20	0.29	0.3	0.31	J	(23)
3. Heat losses	a and he												
		·											
ELEMENT	Gros area	SS	oaramete Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
<b>ELEMENT</b> Windows Type	Gros area	SS	Openin	gs		m²		2K					
	Gros area e 1	SS	Openin	gs	A ,r	m² x1	W/m2	2K - 0.04] =	(W/				kJ/K
Windows Type	Gros area e 1	SS	Openin	gs	A ,r	m² x1 x1	W/m2 /[1/( 1.2 )+	2K $-0.04] = $ $-0.04] =$	(W/ 5.4				kJ/K (27)
Windows Type	Gros area 1 2 2 3	SS	Openin	gs	A ,r 4.72 2.29	m² x1 x1 x1 x1	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+	2K - 0.04] =   - 0.04] =   - 0.04] =	5.4 2.62				kJ/K (27) (27)
Windows Type Windows Type Windows Type	Gros area 1 2 2 3	SS	Openin	gs	A ,r 4.72 2.29 4.51	m <sup>2</sup> x1 x1 x1 x1 x1	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K - 0.04] =   - 0.04] =   - 0.04] =	5.4 2.62 5.16	K)			kJ/K (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3	ss (m²)	Openin	gs <sup>2</sup>	A ,r 4.72 2.29 4.51 2.26	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K - 0.04] = - 0.04] = - 0.04] = - 0.04] =	5.4 2.62 5.16 2.59	K)			kJ/K (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Floor	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs <sup>2</sup>	A ,r 4.72 2.29 4.51 2.26 16.08	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =	5.4 2.62 5.16 2.59 2.0904	K)			kJ/K (27) (27) (27) (27) (28)
Windows Type Windows Type Windows Type Windows Type Floor Walls Type1	Gros area : 1 : 2 : 2 : 3 : 4	ss (m²)	Openin m	gs <sup>2</sup>	A ,r 4.72 2.29 4.51 2.26 16.08	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =	5.4 2.62 5.16 2.59 2.0904 7.4	K)			kJ/K (27) (27) (27) (27) (28)
Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2	Gros area 1 2 2 3 3 4 4 66.6	ss (m²)	25.5°	gs <sup>2</sup>	A ,r 4.72 2.29 4.51 2.26 16.08 41.11 65.03	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.18	2K - 0.04] = - 0.04] = - 0.04] = - 0.04] = = = = =	(W// 5.4 2.62 5.16 2.59 2.0904 7.4 14.68	K)			kJ/K (27) (27) (27) (27) (28) (29)
Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Type1	Gros area 1 2 2 3 3 4 4 66.6 65.0 4 88.4	SS (m²)	25.5 0	gs <sup>2</sup>	A ,r 4.72 2.29 4.51 2.26 16.08 41.11 65.03	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.18 0.23	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	5.4 2.62 5.16 2.59 2.0904 7.4 14.68 0.52	K)			kJ/K (27) (27) (27) (27) (28) (29) (29)
Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2	Gros area 1 2 2 3 3 4 4 66.6 65.0 4 88.4	SS (m²)	25.5 0	gs <sup>2</sup>	A ,r  4.72  2.29  4.51  2.26  16.08  41.11  65.03  4  88.47	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.18 0.23	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =	5.4 2.62 5.16 2.59 2.0904 7.4 14.68 0.52	K)			kJ/K (27) (27) (27) (27) (28) (29) (29) (30) (30)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of e Party wall * for windows and	Gros area 1 2 2 3 3 4 4 66.6 65.0 4 88.4 elements	65 (m²) 62 03 17 , m²	Openin m  25.5	gs 1 1 Indow U-ve	A ,r  4.72  2.29  4.51  2.26  16.08  41.11  65.03  4  88.47  240.2  51.82  alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.18 0.23 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =   =	(W// 5.4 2.62 5.16 2.59 2.0904 7.4 14.68 0.52 11.5	K)	kJ/m²-	K	kJ/K (27) (27) (27) (28) (29) (30) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of e Party wall *for windows and ** include the area	Gros area 1 2 2 3 3 4 4 66.6 65.0 4 88.4 elements	SS (m²)  33  47  , m²  ows, use e sides of ir	25.5 0 0 0 effective winternal wall	gs 1 1 Indow U-ve	A ,r  4.72  2.29  4.51  2.26  16.08  41.11  65.03  4  88.47  240.2  51.82  alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.13 0.18 0.23 0.13	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =   =   =     =	(W// 5.4 2.62 5.16 2.59 2.0904 7.4 14.68 0.52 11.5	K)	kJ/m²-	K	kJ/K (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of e Party wall * for windows and	Gros area a 1 a 2 a 3 a 4 a 4 a 66.6 a 65.0 a 4 a 88.4 a lements a roof windows on both as, W/K =	SS (m²)  33  47  , m²  ows, use e sides of ir = S (A x	25.5 0 0 0 effective winternal wall	gs 1 1 Indow U-ve	A ,r  4.72  2.29  4.51  2.26  16.08  41.11  65.03  4  88.47  240.2  51.82  alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =   =   =   =   =	(W// 5.4 2.62 5.16 2.59 2.0904 7.4 14.68 0.52 11.5	K)	kJ/m²-	K	kJ/K (27) (27) (27) (28) (29) (30) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of e Party wall * for windows and ** include the area Fabric heat los	Gros area a 1 a 2 a 3 a 4 a 4 a 66.6 a 65.0 a 4 a 88.4 a lements a roof windows on both as, W/K =	SS (m²)  33  47  , m²  ows, use e sides of ir = S (A x	25.5 0 0 0 effective winternal wall	gs 1 1 Indow U-ve	A ,r  4.72  2.29  4.51  2.26  16.08  41.11  65.03  4  88.47  240.2  51.82  alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	2K - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   =   =   =   =   =   =   =	(W// 5.4 2.62 5.16 2.59 2.0904 7.4 14.68 0.52 11.5	K)	kJ/m²-	K	kJ/K (27) (27) (27) (28) (29) (30) (31) (32)

can be used instead of a detailed calculation.

Therm	al bridge	es : S (L	x Y) cal	culated (	using Ap	pendix k	<					[	22.3	(36)
	of therma	0 0	are not kn	own (36) =	= 0.15 x (3	1)			<i>(</i> )			r		_
	abric hea ation hea		alculated	l monthly	y				(33) + (38)m	` '	(25)m x (5)	Į	87.7	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	40.16	39.76	39.36	37.35	36.95	34.94	34.94	34.53	35.74	36.95	37.75	38.55		(38)
Heat tr	ransfer c	oefficier	nt. W/K						(39)m	= (37) + (37)	38)m			
(39)m=	127.86	127.46	127.06	125.05	124.65	122.64	122.64	122.23	123.44	124.65	125.45	126.26		
Heat lo	oss para	meter (H	HLP), W	′m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	124.95	(39)
(40)m=	0.95	0.95	0.95	0.93	0.93	0.91	0.91	0.91	0.92	0.93	0.93	0.94		
, ,									<i>,</i>	Average =	Sum(40) <sub>1</sub>	12 /12=	0.93	(40)
Numbe	er of day	s in mor	nth (Tab	le 1a)										_
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ener	rgy requi	rement:								kWh/ye	ar:	
if TF	ned occu FA > 13.9 FA £ 13.9	9, N = 1		[1 - exp	(-0.0003	49 x (TF	A -13.9	)2)] + 0.0	0013 x (T	ΓFA -13.	.9)	91		(42)
	l averag	•	ater usad	ae in litre	s per da	ıv Vd.av	erage =	(25 x N)	+ 36		10	3.2		(43)
Reduce	the annua	ıl average	hot water	usage by	5% if the a	welling is	designed t			se target o		<u> </u>		(10)
not more	e that 125	litres per p	person pei	day (all w	ater use, l	not and co	ld)							
	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 1	able 1c x	(43)						
(44)m=	113.52	109.4	105.27	101.14	97.01	92.88	92.88	97.01	101.14	105.27	109.4	113.52		_
Energy (	content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,n	n x nm x D	0Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	1238.44	(44)
(45)m=	168.35	147.24	151.94	132.47	127.1	109.68	101.64	116.63	118.02	137.54	150.14	163.04		
, ,										Γotal = Su	m(45) <sub>112</sub> =		1623.79	(45)
If instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)						
(46)m=	25.25	22.09	22.79	19.87	19.07	16.45	15.25	17.49	17.7	20.63	22.52	24.46		(46)
	storage	loss:												
Storag	_									<u> </u>				
	je volum	e (litres)	includir	ig any so	olar or W	/WHRS	storage	within sa	ime vess	sel	(	0		(47)
	munity h	eating a	ind no ta	nk in dw	velling, e	nter 110	litres in	(47)				0		(47)
Otherv	munity h	eating a	ind no ta	nk in dw	velling, e	nter 110	litres in	(47)				0		(47)
Otherv Water	munity h vise if no storage	eating a stored loss:	nd no ta	nk in dw er (this in	velling, e ncludes i	nter 110 nstantan	litres in leous co	(47)			47)			
Otherw Water a) If m	munity h vise if no storage nanufacti	eating a stored loss: urer's de	nd no ta hot wate	nk in dw er (this in	velling, e ncludes i	nter 110 nstantan	litres in leous co	(47)			(47)	0		(48)
Otherw Water a) If m Tempe	munity h vise if no storage nanufacto erature fa	eating a stored loss: urer's de actor fro	ind no ta hot wate eclared I m Table	nk in dw er (this in oss facto 2b	velling, e ncludes i or is kno	nter 110 nstantan	litres in leous co n/day):	(47) mbi boild	ers) ente		(47)			(48) (49)
Otherw Water a) If m Tempe Energy	munity h vise if no storage nanufacto erature fa y lost fro	eating a stored loss: urer's de actor fro m water	nd no ta hot wate eclared I m Table storage	nk in dwer (this in oss facto 2b , kWh/ye	velling, e acludes i or is kno ear	nter 110 nstantan wn (kWh	litres in leous co	(47)	ers) ente		47)	0		(48)
Otherw Water a) If m Tempe Energy b) If m	munity h vise if no storage nanufacto erature fa y lost fro nanufacto	eating a stored loss: urer's de actor fro m water urer's de	nd no ta hot wate eclared I m Table storage eclared o	onk in dwer (this in oss factor 2b cylinder I	relling, e acludes i or is kno ear oss facto	nter 110 nstantan wn (kWh	litres in leous co n/day): known:	(47) mbi boild	ers) ente		47)	0 0		(48) (49) (50)
Otherw Water a) If m Tempe Energy b) If m Hot wa	munity he vise if no storage nanufaction from the control of the c	eating a o stored loss: urer's de actor fro m water urer's de age loss	nd no ta hot wate eclared I m Table storage eclared of factor fr	onk in dw er (this in oss facto 2b , kWh/ye cylinder l om Tabl	velling, e acludes i or is kno ear oss facto	nter 110 nstantan wn (kWh	litres in leous co n/day): known:	(47) mbi boild	ers) ente		47)	0 0		(48) (49)
Otherw Water a) If m Tempe Energy b) If m Hot wa	munity h vise if no storage nanufacto erature fa y lost fro nanufacto	eating a o stored loss: urer's de actor fro m water urer's de age loss eating s	nd no ta hot wate eclared I m Table storage eclared of factor free section	onk in dw er (this in oss facto 2b , kWh/ye cylinder l om Tabl	velling, e acludes i or is kno ear oss facto	nter 110 nstantan wn (kWh	litres in leous co n/day): known:	(47) mbi boild	ers) ente		47)	0 0		(48) (49) (50)
Otherw Water a) If m Tempe Energy b) If m Hot wa If comm	munity he vise if no storage chanufaction of the control of the co	eating a o stored loss: urer's de actor fro m water urer's de age loss eating s from Tal	nd no ta hot wate eclared I m Table storage eclared of factor fr ee section	onk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	velling, e acludes i or is kno ear oss facto	nter 110 nstantan wn (kWh	litres in leous co n/day): known:	(47) mbi boild	ers) ente		47) ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( ( (	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(48) (49) (50) (51)

Energy lost from w	_	e, kWh/y	ear			(47) x (51	) x (52) x (	53) =	1.	03		(54)
Enter (50) or (54)									1.	03		(55)
Water storage loss	calculated	for each	month			((56)m = (	(55) × (41)r	n				
(56)m= 32.01 28		30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains ded	cated solar sto	orage, (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= 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) fro	om Table	e 3							0		(58)
Primary circuit loss	calculated	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by fact		le H5 if t		olar wat		<del></del>	cylinde		stat)			
(59)m= 23.26 21	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calcula	ted for each	month	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat required	for water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 223.63 197	17 207.22	185.96	182.38	163.17	156.91	171.91	171.51	192.82	203.63	218.32		(62)
Solar DHW input calcul	ated using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	contributi	on to wate	er heating)		
(add additional line	s if FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	<b>3</b> )					
(63)m = 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water	neater				_							
(64)m= 223.63 197	17 207.22	185.96	182.38	163.17	156.91	171.91	171.51	192.82	203.63	218.32		_
						Outp	out from wa	ater heate	(annual)	12	2274.63	(64)
Heat gains from wa	ter heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	า1 + 0.8 x	[(46)m	+ (57)m	+ (59)m	1	
					` ,	( - /		L( )	(-,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	()		
(65)m= 100.2 88	9 94.74	86.84	86.48	79.26	78.02	83	82.04	89.95	92.72	98.43	•	(65)
(65)m= 100.2 88 include (57)m in		<u>!</u>			78.02	83	82.04	89.95	92.72	98.43		(65)
	calculation	of (65)m	only if c		78.02	83	82.04	89.95	92.72	98.43		(65)
include (57)m in 5. Internal gains	calculation see Table !	of (65)m 5 and 5a	only if c		78.02	83	82.04	89.95	92.72	98.43		(65)
include (57)m in 5. Internal gains Metabolic gains (T	calculation see Table !	of (65)m 5 and 5a	only if c		78.02	83	82.04	89.95	92.72	98.43		(65)
include (57)m in 5. Internal gains Metabolic gains (T	calculation see Table (able 5), Wa b Mar	of (65)m and 5a	only if c	ylinder i	78.02 s in the o	83 dwelling	82.04 or hot w	89.95 ater is fr	92.72 om com	98.43 munity h		(65)
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F	calculation see Table 9 able 5), Wa b Mar 27 145.27	of (65)m 5 and 5a tts Apr 145.27	only if c ):  May 145.27	ylinder i Jun 145.27	78.02 s in the 0	83 dwelling Aug 145.27	82.04 or hot w Sep 145.27	89.95 ater is fr	92.72 om com	98.43 munity h		
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F  (66)m= 145.27 145	calculation see Table ( able 5), Wa b Mar 145.27 culated in A	of (65)m 5 and 5a tts Apr 145.27	only if c ):  May 145.27	ylinder i Jun 145.27	78.02 s in the 0	83 dwelling Aug 145.27	82.04 or hot w Sep 145.27	89.95 ater is fr	92.72 om com	98.43 munity h		
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F  (66)m= 145.27 145  Lighting gains (calc (67)m= 27.36 24	calculation see Table ( able 5), War eb Mar 27 145.27 culated in A 3 19.76	of (65)m  of and 5a  tts  Apr  145.27  ppendix  14.96	only if c ):  May 145.27 L, equati	Jun 145.27 ion L9 o	78.02 s in the o	Aug 145.27 Iso see	82.04 or hot w Sep 145.27 Table 5	89.95 ater is fr  Oct 145.27	92.72 om com Nov 145.27	98.43 munity h		(66)
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F  (66)m= 145.27 145  Lighting gains (cale	calculation see Table (able 5), Wareb Mar 27 145.27 culated in A 3 19.76 calculated in	of (65)m  of and 5a  tts  Apr  145.27  ppendix  14.96	only if c ):  May 145.27 L, equati	Jun 145.27 ion L9 o	78.02 s in the o	Aug 145.27 Iso see	82.04 or hot w Sep 145.27 Table 5	89.95 ater is fr  Oct 145.27	92.72 om com Nov 145.27	98.43 munity h		(66)
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F  (66)m= 145.27 145  Lighting gains (calc (67)m= 27.36 24  Appliances gains ( (68)m= 302.87 306	calculation see Table ( able 5), Wa eb Mar 27 145.27 culated in A 3 19.76 calculated in 01 298.09	of (65)m of (65)m of and 5a tts Apr 145.27 ppendix 14.96 n Append 281.23	only if c ):  May 145.27 L, equati 11.18 dix L, equali 259.95	Jun 145.27 ion L9 o 9.44 uation L 239.94	78.02 s in the o  Jul 145.27 r L9a), a 10.2 13 or L1 226.58	Aug 145.27 Iso see 13.26 3a), also	82.04 or hot w Sep 145.27 Table 5 17.8 o see Tal 231.36	89.95  ater is fr  Oct  145.27  22.6  ble 5  248.22	92.72 om com Nov 145.27	98.43 munity h  Dec  145.27		(66) (67)
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F  (66)m= 145.27 145  Lighting gains (cale (67)m= 27.36 24  Appliances gains ( (68)m= 302.87 306  Cooking gains (cale	calculation see Table ( able 5), War eb Mar 27 145.27 culated in A 3 19.76 calculated ii 01 298.09 culated in A	of (65)m of (65)m of and 5a tts Apr 145.27 ppendix 14.96 n Append 281.23	only if c ):  May 145.27 L, equati 11.18 dix L, equali 259.95	Jun 145.27 ion L9 o 9.44 uation L 239.94	78.02 s in the o  Jul 145.27 r L9a), a 10.2 13 or L1 226.58	Aug 145.27 Iso see 13.26 3a), also	82.04 or hot w Sep 145.27 Table 5 17.8 o see Tal 231.36	89.95  ater is fr  Oct  145.27  22.6  ble 5  248.22	92.72 om com Nov 145.27	98.43 munity h  Dec  145.27		(66) (67)
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F  (66)m= 145.27 145  Lighting gains (cale (67)m= 27.36 24  Appliances gains ( (68)m= 302.87 306  Cooking gains (cale (69)m= 37.53 37	calculation see Table (able 5), Wareb Mar 27 145.27 culated in A 3 19.76 calculated in 01 298.09 culated in A 53 37.53	of (65)m 5 and 5a tts Apr 145.27 ppendix 14.96 Append 281.23 ppendix 37.53	only if c ):  May 145.27 L, equati 11.18 dix L, equ 259.95 L, equat	Jun 145.27 ion L9 o 9.44 uation L 239.94 ion L15	78.02 s in the of  Jul  145.27 r L9a), a  10.2 13 or L1  226.58 or L15a)	Aug 145.27 Iso see 13.26 3a), also 223.44 ), also se	Sep 145.27 Table 5 17.8 Dissee Table 231.36 Dee Table	89.95  ater is fr  Oct  145.27  22.6  ole 5  248.22  5	92.72 om com Nov 145.27 26.38	98.43 munity h  Dec 145.27  28.12		(66) (67) (68)
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F  (66)m= 145.27 145  Lighting gains (calc (67)m= 27.36 24  Appliances gains ( (68)m= 302.87 306  Cooking gains (calc (69)m= 37.53 37  Pumps and fans gains	calculation see Table ( able 5), Wa eb Mar 27 145.27 culated in A 3 19.76 calculated in 01 298.09 culated in A 53 37.53 tins (Table	of (65)m of (65)m of and 5a tts Apr 145.27 ppendix 14.96 n Appendix 281.23 ppendix 37.53	only if c ):  May 145.27 L, equati 11.18 dix L, eq 259.95 L, equat 37.53	Jun 145.27 ion L9 o 9.44 uation L 239.94 ion L15 37.53	78.02 s in the o  Jul 145.27 r L9a), a 10.2 13 or L1 226.58 or L15a) 37.53	Aug 145.27 Iso see 13.26 3a), also 223.44 ), also se 37.53	82.04 or hot w  Sep 145.27 Table 5 17.8 o see Tal 231.36 ee Table 37.53	89.95  ater is fr  Oct  145.27  22.6  ble 5  248.22  5  37.53	92.72 om com Nov 145.27 26.38	98.43 munity h  Dec 145.27  28.12  289.5		(66) (67) (68) (69)
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F  (66)m= 145.27 145  Lighting gains (cale (67)m= 27.36 24  Appliances gains ( (68)m= 302.87 306  Cooking gains (cale (69)m= 37.53 37  Pumps and fans gains (70)m= 0	calculation see Table ( able 5), Wa eb Mar 27 145.27 culated in A 3 19.76 calculated in 01 298.09 culated in A 53 37.53 cins (Table	of (65)m 5 and 5a tts Apr 145.27 ppendix 14.96 Append 281.23 ppendix 37.53 5a) 0	only if c ):  May 145.27  L, equati 11.18  dix L, equ 259.95  L, equat 37.53	Jun 145.27 ion L9 o 9.44 uation L 239.94 ion L15 37.53	78.02 s in the of  Jul  145.27 r L9a), a  10.2 13 or L1  226.58 or L15a)	Aug 145.27 Iso see 13.26 3a), also 223.44 ), also se	Sep 145.27 Table 5 17.8 Dissee Table 231.36 Dee Table	89.95  ater is fr  Oct  145.27  22.6  ole 5  248.22  5	92.72 om com Nov 145.27 26.38	98.43 munity h  Dec 145.27  28.12		(66) (67) (68)
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F  (66)m= 145.27 145  Lighting gains (calc (67)m= 27.36 24  Appliances gains ( (68)m= 302.87 306  Cooking gains (calc (69)m= 37.53 37  Pumps and fans gains (70)m= 0 (2000)  Losses e.g. evapo	calculation see Table ( able 5), Wa ab Mar 27 145.27 culated in A 3 19.76 calculated in 01 298.09 culated in A 53 37.53 ains (Table a 0 ation (negan	of (65)m for and 5a tts Apr 145.27 ppendix 14.96 Appendix 281.23 ppendix 37.53 5a) 0 ttive value	only if c ):  May 145.27 L, equati 11.18 dix L, equ 259.95 L, equati 37.53  0 es) (Tab	Jun 145.27 ion L9 o 9.44 uation L 239.94 ion L15 37.53 0 le 5)	78.02 s in the o  Jul 145.27 r L9a), a 10.2 13 or L1 226.58 or L15a) 37.53	83 dwelling Aug 145.27 lso see 13.26 3a), also 223.44 ), also se 37.53	82.04 or hot w  Sep 145.27 Table 5 17.8 o see Tal 231.36 ee Table 37.53	89.95 ater is fr  Oct 145.27  22.6 ole 5 248.22 5 37.53	92.72 om com Nov 145.27 26.38 269.5	98.43 munity h  Dec 145.27  28.12  289.5		(66) (67) (68) (69) (70)
include (57)m in  5. Internal gains  Metabolic gains (T	calculation see Table ( able 5), Wa eb Mar 27 145.27 culated in A 3 19.76 calculated in A 53 37.53 culated in A 53 37.53 culated in A 53 37.53 culated in A 53 37.53	of (65)m 5 and 5a tts Apr 145.27 ppendix 14.96 Append 281.23 ppendix 37.53 5a) 0	only if c ):  May 145.27  L, equati 11.18  dix L, equ 259.95  L, equat 37.53	Jun 145.27 ion L9 o 9.44 uation L 239.94 ion L15 37.53	78.02 s in the o  Jul 145.27 r L9a), a 10.2 13 or L1 226.58 or L15a) 37.53	Aug 145.27 Iso see 13.26 3a), also 223.44 ), also se 37.53	82.04 or hot w  Sep 145.27 Table 5 17.8 o see Tal 231.36 ee Table 37.53	89.95  ater is fr  Oct  145.27  22.6  ble 5  248.22  5  37.53	92.72 om com Nov 145.27 26.38	98.43 munity h  Dec 145.27  28.12  289.5		(66) (67) (68) (69)
include (57)m in  5. Internal gains  Metabolic gains (T    Jan   F     (66)m=   145.27   145     Lighting gains (cale   (67)m=   27.36   24     Appliances gains (   (68)m=   302.87   306     Cooking gains (cale   (69)m=   37.53   37     Pumps and fans gains (70)m=   0   0     Losses e.g. evapo (71)m=   -116.22   -116   Water heating gains	calculation see Table 5 able 5), War 27 145.27 culated in A 3 19.76 calculated in A 53 37.53 culated in A 64 57 57 57 57 57 57 57 57 57 57 57 57 57	of (65)m of (65)m of and 5a tts Apr 145.27 ppendix 14.96 Appendix 37.53 5a) 0 tive valu -116.22	only if c ):  May 145.27  L, equati 11.18  dix L, equ 259.95  L, equati 37.53  0  es) (Tab -116.22	Jun 145.27 ion L9 o 9.44 uation L 239.94 iion L15 37.53 0 le 5) -116.22	78.02 s in the of  Jul  145.27 r L9a), a  10.2 13 or L1  226.58 or L15a)  37.53	83 dwelling Aug 145.27 lso see 13.26 3a), also 223.44 ), also se 37.53	82.04 or hot w  Sep 145.27 Table 5 17.8 o see Tall 231.36 ee Table 37.53  0  -116.22	89.95 ater is fr  Oct 145.27  22.6 ole 5 248.22 5 37.53  0	92.72 om com Nov 145.27 26.38 269.5 37.53	98.43 munity h  Dec 145.27  28.12  289.5  37.53		(66) (67) (68) (69) (70)
include (57)m in  5. Internal gains  Metabolic gains (T    Jan   F     (66)m=   145.27   145     Lighting gains (calcomorphism) (calcomorphism	calculation see Table shable 5), Wareb Mar 27 145.27 sulated in A 3 19.76 calculated in A 53 37.53 sins (Table 5) ation (negat	of (65)m for and 5a tts Apr 145.27 ppendix 14.96 Appendix 281.23 ppendix 37.53 5a) 0 ttive value	only if c ):  May 145.27 L, equati 11.18 dix L, equ 259.95 L, equati 37.53  0 es) (Tab	Jun 145.27 ion L9 o 9.44 uation L 239.94 ion L15 37.53  0 le 5) -116.22	78.02 s in the of  Jul 145.27 r L9a), a 10.2 13 or L1 226.58 or L15a) 37.53  0  -116.22	83 dwelling Aug 145.27 lso see 13.26 3a), also 223.44 ), also se 37.53  0  -116.22	82.04 or hot w  Sep 145.27 Table 5 17.8 o see Tal 231.36 ee Table 37.53  0  -116.22	89.95 ater is fr  Oct 145.27  22.6 ole 5 248.22 5 37.53  0  -116.22	92.72 om com Nov 145.27 26.38 269.5 37.53 0 -116.22	98.43 munity h  Dec 145.27  28.12  289.5  37.53  0  -116.22		(66) (67) (68) (69) (70)
include (57)m in  5. Internal gains  Metabolic gains (T  Jan F  (66)m= 145.27 145  Lighting gains (cale (67)m= 27.36 24  Appliances gains ( (68)m= 302.87 306  Cooking gains (cale (69)m= 37.53 37  Pumps and fans gains (70)m= 0 (20)  Losses e.g. evapo (71)m= -116.22 -116  Water heating gains (72)m= 134.68 132  Total internal gains	calculation see Table ( able 5), Wa eb Mar 27 145.27 culated in A 3 19.76 calculated in A 53 37.53 culated in A 53 37.53 culated in A 53 19.76 calculated in A 53 29.753 culated in A 53 37.53	of (65)m of (65)m of and 5a tts Apr 145.27 ppendix 14.96 Appendix 37.53 5a) 0 ttive valu -116.22	only if c ):  May 145.27 L, equati 11.18 dix L, equ 259.95 L, equat 37.53  0 es) (Tab -116.22	Jun 145.27 ion L9 o 9.44 uation L 239.94 ion L15 37.53  0 le 5) -116.22	78.02 s in the of  Jul 145.27 r L9a), a 10.2 13 or L1 226.58 or L15a) 37.53  0  -116.22	83 dwelling Aug 145.27 lso see 13.26 3a), also 223.44 ), also se 37.53  0  -116.22	82.04 or hot w  Sep 145.27 Table 5 17.8 o see Tale 231.36 ee Table 37.53  0  -116.22	89.95 ater is fr  Oct 145.27  22.6 ble 5 248.22  5 37.53  0  -116.22  120.91 70)m + (7	92.72 om com Nov 145.27 26.38 269.5 37.53 0 -116.22 128.77 1)m + (72)	98.43 munity h  Dec 145.27  28.12  289.5  37.53  0  -116.22  132.3		(66) (67) (68) (69) (70) (71)
include (57)m in  5. Internal gains  Metabolic gains (T    Jan   F     (66)m=   145.27   145     Lighting gains (calcomorphism) (calcomorphism	calculation see Table ( able 5), Wa eb Mar 27 145.27 culated in A 3 19.76 calculated in A 53 37.53 culated in A 53 37.53 culated in A 53 19.76 calculated in A 53 29.753 culated in A 53 37.53	of (65)m of (65)m of and 5a tts Apr 145.27 ppendix 14.96 Appendix 37.53 5a) 0 tive valu -116.22	only if c ):  May 145.27  L, equati 11.18  dix L, equ 259.95  L, equati 37.53  0  es) (Tab -116.22	Jun 145.27 ion L9 o 9.44 uation L 239.94 ion L15 37.53  0 le 5) -116.22	78.02 s in the of  Jul 145.27 r L9a), a 10.2 13 or L1 226.58 or L15a) 37.53  0  -116.22	83 dwelling Aug 145.27 lso see 13.26 3a), also 223.44 ), also se 37.53  0  -116.22	82.04 or hot w  Sep 145.27 Table 5 17.8 o see Tal 231.36 ee Table 37.53  0  -116.22	89.95 ater is fr  Oct 145.27  22.6 ole 5 248.22 5 37.53  0  -116.22	92.72 om com Nov 145.27 26.38 269.5 37.53 0 -116.22	98.43 munity h  Dec 145.27  28.12  289.5  37.53  0  -116.22		(66) (67) (68) (69) (70)

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

Orientatio	n:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East (	).9x	1	x	4.51	x	19.64	x	0.5	x	0.7	=	21.48	(76)
East (	).9x	1	x	2.26	x	19.64	х	0.5	x	0.7	=	10.77	(76)
East (	).9x	1	x	4.51	x	38.42	x	0.5	x	0.7	=	42.03	(76)
East (	).9x	1	x	2.26	x	38.42	х	0.5	x	0.7	=	21.06	(76)
East (	).9x	1	x	4.51	x	63.27	x	0.5	x	0.7	=	69.21	(76)
East (	).9x	1	x	2.26	X	63.27	X	0.5	x	0.7	=	34.68	(76)
East (	).9x	1	x	4.51	X	92.28	x	0.5	x	0.7	=	100.95	(76)
East (	).9x	1	x	2.26	x	92.28	x	0.5	x	0.7	=	50.58	(76)
East (	).9x	1	x	4.51	x	113.09	x	0.5	x	0.7	=	123.71	(76)
East (	).9x	1	x	2.26	x	113.09	x	0.5	x	0.7	=	61.99	(76)
East (	).9x	1	x	4.51	x	115.77	x	0.5	x	0.7	=	126.64	(76)
East (	).9x	1	x	2.26	x	115.77	x	0.5	x	0.7	=	63.46	(76)
East (	).9x	1	x	4.51	x	110.22	x	0.5	x	0.7	=	120.57	(76)
East (	).9x	1	x	2.26	x	110.22	x	0.5	x	0.7	=	60.42	(76)
East (	).9x	1	x	4.51	x	94.68	x	0.5	x	0.7	=	103.57	(76)
East (	).9x	1	x	2.26	x	94.68	x	0.5	x	0.7	=	51.9	(76)
East (	).9x	1	X	4.51	X	73.59	x	0.5	X	0.7	=	80.5	(76)
East (	).9x	1	x	2.26	x	73.59	x	0.5	x	0.7	=	40.34	(76)
East (	).9x	1	X	4.51	X	45.59	X	0.5	X	0.7	=	49.87	(76)
East (	).9x	1	x	2.26	x	45.59	x	0.5	x	0.7	=	24.99	(76)
East (	).9x	1	x	4.51	x	24.49	x	0.5	x	0.7	=	26.79	(76)
East (	).9x	1	x	2.26	X	24.49	X	0.5	X	0.7	=	13.42	(76)
East (	).9x	1	X	4.51	X	16.15	X	0.5	X	0.7	=	17.67	(76)
East (	).9x	1	X	2.26	X	16.15	X	0.5	X	0.7	=	8.85	(76)
West (	).9x	0.77	X	4.72	X	19.64	X	0.5	X	0.7	=	67.45	(80)
West (	).9x	0.77	X	2.29	x	19.64	x	0.5	X	0.7	=	21.82	(80)
West (	).9x	0.77	X	4.72	X	38.42	X	0.5	X	0.7	=	131.96	(80)
West (	).9x	0.77	X	2.29	x	38.42	x	0.5	X	0.7	=	42.68	(80)
West (	).9x	0.77	X	4.72	x	63.27	x	0.5	X	0.7	=	217.31	(80)
West (	).9x	0.77	X	2.29	X	63.27	X	0.5	X	0.7	=	70.29	(80)
West (	).9x	0.77	X	4.72	x	92.28	x	0.5	X	0.7	=	316.94	(80)
West (	).9x	0.77	X	2.29	x	92.28	x	0.5	X	0.7	=	102.51	(80)
West (	).9x	0.77	X	4.72	x	113.09	x	0.5	X	0.7	=	388.42	(80)
West (	).9x	0.77	X	2.29	X	113.09	X	0.5	X	0.7	=	125.63	(80)
West (	).9x	0.77	X	4.72	X	115.77	X	0.5	X	0.7	=	397.61	(80)
West (	).9x	0.77	X	2.29	X	115.77	x	0.5	X	0.7	=	128.61	(80)
West (	).9x	0.77	X	4.72	x	110.22	x	0.5	x	0.7	=	378.55	(80)
West (	).9x	0.77	X	2.29	x	110.22	x	0.5	x	0.7	=	122.44	(80)
West (	).9x	0.77	X	4.72	х	94.68	x	0.5	X	0.7	=	325.16	(80)

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West	0.9x	0.77	X	2.2	29	×	9	4.68	X		0.5	X	0.7	=	105.17	(80)
West	0.9x	0.77	X	4.7	'2	x	7	3.59	X		0.5	х	0.7	=	252.74	(80)
West	0.9x	0.77	X	2.2	29	x [	7	3.59	X		0.5	х	0.7	=	81.75	(80)
West	0.9x	0.77	X	4.7	<b>'</b> 2	x	4	5.59	X		0.5	x	0.7	=	156.58	(80)
West	0.9x	0.77	X	2.2	29	x	4	5.59	X		0.5	x	0.7	=	50.64	(80)
West	0.9x	0.77	X	4.7	′2	x	2	4.49	X		0.5	x	0.7	=	84.11	(80)
West	0.9x	0.77	X	2.2	29	x	2	4.49	X		0.5	x [	0.7	=	27.2	(80)
West	0.9x	0.77	Х	4.7	<b>'</b> 2	x	1	6.15	X		0.5	x [	0.7	=	55.47	(80)
West	0.9x	0.77	X	2.2	29	x	1	6.15	X		0.5	x	0.7	=	17.94	(80)
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	ım(74)m .	(82)m	_		_	
(83)m=	121.52	237.73	391.5	570.98	699.76	71	6.32	681.97	585	5.8	455.33	282.08	151.53	99.93		(83)
Total g	ains – i	nternal a	ind solar	(84)m =	= (73)m ·	+ (8	3)m	, watts					_		_	
(84)m=	653.01	766.91	903.27	1054.36	1153.71	114	42.38	1090.19	1000	0.64	885.01	740.39	642.76	616.44		(84)
7. Me	an inter	nal temp	erature	(heating	season	)										
Temp	erature	during h	eating p	eriods ir	n the livii	ng a	area f	rom Tab	ole 9,	, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	living are	ea, h1,m	(se	е Та	ble 9a)								
	Jan	Feb	Mar	Apr	May	Ī.	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m=	0.98	0.97	0.93	0.87	0.75	C	0.6	0.46	0.5	51	0.74	0.91	0.97	0.98		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollov	v stei	ns 3 to 7	in T	able	9c)					
(87)m=	18.86	19.12	19.57	20.14	20.58		0.85	20.95	20.9		20.71	20.1	19.39	18.83	7	(87)
Tomp	oroturo	during h	ooting n	oriodo ir	root of	طس	مالام	from To	hla (		.2 (°C)		1	l		
(88)m=	20.12	20.13	20.13	20.14	20.14		D.16	20.16	20.		20.15	20.14	20.14	20.13	٦	(88)
						I			<u> </u>		200		1			()
ı		tor for g				$\overline{}$	<del>`</del>		r –		0.00	0.00	1		٦	(00)
(89)m=	0.98	0.96	0.92	0.84	0.71	L	.54	0.38	0.4	!	0.68	0.89	0.96	0.98		(89)
Mean		temper				<del>-</del>	$\overline{}$		<del>i                                     </del>						7	
(90)m=	17.22	17.6	18.25	19.06	19.66	20	0.02	20.12	20.	11	19.85	19.03	18	17.18		(90)
											f	LA = Livir	ng area ÷ (4	4) =	0.29	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling	g) = fL	_A × T1	+ (1	– fL	A) × T2					
(92)m=	17.7	18.05	18.64	19.37	19.93	20	0.26	20.36	20.	35	20.1	19.34	18.4	17.66		(92)
Apply	adjustn	nent to th	ne mear	interna	temper	atur	re fro	m Table	4e,	whe	re appro	priate	_		_	
(93)m=	17.7	18.05	18.64	19.37	19.93	20	0.26	20.36	20.	35	20.1	19.34	18.4	17.66		(93)
•		ting requ														
						ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-ca	lculate	
trie ut	Jan	factor fo	Mar				Jun	Jul	۸.		Sep	Oct	Nov	Dec	٦	
   Itilies		tor for g		Apr	May		Juli	Jui	A	ug	Sep	Oct	INOV	Dec		
(94)m=	0.96	0.94	0.9	0.82	0.7	0	.55	0.4	0.4	15	0.68	0.87	0.95	0.97	7	(94)
		hmGm ,											1			, ,
(95)m=		723.54	815.81	868.64	812.37	62	4.66	441.18	453	.74	602.57	645.59	608.1	596.76		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able	 8 8		· · · · ·			I	1	I	_	
(96)m=	4.3	4.9	6.5	8.9	11.7	_	4.6	16.6	16.	.4	14.1	10.6	7.1	4.2		(96)
Heat I	loss rate	e for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93	3)m-	- (96)m	]				
(97)m=	1713.81	1675.92	1541.95	1309.46	1025.85	69	4.32	461.53	482	.58	741	1089.72	1417.93	1699.12	2	(97)
'															_	

Space heating requirement for each month, kWh/month =	: 0.02	4 x [(97	)m – (95	5)ml x (4 <sup>-</sup>	1)m		
	0	0	0	330.43	583.08 820.16		
		Tota	l per year	(kWh/year	$) = Sum(98)_{15,912} =$	4197.31	(98)
Space heating requirement in kWh/m²/year						31.25	(99)
9b. Energy requirements – Community heating scheme							
This part is used for space heating, space cooling or water Fraction of space heat from secondary/supplementary hea					unity scheme.	0	(301)
Fraction of space heat from community system 1 – (301) =	:					1	(302)
The community scheme may obtain heat from several sources. The proceincludes boilers, heat pumps, geothermal and waste heat from power states.				up to four (	other heat sources; th		<b>-</b> -
Fraction of heat from Community heat pump						0.5	(303a)
Fraction of community heat from heat source 2						0.5	(303b)
Fraction of total space heat from Community heat pump				(3	02) x (303a) =	0.5	(304a)
Fraction of total space heat from community heat source 2				`	02) x (303b) =	0.5	(304b)
Factor for control and charging method (Table 4c(3)) for co	mmu	ınity hea	iting sys	stem		1	(305)
Distribution loss factor (Table 12c) for community heating s	syster	m				1.05	(306)
Space heating Annual space heating requirement						<b>kWh/yea</b> 4197.31	r 
Space heat from Community heat pump			(98) x (3	04a) x (30	5) x (306) =	2203.59	(307a)
Space heat from heat source 2			(98) x (3	04b) x (305	5) x (306) =	2203.59	(307b)
Efficiency of secondary/supplementary heating system in %	% (fro	m Table	4a or <i>A</i>	Appendix	E)	0	(308
Space heating requirement from secondary/supplementary	/ syste	em	(98) x (3	01) x 100 ÷	- (308) =	0	(309)
Water heating Annual water heating requirement					I	2274.63	٦
If DHW from community scheme:			, , .	, ,			<b>-</b> 
Water heat from Community heat pump					5) x (306) =	1194.18	(310a)
Water heat from heat source 2					5) x (306) =	1194.18	(310b)
Electricity used for heat distribution		0.01	× [(307a)	(307e) +	(310a)(310e)] =	67.96	(313)
Cooling System Energy Efficiency Ratio						0	(314)
Space cooling (if there is a fixed cooling system, if not enter	÷r 0)		= (107) -	÷ (314) =		0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	from	outside				489.79	(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) =	489.79	(331)
Energy for lighting (calculated in Appendix L)						483.19	(332)
Electricity generated by PVs (Appendix M) (negative quant	ity)					-820.06	(333)

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 (%) 425 (367a) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 2 (%) (367b) 91 CO2 associated with heat source 1  $[(307b)+(310b)] \times 100 \div (367b) \times$ (367)414.93 0.52 CO2 associated with heat source 2  $[(307b)+(310b)] \times 100 \div (367b) \times$ (368)0.22 806.5 Electrical energy for heat distribution [(313) x (372)0.52 35.27 Total CO2 associated with community systems (363)...(366) + (368)...(372)1256.7 (373)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 (376)(373) + (374) + (375) =1256.7 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378)0.52 254.2 CO2 associated with electricity for lighting (379)(332))) x 0.52 250.78 Energy saving/generation technologies (333) to (334) as applicable x 0.01 =Item 1 (380) 0.52 -425.61 sum of (376)...(382) = Total CO2, kg/year (383)1336.07  $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)9.95

El rating (section 14)

90.02

(385)

		User	Details:				
Assessor Name:	Joseph Treanor		Stroma I	Number:	STRO	032062	
Software Name:	Stroma FSAP 2012			e Version:	Versio	n: 1.0.4.14	
			y Address: P	14			
Address :	, Gondar Gardens, L	ondon, NW6	1HG				
Overall dwelling dime	ensions:	Α	a a (ma 2)	Ass Ilain	In talence)	V a la una a (ma 2)	
Ground floor		Ar	ea(m²)  57.38 (1a	Av. Heig	<u>`</u>	Volume(m³)	(3a)
First floor				o) x 3	L	175.02	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	115.72 (4)		`` ´ [		<b>」</b> `
Dwelling volume		` ′		a)+(3b)+(3c)+(3d)+	(3e)+(3n) =	321.34	(5)
2. Ventilation rate:					L		<b></b>
<u> </u>	main se heating he	condary eating	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 fa	ns		_	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)
						anges per ho	
Infiltration due to chimne	va fluor and fans – (63	\_(6b\_(7a\_(7b)	±(7c) =				_
	een carried out or is intended			0 tinue from (9) to (16	÷ (5) =	0	(8)
Number of storeys in the	ne dwelling (ns)				[	0	(9)
Additional infiltration					[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber fr	ame or 0.35 f	or masonry o	construction	]	0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresp pas): if equal user 0.35	onding to the gre	eater wall area (a	after			
	floor, enter 0.2 (unseale	ed) or 0.1 (sea	aled), else en	ter 0	[	0	(12)
If no draught lobby, en	ter 0.05, else enter 0				Ī	0	(13)
Percentage of windows	s and doors draught str	ipped			Ī	0	(14)
Window infiltration			0.25 - [0.2 x (	14) ÷ 100] =	Ì	0	(15)
Infiltration rate			(8) + (10) + (1	11) + (12) + (13) + (	15) =	0	(16)
Air permeability value,	q50, expressed in cubi	c metres per l	nour per squa	are metre of en	velope area	3	(17)
If based on air permeabil	ity value, then (18) = [(17	) ÷ 20]+(8), other	wise (18) = (16)		ĺ	0.15	(18)
Air permeability value applie	s if a pressurisation test has	been done or a c	legree air perme	eability is being use	d		_
Number of sides sheltered	ed					2	(19)
Shelter factor			(20) = 1 - [0.0]	75 x (19)] =		0.85	(20)
Infiltration rate incorporate	ing shelter factor		$(21) = (18) \times (21)$	(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						

4.3

3.8

3.8

3.7

4

4.3

4.5

Wind Factor	(22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Adjusted infil	Itration rat	e (allowi	ng for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	1	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate eff		-	rate for t	пе арріі	саріе са	se						0.5	(23a)
If exhaust air			endix N, (2	(23a) = (23a	a) × Fmv (e	equation (f	N5)) , othe	rwise (23b	) = (23a)			0.5	(23b)
If balanced w	vith heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				68.85	(23c)
a) If baland	ced mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(24a)
b) If baland	ced mech	anical ve	entilation	without	heat red	covery (N	ЛV) (24k	o)m = (22	2b)m + (	23b)	-	-	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole				•	•								
	)m < 0.5 >	<del>``</del>	· ` ·	<del></del>	í –	<u> </u>	ŕ	ŕ	· ` `	<del>í –</del>		1	(5.1.)
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natura	al ventilation) )m = 1, th								0.51				
(24d)m = 0	0	0	0	0	0	0	0.0 1 [(2	0	0.01	0	0	]	(24d)
Effective a	L ir change	rate - er	ı nter (24a	) or (24b	o) or (24	L c) or (24	d) in bo	x (25)	ļ	!		J	
(25)m= 0.32	<del></del>	0.31	0.3	0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31	]	(25)
3. Heat loss	ses and he	eat loss i	paramet	er:									
ELEMENT	Gros		Openin	•	Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value kJ/m²-l		A X k kJ/K
ELEMENT Windows Typ	area		•	•		m²		2K .		K)			
	area pe 1		•	•	A ,r	m² x1	W/m2	2K · 0.04] =	(W/	K)			kJ/K
Windows Typ	area pe 1 pe 2		•	•	A ,r	m <sup>2</sup> x1.	W/m2 /[1/( 1.2 )+	2K $0.04 = 0.04 = 0.04 = 0.04$	(W/ 5.55	K)			(27)
Windows Тур Windows Тур	area pe 1 pe 2 pe 3		•	•	A ,r 4.85	m <sup>2</sup> x1 x1 x1	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+	$2K$ $0.04] = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	5.55 2.4	K)			(27) (27)
Windows Typ Windows Typ Windows Typ	area pe 1 pe 2 pe 3 pe 4		•	•	A ,r 4.85 2.1 4.78	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$\begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \end{bmatrix}$	5.55 2.4 5.47	K)			(27) (27) (27)
Windows Typ Windows Typ Windows Typ Windows Typ	area pe 1 pe 2 pe 3 pe 4 pe 5		•	•	A ,r 4.85 2.1 4.78 4.99	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$\begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix}$	(W/ 5.55 2.4 5.47 5.71	K)			(27) (27) (27) (27) (27)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area pe 1 pe 2 pe 3 pe 4 pe 5 pe 6		•	•	A ,r 4.85 2.1 4.78 4.99 2.16	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$\begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \end{bmatrix}$	(W/ 5.55 2.4 5.47 5.71 2.47	K)			(27) (27) (27) (27) (27) (27)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area pe 1 pe 2 pe 3 pe 4 pe 5 pe 6	(m²)	•	<u>,</u>	A ,r 4.85 2.1 4.78 4.99 2.16 5.9	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$\begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \end{bmatrix}$	(W/ 5.55 2.4 5.47 5.71 2.47 6.76	K)			(27) (27) (27) (27) (27) (27) (27)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area pe 1 pe 2 pe 3 pe 4 pe 5 pe 6 pe 7	.9	· m	<u>,</u>	A ,r 4.85 2.1 4.78 4.99 2.16 5.9 2.26	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	EK 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	5.55 2.4 5.47 5.71 2.47 6.76 2.59	K)			(27) (27) (27) (27) (27) (27) (27)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1	area pe 1 pe 2 pe 3 pe 4 pe 5 pe 6 pe 7	.9 2	31.4	<u>,</u>	A ,r  4.85  2.1  4.78  4.99  2.16  5.9  2.26  87.44	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	PK  0.04] = [ 0.	(W/ 5.55 2.4 5.47 5.71 2.47 6.76 2.59 15.74	K)			(27) (27) (27) (27) (27) (27) (27) (29)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2	area pe 1 pe 2 pe 3 pe 4 pe 5 pe 6 pe 7  118 4.0 6.8	.9 2	31.4 0	<u>,</u>	A ,r  4.85  2.1  4.78  4.99  2.16  5.9  2.26  87.44  4.02	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18	RK  0.04] = [ 0.	(W/ 5.55 2.4 5.47 5.71 2.47 6.76 2.59 15.74 0.91	K)			(27) (27) (27) (27) (27) (27) (27) (29)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1	area pe 1 pe 2 pe 3 pe 4 pe 5 pe 6 pe 7  118  4.0 6.8	.9 2 2 34	31.4 0	<u>,</u>	A ,r  4.85  2.1  4.78  4.99  2.16  5.9  2.26  87.44  4.02  6.82	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23	PK  0.04] = [ 0.	(W/ 5.55 2.4 5.47 5.71 2.47 6.76 2.59 15.74 0.91 0.89	K)			(27) (27) (27) (27) (27) (27) (27) (29) (29)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2	area pe 1 pe 2 pe 3 pe 4 pe 5 pe 6 pe 7  118  4.0 6.8	.9 2 2 34	31.4 0	<u>,</u>	A ,r  4.85  2.1  4.78  4.99  2.16  5.9  2.26  87.44  4.02  6.82  58.34	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23	PK  0.04] = [ 0.	(W/ 5.55 2.4 5.47 5.71 2.47 6.76 2.59 15.74 0.91 0.89	K)			(27) (27) (27) (27) (27) (27) (27) (29) (29) (30)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of	area pe 1 pe 2 pe 3 pe 4 pe 5 pe 6 pe 7  118  6.8  58.3 elements	.9 2 2 34 5, m <sup>2</sup>	31.4 0 0 0	6 6	A ,r  4.85  2.1  4.78  4.99  2.16  5.9  2.26  87.44  4.02  6.82  58.34  188.0  72.21  alue calcul	m <sup>2</sup>	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	PK  0.04] = [ 0.	(W/ 5.55 2.4 5.47 5.71 2.47 6.76 2.59 15.74 0.91 0.89 7.58		kJ/m²-l	K !	(27) (27) (27) (27) (27) (27) (27) (29) (29) (30) (30) (31)
Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of Party wall * for windows and	area pe 1 pe 2 pe 3 pe 4 pe 5 pe 6 pe 7  118 4.0 6.8 58.3 elements	.9 2 2 34 s, m²	31.4 0 0 0 offective with the state of the s	6 6	A ,r  4.85  2.1  4.78  4.99  2.16  5.9  2.26  87.44  4.02  6.82  58.34  188.0  72.21  alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 xx xx xx x	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	$ \begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04\end{bmatrix} = \begin{bmatrix} \\ 0.04\end{bmatrix} = \begin{bmatrix} \\ 0.04\end{bmatrix} = \begin{bmatrix} \\ 0.04\end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \end{bmatrix} \\ = \begin{bmatrix} \\ \end{bmatrix} \\ = \begin{bmatrix} \\ \end{bmatrix} \\ = \begin{bmatrix} \\ \end{bmatrix} \\ = \begin{bmatrix} \\ \end{bmatrix} \\ = \begin{bmatrix} \\ \end{bmatrix} $	(W/ 5.55 2.4 5.47 5.71 2.47 6.76 2.59 15.74 0.91 0.89 7.58		kJ/m²-l	K !	(27) (27) (27) (27) (27) (27) (27) (29) (29) (30) (30) (31)
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Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Roof Type2 Total area of Party wall * for windows an ** include the an Fabric heat le	area pe 1 pe 2 pe 3 pe 4 pe 5 pe 6 pe 7  118 4.0 6.8 58.3 elements and roof wind reas on both oss, W/K by Cm = Si	.9 2 2 34 5, m <sup>2</sup> lows, use et a sides of in = S (A x (A x k))	31.4 0 0 0 effective winternal wall	6 indow U-va ds and pan	A ,r  4.85  2.1  4.78  4.99  2.16  5.9  2.26  87.44  4.02  6.82  58.34  188.0  72.21  alue calculatitions	x1 x1 x1 x1 x1 x1 x x x x x x x x x x x	W/m2 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.18 0.23 0.13 0.13	$\begin{array}{l} 2K \\ 0.04] = \begin{bmatrix} 0.04 \\ 0.04] = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.$	(W/ 5.55 2.4 5.47 5.71 2.47 6.76 2.59 15.74 0.91 0.89 7.58	as given in [2] + (32a).	kJ/m²-l	7 3.2 61.14	(27) (27) (27) (27) (27) (27) (27) (29) (29) (30) (30) (31) (32)

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

an be used in	stead of a de												
Thermal bri	dges : S (L	x Y) cal	culated (	using Ap	pendix I	K						25.71	(36)
f details of the	0 0	are not kn	own (36) =	= 0.15 x (3	1)			,,					
Total fabric								. ,	(36) =			86.85	(37
entilation h			·	<u> </u>		1	ī		= 0.33 × (			1	
Jai	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 33.7	5 33.42	33.08	31.39	31.05	29.36	29.36	29.02	30.04	31.05	31.73	32.4		(38
leat transfe	r coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
39)m= 120.	6 120.26	119.93	118.24	117.9	116.21	116.21	115.87	116.88	117.9	118.57	119.25		
Heat loss pa	arameter (I	HLP), W/	/m²K						Average = = (39)m ÷		12 /12=	118.15	(39
40)m= 1.04	1.04	1.04	1.02	1.02	1	1	1	1.01	1.02	1.02	1.03		
Number of o	lays in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.02	(40
Jai	n 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 h	eating ene	rav reaui	irement:								kWh/ye	ear:	
Assumed o	J		iromoni.							2			(42
if TFA £ 1 Annual ave	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wa	N + 1.76 x ater usaç	[1 - exp	es per da	ay Vd,av	erage =	(25 x N)	+ 36		9)	85		•
if TFA > 1 if TFA £ 1	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average	N + 1.76 x ater usag hot water	[1 - exp ge in litre usage by	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9)	85		•
if TFA > 1 if TFA £ 1 Annual averageduce the analot more that	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wa nual average 25 litres per	N + 1.76 x ater usag hot water person per	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36		9)	85		•
if TFA > 1 if TFA £ 1 Annual averaged and the	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wa nual average 25 litres per	N + 1.76 x ater usag hot water person per	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9)	85		
if TFA > 1 if TFA £ 1 Annual average and the second in the	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per h Feb e in litres per	N + 1.76 x ater usag hot water person per	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, l	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9)	85		
if TFA > 1 if TFA £ 1 Annual average the analog the analog that analog that analog that analog that analog that water usage	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per n Feb re in litres per 15 107.88	N + 1.76 x ater usag hot water person per Mar r day for ea	[1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, l May Vd,m = fa 95.67	ay Vd,av lwelling is not and co Jun ctor from 1	erage = designed (d)  Jul Table 1c x  91.59	(25 x N) to achieve Aug (43) 95.67	+ 36 a water us Sep 99.74	Oct  103.81  Total = Sui	Nov 107.88 m(44) <sub>112</sub> =	1.77  Dec  111.95	1221.27	(43
if TFA > 1 if TFA £ 1 Annual average the analog more that analog the analog that analog the analog that are analog that analog the analog that analog that are analog that analog that are analog that analog that are analog	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per h Feb e in litres per 15 107.88	N + 1.76 x ater usag hot water person per Mar r day for ea	[1 - exp ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, l May Vd,m = fa 95.67	ay Vd,av lwelling is not and co Jun ctor from 1	erage = designed (d)  Jul Table 1c x  91.59	(25 x N) to achieve Aug (43) 95.67	+ 36 a water us Sep 99.74	Oct  103.81  Total = Sui	Nov 107.88 m(44) <sub>112</sub> =	1.77  Dec  111.95	1221.27	(43
if TFA > 1 if TFA £ 1 Annual average and more that and more that and the state and the	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per be in litres per 107.88 for hot water 12 145.2	N + 1.76 x ater usage hot water person per Mar day for each 103.81 used - calconding 149.83	[1 - exp ge in litre usage by day (all w Apr ach month 99.74 culated me 130.63	es per da 5% if the do ater use, l  May  Vd,m = fa  95.67  onthly = 4.	ay Vd,av lwelling is not and co Jun ctor from 7 91.59 190 x Vd,r	erage = designed and ld)  Jul Table 1c x  91.59  m x nm x E  100.23	(25 x N) to achieve  Aug (43)  95.67  07m / 3600 115.01	+ 36 a water us  Sep  99.74  0 kWh/mon  116.38	Oct  103.81  Fotal = Suith (see Ta	Nov 107.88 m(44) <sub>112</sub> = ables 1b, 1 148.06	1.77  Dec  111.95  c, 1d)  160.78	1221.27	(43
if TFA > 1 if TFA £ 1 Annual average and more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more than in the	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per n Feb ne in litres per no Feb ne	N + 1.76 x ater usage hot water person per Mar day for each 103.81 used - calconding 149.83	[1 - exp ge in litre usage by day (all w Apr ach month 99.74 culated mo 130.63	es per da 5% if the d vater use, I  May  Vd,m = fa  95.67  onthly = 4.  125.34	ay Vd,av lwelling is not and co Jun ctor from 7 91.59 190 x Vd,r	erage = designed and designed a	(25 x N) to achieve  Aug (43)  95.67  07m / 3600 115.01  boxes (46)	+ 36 a water us  Sep  99.74  0 kWh/mon  116.38	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth (see Tail 135.63)	Nov 107.88 m(44) <sub>112</sub> = ables 1b, 1 148.06 m(45) <sub>112</sub> =	1.77  Dec  111.95  c, 1d)  160.78		(44
if TFA > 1 if TFA £ 1 Annual average and more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more than th	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per be in litres per constant of hot water co	N + 1.76 x ater usage hot water person per Mar day for each 103.81 used - calconding 149.83	[1 - exp ge in litre usage by day (all w Apr ach month 99.74 culated me 130.63	es per da 5% if the do ater use, l  May  Vd,m = fa  95.67  onthly = 4.	ay Vd,av lwelling is not and co Jun ctor from 7 91.59 190 x Vd,r	erage = designed and ld)  Jul Table 1c x  91.59  m x nm x E  100.23	(25 x N) to achieve  Aug (43)  95.67  07m / 3600 115.01	+ 36 a water us  Sep  99.74  0 kWh/mon  116.38	Oct  103.81  Total = Sunth (see Tail 135.63	Nov 107.88 m(44) <sub>112</sub> = ables 1b, 1 148.06	1.77  Dec  111.95  c, 1d)  160.78		(44
if TFA > 1 if TFA £ 1 Annual average and the state of the and the state of the stat	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per n Feb ne in litres per n Feb ne in litres per n 107.88 ne of hot water n 12 145.2 ne water heatin n 21.78 ne loss:	N + 1.76 x ater usag hot water person per Mar r day for ear 103.81 used - calc 149.83 ng at point 22.48	[1 - exp ge in litre usage by day (all w Apr ach month 99.74  culated mo 130.63	es per da 5% if the day the second of the control of the second of the s	ay Vd,av Iwelling is not and co Jun ctor from 1 91.59 190 x Vd,r 108.16	erage = designed (d)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25	+ 36 a water us  Sep  99.74  116.38  1 to (61)  17.46	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	Nov 107.88 m(44) <sub>112</sub> = ables 1b, 1 148.06 m(45) <sub>112</sub> =	1.77  Dec  111.95  c, 1d)  160.78		(44)
if TFA > 1 if TFA £ 1 Annual average and more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more that in the more than in the	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per n Feb e in litres per 105 107.88 for hot water 102 145.2 s water heati 103 21.78 ge loss: ume (litres)	N + 1.76 x ater usage hot water person per Mar 103.81 used - call 149.83 ng at point 22.48 including	ge in litre usage by day (all w Apr ach month 99.74  130.63  of use (no	es per da 5% if the of vater use, I  May  Vd,m = fa  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W	y Vd,av welling is not and co Jun ctor from 1 91.59 190 x Vd,r 108.16 r storage),	erage = designed and designed a	(25 x N) to achieve  Aug (43)  95.67  77m / 3600  115.01  boxes (46)  17.25  within sa	+ 36 a water us  Sep  99.74  116.38  1 to (61)  17.46	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	Nov 107.88 m(44) <sub>112</sub> = ables 1b, 1 148.06 m(45) <sub>112</sub> =	1.77  Dec  111.95  c, 1d)  160.78		(44)
if TFA > 1 if TFA £ 1 Annual average and the state of the and the state of the stat	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per n Feb ne in litres per no for hot water no 145.2 s water heating 21.78 ge loss: ume (litres)	N + 1.76 x ater usage hot water person per Mar r day for ear 103.81  used - calc 149.83  ng at point 22.48  including and no talc and no talc at the same series of t	ge in litre usage by day (all w Apr ach month 99.74  130.63  of use (not 19.59  and any so	es per da 5% if the d yater use, I  May  Vd,m = fa  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W yelling, e	ay Vd,av Iwelling is not and co Jun ctor from 1 91.59 190 x Vd,r 108.16 r storage), 16.22	erage = designed (d)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03  storage ) litres in	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47)	+ 36 a water us  Sep  99.74  116.38  ) to (61)  17.46  ame vess	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	Nov  107.88  m(44)112 = sbles 1b, 1  148.06  m(45)112 = 22.21	1.77  Dec  111.95  c, 1d)  160.78		(43)
if TFA > 1 if TFA £ 1 Annual average and the state of the and the state of the stat	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per n Feb re in litres per n 107.88 re of hot water n 21.78 ge loss: ume (litres) n heating a no stored	N + 1.76 x ater usage hot water person per Mar r day for ear 103.81  used - calc 149.83  ng at point 22.48  including and no talc and no talc at the same series of t	ge in litre usage by day (all w Apr ach month 99.74  130.63  of use (not) 19.59  and any so	es per da 5% if the d yater use, I  May  Vd,m = fa  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W yelling, e	ay Vd,av Iwelling is not and co Jun ctor from 1 91.59 190 x Vd,r 108.16 r storage), 16.22	erage = designed (d)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03  storage ) litres in	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47)	+ 36 a water us  Sep  99.74  116.38  ) to (61)  17.46  ame vess	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	Nov  107.88  m(44)112 = sbles 1b, 1  148.06  m(45)112 = 22.21	1.77  Dec  111.95  c, 1d)  160.78		(43)
if TFA > 1 if TFA £ 1 Annual average and more that in the state of the and the state of the stat	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per be in litres per construction of hot water 12 145.2 s water heating 21.78 ge loss: ume (litres) y heating a no stored ge loss:	N + 1.76 x ater usage hot water person per Mar r day for ear 103.81  used - calconding at point 22.48 including and no talcondino ta	ge in litre usage by day (all w Apr ach month 99.74  130.63  for use (not) 19.59  ag any so ank in dw er (this in	es per da 5% if the of water use, I  May Vd,m = fa  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W welling, e	y Vd,av welling is not and co Jun ctor from 1 91.59 190 x Vd,r 108.16 r storage), 16.22 /WHRS nter 110 nstantar	erage = designed (d)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03  storage 0 litres in neous co	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47)	+ 36 a water us  Sep  99.74  116.38  ) to (61)  17.46  ame vess	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	Nov  107.88  m(44) <sub>112</sub> = sbles 1b, 1  148.06  m(45) <sub>112</sub> = 22.21	1.77  Dec  111.95  c, 1d)  160.78		(43)
if TFA > 1 if TFA £ 1 Annual average and more that and more that and more that and more that and more that and more that and and more that and and and and and and and and and and	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per n Feb re in litres per n Feb re in litres per n 107.88 re of hot water n 21.78 ge loss: ume (litres) y heating a no stored ge loss: acturer's de	N + 1.76 x ater usage hot water person per Mar r day for ear 103.81  used - call 149.83  ng at point 22.48  including and no tall hot water eclared less than 1.00 and 1.00 are colored less than 1.00 are colored	[1 - exp ge in litre usage by day (all w Apr ach month 99.74  culated mo 130.63  for use (no 19.59  and any so ank in dw er (this in	es per da 5% if the of water use, I  May Vd,m = fa  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W welling, e	y Vd,av welling is not and co Jun ctor from 1 91.59 190 x Vd,r 108.16 r storage), 16.22 /WHRS nter 110 nstantar	erage = designed (d)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03  storage 0 litres in neous co	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47)	+ 36 a water us  Sep  99.74  116.38  ) to (61)  17.46  ame vess	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	Nov  107.88  m(44) <sub>112</sub> = 148.06  m(45) <sub>112</sub> = 22.21	1.77  Dec  111.95  c, 1d)  160.78  24.12		(43 (44 (45 (46 (47
if TFA > 1 if TFA £ 1 Annual average and the state of the and the state of the stat	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per n Feb re in litres per n 107.88 re of hot water n 21.78 ge loss: ume (litres) y heating a no stored ge loss: acturer's de re factor fro from water	N + 1.76 x ater usage hot water person per Mar r day for ear 103.81  used - calc 149.83  ng at point 22.48  including and no talc hot water eclared lear man Table r storage	ge in litre usage by day (all w Apr ach month 99.74  culated me 130.63  for use (no 19.59  ag any so ank in dw er (this in oss facto 2b	es per da 5% if the of water use, I  May Vd,m = fa  95.67  onthly = 4.  125.34  o hot water  18.8  colar or Water velling, encludes in or is known	ay Vd,av fwelling is foot and co Jun ctor from 7 91.59 190 x Vd,r 108.16 r storage), 16.22 /WHRS nter 110 nstantar	erage = designed (d)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03  storage 0 litres in neous con/day):	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47)	+ 36 a water us  Sep  99.74  116.38  10 to (61)  17.46  ame vess ers) ente	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9)  Nov  107.88  m(44) <sub>112</sub> = ables 1b, 1  148.06  m(45) <sub>112</sub> = 22.21	1.77  Dec  111.95  c, 1d)  160.78  24.12		(43 (44 (45 (46 (47 (48 (49
if TFA > 1 if TFA £ 1 Annual average and more that a second more that a second more that a second more that a second more that a second more that a second more that a second more that a second more that a second more than	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per n Feb e in litres per 15 107.88 for hot water 12 145.2 s water heatif 2 21.78 ge loss: ume (litres) y heating a no stored ge loss: acturer's de e factor fro from water acturer's de e orage loss	N + 1.76 x ater usage hot water person per Mar r day for ear 103.81  used - calconding at point 22.48  including and no talconding at water and root water eclared learned at a factor from talconding and root water eclared at a factor from talconding at point and no talconding at point and root water eclared at a factor from talconding at point and root water eclared at a factor from talconding at point and root water eclared at a factor from talconding at point and root water eclared at a factor from talconding at point at a factor from talconding at point at a factor from talconding at point at a factor from talconding at point at a factor from talconding at point at a factor from talconding at point at a factor from talconding at a factor from talconding at point at a factor from talconding at a facto	ge in litre usage by day (all w Apr ach month 99.74  130.63  19.59  ag any so ank in dw er (this in oss facto 2b c, kWh/ye com Table	es per da 5% if the of water use, I  May Vd,m = fa  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W welling, e ncludes i  or is kno  ear loss fact	ay Vd,av welling is not and co	erage = designed id)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47) ombi boil	+ 36 a water us  Sep  99.74  116.38  10 to (61)  17.46  ame vess ers) ente	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44)12 = sbles 1b, 1 148.06 m(45)112 = 22.21	1.77  Dec  111.95  c, 1d)  160.78  24.12  0		(43 (44 (45 (46 (47 (48 (49 (50
if TFA > 1 if TFA £ 1 Annual average and more that and more that and more that and more that and more that and more that and and and and and and and and and and	ccupancy, 3.9, N = 1 3.9, N = 1 age hot wanual average 25 litres per n Feb re in litres per n 107.88 re of hot water n 21.78 ge loss: ume (litres) y heating a no stored ge loss: acturer's de refactor from from water acturer's de refactor from from water acturer's de refactor from from water acturer's de refactor from from water acturer's de refactor from from water acturer's de refactor from from water acturer's de refactor from from water acturer's de refactor from from water from water from water from water from water from water from water from water from water from water	N + 1.76 x ater usage hot water person per Mar r day for ear 103.81  used - calcondinate 149.83  ng at point 22.48  includinate 149.83	ge in litre usage by day (all w Apr ach month 99.74  130.63  19.59  ag any so ank in dw er (this in oss facto 2b c, kWh/ye com Table	es per da 5% if the of water use, I  May Vd,m = fa  95.67  onthly = 4.  125.34  o hot water  18.8  olar or W welling, e ncludes i  or is kno  ear loss fact	ay Vd,av welling is not and co	erage = designed id)  Jul Table 1c x  91.59  m x nm x E  100.23  enter 0 in  15.03  storage 0 litres in neous con/day):  known:	(25 x N) to achieve  Aug (43)  95.67  07m / 3600  115.01  boxes (46)  17.25  within sa (47) ombi boil	+ 36 a water us  Sep  99.74  116.38  10 to (61)  17.46  ame vess ers) ente	Oct  103.81  Total = Sunth (see Tail 135.63)  Total = Sunth 20.35	9) Nov 107.88 m(44)112 = 2bles 1b, 1 148.06 m(45)112 = 22.21 47)	1.77  Dec  111.95  c, 1d)  160.78  24.12  0		(42 (43 (44 (46 (47 (48 (49 (50 (51 (52

Energy lost from	_	e, kWh/y	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or (54)			.1			((==)			1.	03		(55)
Water storage los	s calculated	for each	month		1	((56)m = (	(55) × (41)r	m ———		1		
` '	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains de	dicated solar st	orage, (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= 32.01 2	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit los	s (annual) fr	om Table	∋ 3							0		(58)
Primary circuit los			•	,	` '	` '						
(modified by fac		1				<del></del>	<del>'                                    </del>					
(59)m= 23.26 2	.01 23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calcul	ated for eac	n 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 require	d for water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 221.29 19	5.13 205.11	184.12	180.62	161.65	155.5	170.29	169.88	190.91	201.55	216.06		(62)
Solar DHW input calc	lated using Ap	pendix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	on to wate	er heating)		
(add additional lin	es if FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	<b>3</b> )					
(63)m= 0	0 0	0	0	0	0	0	0	0	0	0		(63)
Output from wate	heater				_							
(64)m= 221.29 19	5.13 205.11	184.12	180.62	161.65	155.5	170.29	169.88	190.91	201.55	216.06		_
						Outp	out from wa	ater heate	r (annual)₁	12	2252.11	(64)
Heat gains from v	ater heating	j, kWh/m	onth 0.25	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	1	
					. ,	` ,		L( -/	( - /	` '		
(65)m= 99.42 8	3.22 94.04	86.23	85.9	78.76	77.55	82.46	81.49	89.32	92.02	97.68		(65)
(65)m= 99.42 8 include (57)m ii						82.46	81.49	89.32	92.02	97.68		(65)
	calculation	of (65)m	only if c			82.46	81.49	89.32	92.02	97.68		(65)
include (57)m in 5. Internal gains	calculation (see Table	of (65)m 5 and 5a	only if c			82.46	81.49	89.32	92.02	97.68		(65)
include (57)m in 5. Internal gains (	calculation (see Table	of (65)m 5 and 5a	only if c			82.46	81.49	89.32	92.02	97.68		(65)
include (57)m in  5. Internal gains  Metabolic gains (	calculation (see Table	of (65)m 5 and 5a	only if c	ylinder i	s in the o	82.46 dwelling	81.49 or hot w	89.32 ater is fr	92.02 om com	97.68 munity h		(65)
include (57)m in  5. Internal gains  Metabolic gains (	calculation (see Table Table 5), Wa Teb Mar 2.26 142.26	of (65)m 5 and 5a tts Apr 142.26	only if c: ):  May 142.26	ylinder i Jun 142.26	Jul 142.26	82.46 dwelling Aug 142.26	81.49 or hot w Sep 142.26	89.32 ater is fr	92.02 om com	97.68 munity h		
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca	calculation (see Table Table 5), Wa Teb Mar 2.26 142.26	of (65)m 5 and 5a tts Apr 142.26	only if c: ):  May 142.26	ylinder i Jun 142.26	Jul 142.26	82.46 dwelling Aug 142.26	81.49 or hot w Sep 142.26	89.32 ater is fr	92.02 om com	97.68 munity h		
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2	calculation (see Table  Table 5), Wa  Teb Mar 2.26 142.26  Culated in A	of (65)m 5 and 5a tts Apr 142.26 ppendix 13.63	only if c: ):  May 142.26 L, equati 10.19	Jun 142.26 on L9 o	Jul 142.26 r L9a), a	Aug 142.26 Iso see	81.49 or hot w Sep 142.26 Table 5	89.32 ater is fr Oct 142.26	92.02 om com Nov 142.26	97.68 munity h		(66)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2  Appliances gains	calculation (see Table  Table 5), Wa  Teb Mar 2.26 142.26  Culated in A	of (65)m 5 and 5a tts Apr 142.26 ppendix 13.63 n Append	only if c: ):  May 142.26 L, equati 10.19	Jun 142.26 on L9 o	Jul 142.26 r L9a), a	Aug 142.26 Iso see	81.49 or hot w Sep 142.26 Table 5	89.32 ater is fr Oct 142.26	92.02 om com Nov 142.26	97.68 munity h		(66)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2  Appliances gains (68)m= 279.53 28	calculation (see Table 5), Wa Feb Mar 2.26 142.26 culated in A 18 (calculated i 2.43 275.12	of (65)m 5 and 5a tts Apr 142.26 ppendix 13.63 n Append 259.56	only if cy ): May 142.26 L, equati 10.19 dix L, equali 239.92	Jun 142.26 on L9 o 8.6 uation L 221.46	Jul 142.26 r L9a), a 9.29 13 or L1 209.12	82.46 dwelling Aug 142.26 lso see 12.08 3a), also 206.22	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53	89.32  ater is fr  Oct 142.26  20.59  ble 5 229.09	92.02 om com Nov 142.26	97.68 munity h		(66) (67)
include (57)m in  5. Internal gains  Metabolic gains (**  Jan  (66)m= 142.26 14  Lighting gains (ca  (67)m= 24.92 2  Appliances gains  (68)m= 279.53 28  Cooking gains (ca	calculation (see Table  Table 5), Wa  Teb Mar 2.26 142.26  Culated in A 2.13 18 (calculated i 2.43 275.12  Iculated in A	of (65)m 5 and 5a tts Apr 142.26 ppendix 13.63 n Append 259.56	only if controls only i	Jun 142.26 on L9 o 8.6 uation L 221.46 ion L15	Jul 142.26 r L9a), a 9.29 13 or L1 209.12	82.46 dwelling Aug 142.26 lso see 12.08 3a), also 206.22	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Table 213.53 ee Table	89.32 ater is fr  Oct 142.26  20.59 ole 5 229.09 5	92.02 om com Nov 142.26 24.03	97.68 munity h Dec 142.26 25.61		(66) (67)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2  Appliances gains (68)m= 279.53 28  Cooking gains (ca (69)m= 37.23 3	calculation (see Table 5), Wareb Mar 2.26 142.26 culated in A 2.13 18 (calculated in A 2.43 275.12 culated in A 2.23 37.23	of (65)m 5 and 5a tts Apr 142.26 ppendix 13.63 n Append 259.56 Appendix 37.23	only if cy ): May 142.26 L, equati 10.19 dix L, equali 239.92	Jun 142.26 on L9 o 8.6 uation L 221.46	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a)	Aug 142.26 lso see 12.08 3a), also 206.22	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53	89.32  ater is fr  Oct 142.26  20.59  ble 5 229.09	92.02 om com Nov 142.26	97.68 munity h		(66) (67) (68)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2  Appliances gains (68)m= 279.53 28  Cooking gains (ca (69)m= 37.23 3  Pumps and fans (	calculation (see Table 5), Wa Feb Mar 2.26 142.26 culated in A 2.13 18 (calculated in A 2.43 275.12 lculated in A 2.23 37.23 gains (Table	of (65)m 5 and 5a tts Apr 142.26 ppendix 13.63 n Appendix 259.56 Appendix 37.23 5a)	only if cy ): May 142.26 L, equati 10.19 dix L, equ 239.92 L, equat 37.23	Jun 142.26 fon L9 o 8.6 uation L 221.46 ion L15 37.23	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a) 37.23	Aug 142.26 Iso see 12.08 3a), also 206.22 ), also se 37.23	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23	89.32  ater is fr  Oct 142.26  20.59  ble 5 229.09  5 37.23	92.02 om com Nov 142.26 24.03	97.68 munity h  Dec 142.26 25.61 267.2		(66) (67) (68) (69)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2  Appliances gains (68)m= 279.53 28  Cooking gains (ca (69)m= 37.23 3  Pumps and fans (70)m= 0	calculation (see Table  Table 5), War  Table 5), War  Table 5), War  Table 142.26  Identify	of (65)m 5 and 5a  tts	only if control only if contro	Jun 142.26 fon L9 o 8.6 uation L 221.46 ion L15 37.23	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a)	Aug 142.26 lso see 12.08 3a), also 206.22	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Table 213.53 ee Table	89.32 ater is fr  Oct 142.26  20.59 ole 5 229.09 5	92.02 om com Nov 142.26 24.03	97.68 munity h Dec 142.26 25.61		(66) (67) (68)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2  Appliances gains (68)m= 279.53 28  Cooking gains (ca (69)m= 37.23 3  Pumps and fans (70)m= 0  Losses e.g. evapor	calculation (see Table Table 5), Wa Teb Mar 2.26 142.26 Culated in A 2.13 18 (calculated in A 2.43 275.12 Iculated in A 2.23 37.23 Tains (Table 0 0 Diration (negation)	of (65)m 5 and 5a tts Apr 142.26 ppendix 13.63 n Appendix 259.56 Appendix 37.23 5a) 0 ative value	only if control only if contro	Jun 142.26 fon L9 o 8.6 uation L 221.46 ion L15 37.23 0 le 5)	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a) 37.23	82.46 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 ), also se 37.23	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23	89.32 ater is fr  Oct 142.26  20.59 ble 5 229.09 5 37.23	92.02 om com Nov 142.26 24.03 248.74 37.23	97.68 munity h  Dec 142.26  25.61  267.2		(66) (67) (68) (69) (70)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2  Appliances gains (68)m= 279.53 28  Cooking gains (ca (69)m= 37.23 3  Pumps and fans ( (70)m= 0  Losses e.g. evapor (71)m= -113.81 -12	calculation (see Table Table 5), Wa Teb Mar 2.26 142.26 Culated in A 2.13 18 (calculated in A 2.43 275.12 Iculated in A 2.23 37.23 Iains (Table 0 0 Diration (negation (negation))	of (65)m 5 and 5a  tts	only if control only if contro	Jun 142.26 fon L9 o 8.6 uation L 221.46 ion L15 37.23	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a) 37.23	Aug 142.26 Iso see 12.08 3a), also 206.22 ), also se 37.23	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23	89.32  ater is fr  Oct 142.26  20.59  ble 5 229.09  5 37.23	92.02 om com Nov 142.26 24.03	97.68 munity h  Dec 142.26 25.61 267.2		(66) (67) (68) (69)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2  Appliances gains (68)m= 279.53 28  Cooking gains (ca (69)m= 37.23 3  Pumps and fans (70)m= 0  Losses e.g. evape (71)m= -113.81 -14  Water heating gains	calculation (see Table Table 5), Ware (see Tab	of (65)m 5 and 5a tts	only if cy ): May 142.26 L, equati 10.19 dix L, equ 239.92 L, equat 37.23	Jun 142.26 fon L9 o 8.6 uation L 221.46 ion L15 37.23 0 le 5) -113.81	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a) 37.23	82.46 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 , also se 37.23	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Table 213.53 ee Table 37.23  0  -113.81	89.32 ater is fr  Oct 142.26  20.59 ole 5 229.09 5 37.23	92.02 om com Nov 142.26 24.03 248.74 37.23	97.68 munity h  Dec 142.26 25.61 267.2 37.23		(66) (67) (68) (69) (70)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 12  Lighting gains (ca (67)m= 24.92 2  Appliances gains (68)m= 279.53 28  Cooking gains (ca (69)m= 37.23 3  Pumps and fans ( (70)m= 0  Losses e.g. evapor (71)m= -113.81 -17  Water heating gains (72)m= 133.63 13	calculation (see Table  Table 5), Wa  Teb Mar  2.26 142.26  culated in A  2.13 18  (calculated in A  2.43 275.12  Iculated in A  2.23 37.23  ains (Table 0 0  pration (nega 3.81 -113.81  ns (Table 5)  1.28 126.4	of (65)m 5 and 5a tts Apr 142.26 ppendix 13.63 n Appendix 259.56 Appendix 37.23 5a) 0 ative value	only if control only if contro	Jun 142.26 fon L9 o 8.6 uation L 221.46 ion L15 37.23 0 le 5) -113.81	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a) 37.23	82.46 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 ), also se 37.23  0  -113.81	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23  0  -113.81	89.32 ater is fr  Oct 142.26  20.59 ble 5 229.09 5 37.23  0  -113.81	92.02 om com Nov 142.26 24.03 248.74 37.23 0	97.68 munity h  Dec 142.26  25.61  267.2  37.23  0  -113.81		(66) (67) (68) (69) (70)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2  Appliances gains (68)m= 279.53 28  Cooking gains (ca (69)m= 37.23 3  Pumps and fans (70)m= 0  Losses e.g. evapor (71)m= -113.81 -12  Water heating gains (72)m= 133.63 13  Total internal gains	calculation   (see Table   5), Wa   Feb   Mar   2.26   142.26   142.26   142.26   12.43   275.12   12.43   275.12   12.43   37.23   13.81   (Table   0	of (65)m  5 and 5a  tts  Apr  142.26  ppendix  13.63  n Appendix  259.56  Appendix  37.23  5a)  0  ative valu  -113.81	only if cylin and only if cyli	Jun 142.26 fon L9 o 8.6 uation L 221.46 ion L15 37.23  0 le 5) -113.81	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a) 37.23	82.46 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 ), also se 37.23  0  -113.81  110.84 1+ (68)m -	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23  0  -113.81  113.18 + (69)m + (	89.32 ater is fr  Oct 142.26  20.59 ole 5 229.09 5 37.23  0  -113.81  120.05 70)m + (7	92.02 om com Nov 142.26 24.03 248.74 37.23 0 -113.81 127.81 1)m + (72)	97.68 munity h  Dec 142.26  25.61  267.2  37.23  0  -113.81		(66) (67) (68) (69) (70) (71)
include (57)m in  5. Internal gains  Metabolic gains (  Jan  (66)m= 142.26 14  Lighting gains (ca (67)m= 24.92 2  Appliances gains (68)m= 279.53 28  Cooking gains (ca (69)m= 37.23 3  Pumps and fans (70)m= 0  Losses e.g. evapor (71)m= -113.81 -12  Water heating gains (72)m= 133.63 13  Total internal gains	calculation (see Table  Table 5), Wa  Teb Mar  2.26 142.26  culated in A  2.13 18  (calculated in A  2.43 275.12  Iculated in A  2.23 37.23  ains (Table 0 0  pration (nega 3.81 -113.81  ns (Table 5)  1.28 126.4	of (65)m 5 and 5a tts	only if cy ): May 142.26 L, equati 10.19 dix L, equ 239.92 L, equat 37.23	Jun 142.26 fon L9 o 8.6 uation L 221.46 ion L15 37.23 0 le 5) -113.81	Jul 142.26 r L9a), a 9.29 13 or L1 209.12 or L15a) 37.23	82.46 dwelling  Aug 142.26 lso see 12.08 3a), also 206.22 ), also se 37.23  0  -113.81	81.49 or hot w  Sep 142.26 Table 5 16.21 o see Tal 213.53 ee Table 37.23  0  -113.81	89.32 ater is fr  Oct 142.26  20.59 ble 5 229.09 5 37.23  0  -113.81	92.02 om com Nov 142.26 24.03 248.74 37.23 0	97.68 munity h  Dec 142.26  25.61  267.2  37.23  0  -113.81		(66) (67) (68) (69) (70)

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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	4.78	x	10.63	x	0.5	x	0.7	] =	12.33	(74)
North	0.9x	0.77	x	4.99	x	10.63	x	0.5	x	0.7	<b>=</b>	12.87	(74)
North	0.9x	0.77	х	5.9	x	10.63	x	0.5	x	0.7	=	15.22	(74)
North	0.9x	0.77	x	4.78	x	20.32	x	0.5	x	0.7	] =	23.56	(74)
North	0.9x	0.77	x	4.99	x	20.32	x	0.5	x	0.7	<b>=</b>	24.59	(74)
North	0.9x	0.77	x	5.9	x	20.32	x	0.5	x	0.7	=	29.08	(74)
North	0.9x	0.77	x	4.78	x	34.53	x	0.5	x	0.7	=	40.03	(74)
North	0.9x	0.77	x	4.99	x	34.53	x	0.5	x	0.7	=	41.79	(74)
North	0.9x	0.77	x	5.9	x	34.53	x	0.5	x	0.7	=	49.41	(74)
North	0.9x	0.77	x	4.78	x	55.46	x	0.5	x	0.7	=	64.3	(74)
North	0.9x	0.77	x	4.99	x	55.46	x	0.5	x	0.7	=	67.13	(74)
North	0.9x	0.77	x	5.9	x	55.46	x	0.5	x	0.7	=	79.37	(74)
North	0.9x	0.77	x	4.78	x	74.72	x	0.5	x	0.7	=	86.62	(74)
North	0.9x	0.77	x	4.99	x	74.72	x	0.5	x	0.7	=	90.43	(74)
North	0.9x	0.77	x	5.9	x	74.72	x	0.5	x	0.7	=	106.92	(74)
North	0.9x	0.77	x	4.78	x	79.99	x	0.5	X	0.7	=	92.73	(74)
North	0.9x	0.77	x	4.99	x	79.99	x	0.5	x	0.7	=	96.81	(74)
North	0.9x	0.77	x	5.9	x	79.99	x	0.5	x	0.7	=	114.46	(74)
North	0.9x	0.77	x	4.78	x	74.68	x	0.5	X	0.7	=	86.58	(74)
North	0.9x	0.77	x	4.99	x	74.68	x	0.5	x	0.7	=	90.38	(74)
North	0.9x	0.77	x	5.9	x	74.68	x	0.5	x	0.7	=	106.87	(74)
North	0.9x	0.77	x	4.78	x	59.25	X	0.5	x	0.7	=	68.69	(74)
North	0.9x	0.77	x	4.99	x	59.25	X	0.5	X	0.7	=	71.71	(74)
North	0.9x	0.77	x	5.9	x	59.25	X	0.5	X	0.7	=	84.78	(74)
North	0.9x	0.77	X	4.78	x	41.52	X	0.5	X	0.7	=	48.13	(74)
North	0.9x	0.77	x	4.99	x	41.52	X	0.5	X	0.7	=	50.25	(74)
North	0.9x	0.77	X	5.9	x	41.52	X	0.5	X	0.7	=	59.41	(74)
North	0.9x	0.77	X	4.78	x	24.19	X	0.5	X	0.7	=	28.04	(74)
North	0.9x	0.77	x	4.99	x	24.19	X	0.5	X	0.7	=	29.28	(74)
North	0.9x	0.77	X	5.9	X	24.19	X	0.5	X	0.7	=	34.62	(74)
North	0.9x	0.77	X	4.78	x	13.12	X	0.5	X	0.7	=	15.21	(74)
North	0.9x	0.77	x	4.99	x	13.12	X	0.5	X	0.7	=	15.88	(74)
North	0.9x	0.77	X	5.9	x	13.12	X	0.5	X	0.7	=	18.77	(74)
North	0.9x	0.77	X	4.78	x	8.86	X	0.5	X	0.7	=	10.28	(74)
North	0.9x	0.77	x	4.99	x	8.86	x	0.5	x	0.7	=	10.73	(74)
North	0.9x	0.77	x	5.9	x	8.86	x	0.5	x	0.7	=	12.69	(74)
East	0.9x	2	x	2.26	x	19.64	x	0.5	x	0.7	=	21.53	(76)
East	0.9x	2	x	2.26	x	38.42	x	0.5	x	0.7	=	42.12	(76)
East	0.9x	2	X	2.26	×	63.27	×	0.5	x	0.7	=	69.37	(76)

			_		_		_				_		_
East	0.9x	2	X	2.26	X	92.28	X	0.5	X	0.7	=	101.17	(76)
East	0.9x	2	X	2.26	X	113.09	X	0.5	X	0.7	=	123.99	(76)
East	0.9x	2	X	2.26	X	115.77	X	0.5	X	0.7	=	126.92	(76)
East	0.9x	2	X	2.26	X	110.22	X	0.5	x	0.7	=	120.84	(76)
East	0.9x	2	X	2.26	x	94.68	X	0.5	X	0.7	=	103.8	(76)
East	0.9x	2	X	2.26	X	73.59	X	0.5	X	0.7	=	80.68	(76)
East	0.9x	2	X	2.26	x	45.59	X	0.5	X	0.7	=	49.98	(76)
East	0.9x	2	X	2.26	x	24.49	X	0.5	x	0.7	=	26.85	(76)
East	0.9x	2	X	2.26	x	16.15	X	0.5	x	0.7	=	17.71	(76)
West	0.9x	0.77	X	4.85	x	19.64	X	0.5	X	0.7	=	23.1	(80)
West	0.9x	0.77	X	2.1	x	19.64	X	0.5	x	0.7	=	10	(80)
West	0.9x	0.77	X	2.16	X	19.64	X	0.5	X	0.7	=	20.58	(80)
West	0.9x	0.77	X	4.85	x	38.42	X	0.5	x	0.7	=	45.2	(80)
West	0.9x	0.77	X	2.1	x	38.42	X	0.5	x	0.7	=	19.57	(80)
West	0.9x	0.77	X	2.16	x	38.42	X	0.5	x	0.7	=	40.26	(80)
West	0.9x	0.77	X	4.85	x	63.27	x	0.5	x	0.7	=	74.43	(80)
West	0.9x	0.77	X	2.1	x	63.27	X	0.5	x	0.7	=	32.23	(80)
West	0.9x	0.77	X	2.16	x	63.27	X	0.5	x	0.7	=	66.3	(80)
West	0.9x	0.77	X	4.85	x	92.28	x	0.5	x	0.7	=	108.56	(80)
West	0.9x	0.77	X	2.1	x	92.28	X	0.5	x	0.7	=	47	(80)
West	0.9x	0.77	X	2.16	x	92.28	X	0.5	x	0.7	=	96.69	(80)
West	0.9x	0.77	X	4.85	x	113.09	x	0.5	x	0.7	=	133.04	(80)
West	0.9x	0.77	X	2.1	x	113.09	x	0.5	x	0.7	=	57.6	(80)
West	0.9x	0.77	X	2.16	x	113.09	X	0.5	x	0.7	=	118.5	(80)
West	0.9x	0.77	X	4.85	x	115.77	x	0.5	x	0.7	=	136.19	(80)
West	0.9x	0.77	X	2.1	x	115.77	x	0.5	x	0.7	=	58.97	(80)
West	0.9x	0.77	X	2.16	x	115.77	x	0.5	x	0.7	=	121.31	(80)
West	0.9x	0.77	X	4.85	x	110.22	x	0.5	x	0.7	=	129.66	(80)
West	0.9x	0.77	X	2.1	x	110.22	x	0.5	x	0.7	=	56.14	(80)
West	0.9x	0.77	X	2.16	x	110.22	x	0.5	x	0.7	=	115.49	(80)
West	0.9x	0.77	X	4.85	x	94.68	x	0.5	x	0.7	=	111.37	(80)
West	0.9x	0.77	X	2.1	x	94.68	x	0.5	X	0.7	=	48.22	(80)
West	0.9x	0.77	X	2.16	x	94.68	x	0.5	x	0.7	=	99.2	(80)
West	0.9x	0.77	X	4.85	x	73.59	X	0.5	x	0.7	=	86.57	(80)
West	0.9x	0.77	X	2.1	x	73.59	x	0.5	x	0.7	=	37.48	(80)
West	0.9x	0.77	x	2.16	x	73.59	x	0.5	x	0.7	j =	77.11	(80)
West	0.9x	0.77	x	4.85	x	45.59	x	0.5	x	0.7	j =	53.63	(80)
West	0.9x	0.77	x	2.1	x	45.59	x	0.5	x	0.7	j =	23.22	(80)
West	0.9x	0.77	x	2.16	x	45.59	x	0.5	x	0.7	j =	47.77	(80)
West	0.9x	0.77	x	4.85	x	24.49	x	0.5	x	0.7	j =	28.81	(80)
West	0.9x	0.77	x	2.1	x	24.49	x	0.5	x	0.7	j =	12.47	(80)
			_		-		-		•		•		_

West	0.9x	0.77	X	2.1	6	x	24.49	X	0.5	×	0.7		25.66	(80)
West	0.9x	0.77	x	4.8	35	x	16.15	x [	0.5	x	0.7	=	19	(80)
West	0.9x	0.77	x	2.	1	x	16.15	x	0.5	x	0.7	=	8.23	(80)
West	0.9x	0.77	x	2.1	6	x	16.15	x	0.5	×	0.7		16.92	(80)
	_													_
Solar o	ains in	watts, ca	alculated	for eacl	h month			(83)m =	Sum(74)m	(82)m				
(83)m=	115.63	224.38	373.57	564.23	717.11	747.	39 705.95	587.78	3 439.63	266.54	143.65	95.55		(83)
Total g	ains – i	nternal a	nd solar	(84)m =	= (73)m -	+ (83)	m , watts	•	•	•	•	•	•	
(84)m=	619.4	725.91	858.77	1022.86	1148.34	1152.	.51 1094.27	982.59	848.24	701.95	609.9	585.33		(84)
7. Me	an inter	nal temp	erature	(heating	season	)	<u> </u>	•	•				•	
							ea from Tal	ole 9. 1	h1 (°C)				21	(85)
•		•	٠.			•	Table 9a)	J.O O, I	( 3)				21	
Otilloc	Jan	Feb	Mar	Apr	May	Ju	<del></del>	Aug	Sep	Oct	Nov	Dec	1	
(86)m=	0.97	0.96	0.92	0.85	0.72	0.56	-	0.49	0.72	0.9	0.96	0.98		(86)
. ,								<u> </u>	_!	0.0	0.00	0.00	J	()
							steps 3 to 7			1	1		1	(07)
(87)m=	18.74	19.01	19.48	20.09	20.57	20.8	20.95	20.92	20.68	20.04	19.29	18.69	J	(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwell	ing from Ta	able 9,	Th2 (°C)		_		_	
(88)m=	20.05	20.05	20.05	20.07	20.07	20.0	8 20.08	20.08	20.07	20.07	20.06	20.06		(88)
Utilisa	ation fac	tor for g	ains for r	est of d	welling,	n2,m	(see Table	9a)						
(89)m=	0.97	0.95	0.91	0.82	0.68	0.5	<u>`                                      </u>	0.41	0.66	0.88	0.95	0.97	]	(89)
Moan	intorna	l temper	ature in t	the rest	of dwalli	na Ta	2 (follow ste	ne 3 t	7 in Tah	lo 9c)			ı	
(90)m=	17	17.39	18.07	18.93	19.58	19.9	<u> </u>	20.03	1	18.89	17.8	16.94	]	(90)
(00)					.0.00	.0.0				fLA = Livin			0.23	(91)
											<b>5</b>	,	0.23	(0.7
							= fLA × T1		_	1		T	1	(00)
(92)m=	17.4	17.77	18.4	19.2	19.81	20.1		20.24		19.15	18.15	17.35	]	(92)
		1			· ·		from Table	1		<u> </u>	10.45	I 47.05	1	(02)
(93)m=	17.4	17.77	18.4	19.2	19.81	20.1	5 20.25	20.24	19.97	19.15	18.15	17.35	J	(93)
			uirement			- 1 - 1	-1441	T-11-	Oh a tha	T' /	70)	.1		
			ernai ter or gains i			ed at	step 11 of	rabie	9D, SO tha	at II,m=(	76)m an	d re-caid	culate	
	Jan	Feb	Mar	Apr	May	Ju	n Jul	Aug	Sep	Oct	Nov	Dec	1	
Utilisa		l	ains, hm	•	may		00.	1 / 108	,	1 001	1 1101	1 200	ı	
(94)m=	0.95	0.93	0.89	0.8	0.67	0.5	1 0.37	0.43	0.66	0.85	0.93	0.96	]	(94)
Usefu	ıl gains,	hmGm .	W = (94	I)m x (84	4)m		-!	<u> </u>	_!	Į.		!	J	
(95)m=	590.62	676.16	761.54	816.62	766.3	584.	11 406.6	417.86	5 556.96	599.38	569.61	561.47		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able 8	3	!		1	ļ.		ı	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	6 16.6	16.4	14.1	10.6	7.1	4.2	]	(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , ۱	W =[(39)m	x [(93)	m– (96)m	]	•	•		
(97)m=	1580.43	1547.74	1427.27	1218.29	956.2	645.2	24 424.68	444.52	2 686.19	1008.58	1310.33	1568.34		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	/Vh/m	onth = 0.02	24 x [(9	7)m – (95	5)m] x (4	1)m		•	
(98)m=	736.42	585.7	495.31	289.2	141.28	0	0	0	0	304.45	533.32	749.11		
								Тс	tal per year	(kWh/year	r) = Sum(9	8)15,912 =	3834.8	(98)
Space	e heatin	a reauire	ement in	kWh/m²	?/vear								33.14	(99)
-1		J - 1		, •	,									<b>」</b> ` ′

9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab		ity scheme.	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 includes boilers, heat pumps, geothermal and waste heat from power stations. See		er heat sources; t	the latter	
Fraction of heat from Community heat pump			0.5	(303a)
Fraction of community heat from heat source 2			0.5	(303b)
Fraction of total space heat from Community heat pump	(302)	) x (303a) =	0.5	(304a)
Fraction of total space heat from community heat source 2	(302)	) x (303b) =	0.5	(304b)
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			<b>kWh/yea</b> 3834.8	<u>r</u>
Space heat from Community heat pump	(98) x (304a) x (305)	x (306) =	2013.27	(307a)
Space heat from heat source 2	(98) x (304b) x (305)	x (306) =	2013.27	(307b)
Efficiency of secondary/supplementary heating system in % (from T	able 4a or Appendix E	)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (3	308) =	0	(309)
Water heating Annual water heating requirement If DHW from community scheme:			2252.11	
Water heat from Community heat pump	(64) x (303a) x (305) x	x (306) =	1182.36	(310a)
Water heat from heat source 2	(64) x (303b) x (305) x	x (306) =	1182.36	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (3	10a)(310e)] =	63.91	(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 outs	side		411.64	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (3	30g) =	411.64	(331)
Energy for lighting (calculated in Appendix L)			440.1	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-706.43	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ty)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	0,	ission factor 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	fuels repeat (363) to (366) f	for the second fue	425	(367a)

Efficiency of heat source 2 (%)	If there is CHP using two fuels repeat (363) to (3	366) for the second	fuel	91	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	390.24	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	758.52	(368)
Electrical energy for heat distribution	[(313) x	0.52	=	33.17	(372)
Total CO2 associated with community system	<b>(363)(366)</b> + (368)(372)		=	1181.94	(373)
CO2 associated with space heating (seconda	ry) (309) x	0	=	0	(374)
CO2 associated with water from immersion he	eater or instantaneous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water h	eating (373) + (374) + (375) =			1181.94	(376)
CO2 associated with electricity for pumps and	d fans within dwelling (331)) x	0.52	=	213.64	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	228.41	(379)
Energy saving/generation technologies (333)	to (334) as applicable		_		7
Item 1		0.52 x 0.01	=	-366.64	(380)
Total CO2, kg/year sum o	of (376)(382) =			1257.35	(383)
Dwelling CO2 Emission Rate (383)	÷ (4) =			10.87	(384)
El rating (section 14)				89.52	(385)

			lloor D	) otoilo						
Assessor Name:	Joseph Treaner		User D	Strom	o Num	bori		STDC	0032062	
Software Name:	Joseph Treanor Stroma FSAP 20	12		Softwa					on: 1.0.4.14	
			roperty	Address		CICIII				
Address :	, Gondar Gardens,									
1. Overall dwelling dim	nensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	³)
Ground floor			7	78.35	(1a) x	2	2.55	(2a) =	199.79	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) 7	78.35	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	199.79	(5)
2. Ventilation rate:		_								_
		econdar heating	у 	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 f	ans				Γ	0	X	10 =	0	(7a)
Number of passive vent	ts				Ē	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	X -	40 =	0	(7c)
Ç					L					` ′
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (	6a)+(6b)+(7	'a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
	been carried out or is intend	led, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 for otaal or tirebor		0.05 %				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corre				•	uction			0	(11)
	nings); if equal user 0.35	oponung te	rino groat	or wan are	a (ano					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
•	nter 0.05, else enter 0								0	(13)
•	ws and doors draught s	stripped		0.05 (0.0	(4.4) 4	001			0	(14)
Window infiltration				0.25 - [0.2] (8) + (10)			. (15) -		0	(15)
Infiltration rate	e, q50, expressed in cu	hic motro	o par ba	. , , ,	, , ,	, , ,	, ,	aroa	0	(16)
If based on air permeat	• • •		•	•	•	elle oi e	rivelope	alea	0.15	(17)
·	lies if a pressurisation test ha					is being u	sed		0.13	(10)
Number of sides shelter	red								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.13	(21)
Infiltration rate modified	for monthly wind spee	d							7	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind s	speed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (	22\m ∸ 4									
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
,									J	

djusted infiltration rate (allowing f	or shelter an	nd wind s	peed) = 0.12	(21a) x 0.12	(22a)m <sub>0.13</sub>	0.14	0.14	0.15		
Calculate effective air change rate	1			0.12	0.13	0.14	0.14	0.13		
If mechanical ventilation:									0.5	(
If exhaust air heat pump using Appendix	N, (23b) = (23a)	a) × Fmv (e	quation (N	N5)) , othe	rwise (23b	) = (23a)		[	0.5	(
If balanced with heat recovery: efficiency	in % allowing f	for in-use fa	actor (fron	n Table 4h	) =				68.85	(
a) If balanced mechanical ventila	ation with he	at recove	ery (MVI	HR) (24a	n)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0.32 0.32 0.31 0	.3 0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(:
b) If balanced mechanical ventila	ation without	heat rec	overy (N	MV) (24b	m = (22)	2b)m + (2	23b)	· · · · · · · · · · · · · · · · · · ·		
24b)m= 0 0 0	0 0	0	0	0	0	0	0	0		(
c) If whole house extract ventilat if $(22b)m < 0.5 \times (23b)$ , then	•	•				5 × (23b	)			
4c)m= 0 0 0	0 0	0	0	0	0	0	0	0		(
d) If natural ventilation or whole if (22b)m = 1, then (24d)m =	•	•				0.5]				
4d)m= 0 0 0	0 0	0	0	0	0	0	0	0		(
Effective air change rate - enter	(24a) or (24k	b) or (24d	c) or (24	d) in box	(25)					
5)m= 0.32 0.32 0.31 0	.3 0.29	0.28	0.28	0.27	0.28	0.29	0.3	0.31		(
B. Heat losses and heat loss para	meter:									
·	enings m²	Net Are A ,n		U-valı W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²-k		X k J/K
indows Type 1		10.85	x1.	/[1/( 1.2 )+	0.04] =	12.42	П			
indows Type 2		4.5	x1.	/[1/( 1.2 )+	0.04] =	5.15	=			
indows Type 3		2.26	x1.	/[1/( 1.2 )+	0.04] =	2.59	=			
indows Type 4		4.5	x1.	/[1/( 1.2 )+	0.04] =	5.15	=			
alls Type1 52.24	22.11	30.13	x	0.18		5.42	<b>=</b>			
alls Type2 24.99	0	24.99	x	0.23	<u> </u>	5.68	<b>=</b>		i	
oof 35.68	0	35.68	×	0.13	<b>=</b>	4.64	F i			_
otal area of elements, m <sup>2</sup>		112.91	一							
arty wall		24.69	=	0		0	<b>—</b> [		<b>-</b>	
or windows and roof windows, use effect	ive window U-va				 /[(1/U-valu		⊥ L ns given in	paragraph	3.2	
include the areas on both sides of interna	al walls and par	rtitions						_		
which heat loss, $W/K = S(A \times U)$				(26)(30)	+ (32) =				41.06	
eat capacity Cm = S(A x k)					((28)	.(30) + (32	2) + (32a).	(32e) =	4739.37	
nermal mass parameter (TMP = 0	•					tive Value			100	
r design assessments where the details n be used instead of a detailed calculation		tion are not	known pr	ecisely the	indicative	values of	TMP in T	able 1f		
nermal bridges : S (L x Y) calcula		opendix k	(					[	13.7	
letails of thermal bridging are not known	• .	•						L	-	
tal fabric heat loss					(33) +	(36) =			54.76	
	onthly				(38)m	= 0.33 × (	25)m x (5	)		
entilation heat loss calculated mo	<del></del>			I .	I	Oct	Nov	Dec		
	Apr May	Jun	Jul	Aug	Sep	Oct	INOV	Dec		
Jan Feb Mar A	<del>- i</del>	Jun 18.25	Jul 18.25	18.04	18.68	19.31	19.73	20.15		(
Jan Feb Mar A	Apr May	<del>† †</del>		Ť	18.68		19.73			(

Heat loss para	ımeter (l	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.97	0.96	0.96	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.95	0.96		
				ı		l	l		Average =	Sum(40) <sub>1</sub>	12 /12=	0.95	(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 hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
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		43		(42)
Annual average Reduce the annual not more that 125	je hot wa al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t			se target o		.93		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 101.12	97.45	93.77	90.09	86.42	82.74	82.74	86.42	90.09	93.77	97.45	101.12		
	<u>!</u>	<u>!</u>		<u> </u>		<u> </u>	<u> </u>		Total = Su	m(44) <sub>112</sub> =	=	1103.18	(44)
Energy content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 149.97	131.16	135.35	118	113.22	97.7	90.54	103.89	105.13	122.52	133.74	145.23		
<i>(f. in a familiar and a manus of the last and a manus</i>			-f /		( )		havea (40		Total = Su	m(45) <sub>112</sub> =	= [	1446.44	(45)
If instantaneous w			ot use (no	not water	storage),		· · ·	) tO (61)			· · · · · · · · · · · · · · · · · · ·		
(46)m= 22.49 Water storage	19.67	20.3	17.7	16.98	14.66	13.58	15.58	15.77	18.38	20.06	21.78		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` '		-			_					<u> </u>		(,
Otherwise if no	-			_			, ,	ers) ente	er '0' in (	(47)			
Water storage	loss:												
a) If manufact	turer's d	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		•					(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water store</li></ul>			-								00		(51)
If community h	-			IC 2 (KVV)	ii/iiti C/GC	<b>'</b> y)				0.	02		(31)
Volume factor	_									1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m watei	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 f	or each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хН	
(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	nual) fro	m Table	- <del></del>							0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	0	0	0	)	)	0	0	0	0	]	(61)
	equired for	water he	eating ca	alculated	l for ea	ach month	(62)	 m =	0.85 × (	(45)m +	(46)m +	(57)m +	י - (59)m + (61)m	
(62)m= 205.2	<del></del>	190.62	171.49	168.5	151.2		159		158.62	177.8	187.23	200.51	1	(62)
Solar DHW inp	ut calculated	using App	endix G oı	· Appendix	H (neg	ative quantit	y) (ent	ter '0'	' if no sola	r contribu	tion to wate	er heating)	)	
(add addition	nal lines if	FGHRS	and/or \	WWHRS	appli	es, see Ap	pend	dix C	3)					
(63)m= 0	0	0	0	0	0	0	0	)	0	0	0	0		(63)
Output from	water hea	ter				•				•	•	•	-	
(64)m= 205.2	24 181.09	190.62	171.49	168.5	151.2	145.81	159	.17	158.62	177.8	187.23	200.51	]	
	<del>-</del>			=		<del>-</del>		Outp	out from wa	ater heate	er (annual)	I12	2097.28	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.8	35 × (45)m	า + (6	31)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	n ]	
(65)m= 94.08	8 83.55	89.22	82.03	81.87	75.28	3 74.32	78.	76	77.75	84.96	87.26	92.51	]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinde	r is in the	dwell	ling	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	n Feb	Mar	Apr	May	Jur	n Jul	Α	ug	Sep	Oct	Nov	Dec	]	
(66)m= 121.5	121.54	121.54	121.54	121.54	121.5	4 121.54	121	.54	121.54	121.54	121.54	121.54	]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee -	Table 5				_	
(67)m= 19.2	5 17.1	13.91	10.53	7.87	6.64	7.18	9.3	33	12.53	15.9	18.56	19.79	]	(67)
Appliances (	gains (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a),	also	see Tal	ble 5		-	_	
(68)m= 215.9	96 218.2	212.55	200.53	185.35	171.0	9 161.56	159	.32	164.97	176.99	192.17	206.43	]	(68)
Cooking gai	ns (calcula	ted in A	opendix	L, equat	ion L1	5 or L15a	), als	o se	ee Table	5	•	•	-	
(69)m= 35.1	5 35.15	35.15	35.15	35.15	35.15	35.15	35.	15	35.15	35.15	35.15	35.15	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 (negat	ive valu	es) (Tab	le 5)	-			-	=		-	_	
(71)m= -97.2	3 -97.23	-97.23	-97.23	-97.23	-97.2	3 -97.23	-97	.23	-97.23	-97.23	-97.23	-97.23	]	(71)
Water heatir	ng gains (T	able 5)				•				•	-		-	
(72)m= 126.4	6 124.33	119.92	113.93	110.04	104.5	6 99.9	105	.87	107.99	114.19	121.2	124.34	]	(72)
Total intern	al gains =				(	66)m + (67)n	n + (68	3)m +	+ (69)m + (	(70)m + (	71)m + (72)	)m	-	
(73)m= 421.1	3 419.1	405.84	384.45	362.72	341.7	5 328.1	333	.98	344.94	366.55	391.39	410.02	]	(73)
6. Solar ga	ins:													
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and ass	ociated equa	ations	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²			lux able 6a		_	g_ able 6b	-	FF able 6c		Gains	
					_	able ba	1		able ob	_ '	able 60		(W)	,
North 0.9		X	4.	5	x	10.63	X		0.5	X	0.7	=	8.14	(74)
North 0.9		X	4.	5	x _	20.32	X		0.5	X	0.7	=	15.55	(74)
North 0.9		X	4.	5	x _	34.53	X	<u></u>	0.5	x	0.7	=	26.43	(74)
North 0.9		Х	4.	5	x	55.46	X		0.5	x	0.7	=	42.46	(74)
North 0.9	x 0.54	X	4.	5	x	74.72	X		0.5	X	0.7	=	57.19	(74)

	_		_								,		_
North	0.9x	0.54	X	4.5	X	79.99	X	0.5	X	0.7	=	61.22	(74)
North	0.9x	0.54	X	4.5	X	74.68	X	0.5	X	0.7	=	57.16	(74)
North	0.9x	0.54	X	4.5	X	59.25	X	0.5	X	0.7	=	45.35	(74)
North	0.9x	0.54	X	4.5	X	41.52	X	0.5	X	0.7	=	31.78	(74)
North	0.9x	0.54	X	4.5	X	24.19	X	0.5	X	0.7	=	18.52	(74)
North	0.9x	0.54	X	4.5	X	13.12	X	0.5	X	0.7	=	10.04	(74)
North	0.9x	0.54	X	4.5	x	8.86	X	0.5	X	0.7	=	6.79	(74)
East	0.9x	1	X	10.85	x	19.64	x	0.5	x	0.7	=	51.69	(76)
East	0.9x	1	X	4.5	x	19.64	X	0.5	X	0.7	=	21.44	(76)
East	0.9x	1	X	2.26	x	19.64	X	0.5	X	0.7	=	10.77	(76)
East	0.9x	1	X	10.85	x	38.42	X	0.5	x	0.7	=	101.11	(76)
East	0.9x	1	X	4.5	x	38.42	X	0.5	x	0.7	=	41.94	(76)
East	0.9x	1	X	2.26	x	38.42	x	0.5	x	0.7	=	21.06	(76)
East	0.9x	1	x	10.85	x	63.27	X	0.5	x	0.7	=	166.51	(76)
East	0.9x	1	X	4.5	x	63.27	x	0.5	X	0.7	=	69.06	(76)
East	0.9x	1	X	2.26	x	63.27	x	0.5	x	0.7	=	34.68	(76)
East	0.9x	1	X	10.85	x	92.28	X	0.5	x	0.7	=	242.85	(76)
East	0.9x	1	X	4.5	x	92.28	x	0.5	x	0.7	=	100.72	(76)
East	0.9x	1	X	2.26	x	92.28	X	0.5	x	0.7	=	50.58	(76)
East	0.9x	1	X	10.85	x	113.09	X	0.5	X	0.7	=	297.62	(76)
East	0.9x	1	X	4.5	x	113.09	x	0.5	x	0.7	=	123.44	(76)
East	0.9x	1	x	2.26	x	113.09	x	0.5	x	0.7	] =	61.99	(76)
East	0.9x	1	X	10.85	x	115.77	x	0.5	X	0.7	] =	304.67	(76)
East	0.9x	1	X	4.5	x	115.77	x	0.5	x	0.7	=	126.36	(76)
East	0.9x	1	X	2.26	x	115.77	x	0.5	x	0.7	=	63.46	(76)
East	0.9x	1	X	10.85	x	110.22	x	0.5	x	0.7	=	290.06	(76)
East	0.9x	1	X	4.5	x	110.22	x	0.5	x	0.7	=	120.3	(76)
East	0.9x	1	X	2.26	x	110.22	x	0.5	x	0.7	=	60.42	(76)
East	0.9x	1	×	10.85	x	94.68	x	0.5	x	0.7	=	249.16	(76)
East	0.9x	1	X	4.5	x	94.68	x	0.5	x	0.7	=	103.34	(76)
East	0.9x	1	x	2.26	x	94.68	x	0.5	x	0.7	=	51.9	(76)
East	0.9x	1	X	10.85	x	73.59	x	0.5	x	0.7	=	193.66	(76)
East	0.9x	1	x	4.5	×	73.59	x	0.5	x	0.7	=	80.32	(76)
East	0.9x	1	x	2.26	x	73.59	x	0.5	x	0.7	=	40.34	(76)
East	0.9x	1	x	10.85	x	45.59	x	0.5	x	0.7	=	119.98	(76)
East	0.9x	1	x	4.5	×	45.59	×	0.5	x	0.7	] =	49.76	(76)
East	0.9x	1	x	2.26	x	45.59	x	0.5	х	0.7	] =	24.99	(76)
East	0.9x	1	x	10.85	x	24.49	x	0.5	x	0.7	] =	64.45	(76)
East	0.9x	1	X	4.5	x	24.49	X	0.5	X	0.7	] =	26.73	(76)
East	0.9x	1	X	2.26	x	24.49	X	0.5	X	0.7	] =	13.42	(76)
East	0.9x	1	X	10.85	X	16.15	X	0.5	X	0.7	] =	42.5	(76)
	_		_				1	<u> </u>	1		1		

East	0.9x	1	x	4.	5	x	1	6.15	x [		0.5	<u> </u>		0.7		=	17.63	(76)
East	0.9x	1	x	2.2	26	x	1	6.15	x		0.5	<b>,</b>		0.7		=	8.85	(76)
	_																	<u></u>
Solar g	ains in	watts, ca	alculated	for eac	h month	l			(83)m	= St	um(74)m .	(82)	m					
(83)m=	92.03	179.66	296.69	436.61	540.24	5	55.72	527.94	449.	74	346.1	213	.24	114.64	75.7	77		(83)
Total g	ains – i	nternal a	and solar	(84)m =	= (73)m	+ (	83)m	, watts									•	
(84)m=	513.16	598.76	702.53	821.06	902.97	8	97.47	856.04	783.	72	691.04	579	.79	506.03	485.	.79		(84)
7. Mea	an inter	nal temp	perature	(heating	seasor	1)												
Temp	erature	during h	neating p	eriods ir	the livi	ng	area	from Tab	ole 9,	Th	1 (°C)						21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	า (ธ	ee Ta	ble 9a)										
ſ	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Αι	ıg	Sep	0	ct	Nov	De	ес		
(86)m=	0.96	0.93	0.88	0.78	0.64	T	0.48	0.36	0.4	1	0.62	0.8	34	0.93	0.9	6		(86)
Mean	interna	l tampar	ature in	livina ar	22 T1 (f	مااد	w sta	ne 3 to 7	in T	ahle		!						
(87)m=	19.11	19.4	19.85	20.37	20.73	_	20.92	20.97	20.9		20.81	20.	31	19.62	19.0	77		(87)
L		<u> </u>	<u> </u>			_		<u> </u>	<u> </u>				-	10.02				, ,
· r			eating p			$\overline{}$		i	1		· ,		40	00.40	00.4	10	1	(00)
(88)m=	20.11	20.11	20.12	20.13	20.13	L	20.14	20.14	20.1	4	20.14	20.	13	20.12	20.1	12		(88)
Utilisa	tion fac	tor for g	ains for i	rest of d	welling,	h2	,m (se	e Table	9a)								•	
(89)m=	0.95	0.92	0.87	0.75	0.6		0.43	0.3	0.3	4	0.57	0.8	32	0.92	0.9	6		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	ps 3	to 7	' in Tabl	e 9c	)					
(90)m=	17.58	17.98	18.62	19.35	19.83		20.06	20.12	20.1	2	19.95	19.	29	18.32	17.5	51		(90)
•								<u>.</u>			f	LA =	Livin	g area ÷ (4	4) =		0.39	(91)
Mean	interna	l tampar	ature (fo	r the wh	ole dwe	llin	(a) – fl	Δ <b>~</b> T1	<b></b>	_ fl	Δ) <b>~</b> T2							
(92)m=	18.18	18.53	19.1	19.75	20.18	_	20.4	20.45	20.4	_	20.29	19.	69	18.83	18.	12		(92)
` ′ L		<u> </u>	he mean					l	l .					10.00				(- /
(93)m=	18.18	18.53	19.1	19.75	20.18	$\overline{}$	20.4	20.45	20.4		20.29	19.		18.83	18.1	12		(93)
		L	uirement			<u> </u>												
			ernal ter		re obtair	nec	d at ste	ep 11 of	Table	e 9b	so tha	t Ti.r	n=(	76)m an	d re-	calc	culate	
			or gains	•				- F			,, 00	, .	(	. 0,				
ſ	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ıg	Sep	0	ct	Nov	De	ес		
Utilisa	ition fac	tor for g	ains, hm	:														
(94)m=	0.93	0.9	0.84	0.74	0.6		0.44	0.32	0.3	6	0.58	0.	8	0.9	0.9	4		(94)
Usefu	l gains,	hmGm	, W = (94	1)m x (8	4)m												•	
(95)m=	478.61	540.37	593.33	607.55	542.29	3	98.22	274.49	284.	47	399.29	463	.93	457.88	456.	.82		(95)
Month	nly aver	age exte	rnal tem	perature	from T	ab	le 8										•	
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	4	14.1	10	.6	7.1	4.2	2		(96)
			an intern			_				_		_					Ī	
` ' L		1029.83	949.07	805.68	627.86		23.12	281.38	294.		454.37	673		873.59	1042	2.59		(97)
		<del></del>	ement fo		1	Wh		l e	Ι	Ì		ŕŤ		r e			ı	
(98)m=	425.96	328.92	264.67	142.66	63.67		0	0	0		0	155		299.31	435.			_
									7	Fotal	per year	(kWh	/year	r) = Sum(9	8)15,9	12 =	2116.6	(98)
Space	e heatin	g require	ement in	kWh/m²	/year												27.01	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

				٦.
Fraction of space heat from secondary/supplementary heating (Tai	ble 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 allow includes boilers, heat pumps, geothermal and waste heat from power stations. See	•	four other heat sources;	the latter	
Fraction of heat from Community heat pump			0.5	(303a)
Fraction of community heat from heat source 2			0.5	(303b)
Fraction of total space heat from Community heat pump		(302) x (303a) =	0.5	(304a)
Fraction of total space heat from community heat source 2		(302) x (303b) =	0.5	(304b)
Factor for control and charging method (Table 4c(3)) for communit	y heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heating			kWh/year	
Annual space heating requirement			2116.6	╛
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1111.22	(307a
Space heat from heat source 2	(98) x (304b) x	x (305) x (306) =	1111.22	(307b
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2097.28	7
If DHW from community scheme:				<b>⊣</b> ¬
Water heat from Community heat pump		x (305) x (306) =	1101.07	(310a
Water heat from heat source 2		x (305) x (306) =	1101.07	(310b
Electricity used for heat distribution	0.01 × [(307a)(30	7e) + (310a)(310e)] =	44.25	(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 our	tside		255.93	(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) =	255.93	(331)
Energy for lighting (calculated in Appendix L)			340.01	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-478.37	(333)
Electricity generated by wind turbine (Appendix M) (negative quant	tity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor 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 tw	o fuels repeat (363) to	(366) for the second fue	el 425	(367
(,		(366) for the second fue		_՝
Emoiority of fleat source 2 (70)	us.s .opout (000) to	(200) is the cooling ful	91	(367b

CO2 associated with heat source 1	[(307b	)+(310b)] x 100 ÷ (367b) x	0.52	=	270.16	(367)
CO2 associated with heat source 2	[(307b	)+(310b)] x 100 ÷ (367b) x	0.22	=	525.11	(368)
Electrical energy for heat distribution		[(313) x	0.52	=	22.96	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	)	=	818.24	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			818.24	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	132.83	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	176.47	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli		0.52 x 0.01	=	-248.27	(380)
Total CO2, kg/year	sum of (376)(382) =				879.26	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =				11.22	(384)
El rating (section 14)					90.45	(385)

			Hoor	Details:						
			User					OTDO		
Assessor Name:	Joseph Tre				a Num				032062	
Software Name:	Stroma FS	AP 2012	_		are Ve	rsion:		Versic	n: 1.0.4.14	
				/ Address	: P16					
Address :	, Gondar Ga	rdens, Lond	on, NW6 <sup>^</sup>	IHG						
1. Overall dwelling dime	ensions:									
			Ar	ea(m²)	•	Av. He	eight(m)	_	Volume(m	<u> </u>
Ground floor				54.62	(1a) x	2	2.55	(2a) =	139.28	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1d)+(1e)+	.(1n)	54.62	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	139.28	(5)
2. Ventilation rate:										
	main heating	secon heati		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	ans					0	x	10 =	0	(7a)
Number of passive vents	5				Ī	0	x	10 =	0	(7b)
Number of flueless gas f	ires				Ī	0	x	40 =	0	(7c)
					_				_	
					_			Air ch	anges per ho	our —
Infiltration due to chimne					Ļ	0		÷ (5) =	0	(8)
If a pressurisation test has b			ceed to (17)	, otherwise	continue fi	rom (9) to	(16)			<b>–</b>
Number of storeys in t	ne aweiling (ns	5)							0	(9)
Additional infiltration	05 (	Carlor Cara	0 05 (				[(9]	)-1]x0.1 =	0	(10)
Structural infiltration: 0					•	ruction			0	(11)
if both types of wall are p deducting areas of openi			ng to the gre	ater wall are	ea (anter					
If suspended wooden	floor, enter 0.2	(unsealed)	or 0.1 (sea	led), else	enter 0				0	(12)
If no draught lobby, en	nter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dr	aught strippe	ed						0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic m	etres per l	nour per s	quare m	etre of e	envelope	e area	3	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 2]$	0]+(8), other	wise (18) =	(16)				0.15	(18)
Air permeability value applie	es if a pressurisatio	on test has beer	done or a d	egree air pe	ermeability	is being u	ısed			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	3) x (20) =				0.13	(21)
Infiltration rate modified	for monthly win	d speed							•	
Jan Feb	Mar Apr	May Ju	ın Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4									
(00.)	,	100 00	E 0.05	1 000	T .	T	T	T	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.5 (2 0.5 (2 8.85 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (
If mechanical ventilation:  If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)  If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =  a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100]  (24a)m = 0.32  0.32  0.31  0.3  0.29  0.28  0.28  0.27  0.28  0.29  0.3  0.31  b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)  (24b)m = 0  0  0  0  0  0  0  0  0  0  0  0  0	0.5 (2 8.85 (2 1 (2 (2 (2 (2
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =   a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100] (24a)m =   0.32   0.32   0.31   0.3   0.29   0.28   0.28   0.27   0.28   0.29   0.3   0.31   0.3   0.31	8.85 (2 ) (2 (2 (2 (2
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] (24a)m = 0.32	(2 (2 (2 (2 A X k
	(2 (2 (2 (2 A X k
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)  (24b)m = 0	(2 (2 (2 A X k
24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(2 (2 A X k
c) If whole house extract ventilation or positive input ventilation from outside     if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b)  24c)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(2 (2 A X k
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  24c)m = 0	(2 A X k
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]  24d)m= 0	(2 A X k
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]  24d)m = 0	(2 A X k
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)  25)m= 0.32 0.32 0.31 0.3 0.29 0.28 0.28 0.27 0.28 0.29 0.3 0.31  3. Heat losses and heat loss parameter:  ELEMENT Gross Openings area (m²) m² Net Area W/m2K (W/K) kJ/m²-K  Windows Type 1 4.5 x1/[1/(1.2)+0.04] = 5.15  Windows Type 2 2.26 x1/[1/(1.2)+0.04] = 2.59  Windows Type 3 4.5 x1/[1/(1.2)+0.04] = 5.15  Walls Type1 50.09 20.26 29.83 x 0.18 = 5.37  Walls Type2 25.36 0 25.36 x 0.23 = 5.76  Roof 44.8 0 44.8 x 0.13 = 5.82  Total area of elements, m² 120.25	(2 A X k
3. Heat losses and heat loss parameter:  ELEMENT Gross area (m²) Openings area (m²) Mindows Type 1  Windows Type 2  Windows Type 3  Walls Type 1  Solve 1  Walls Type 2  Solve 25.36  Solve 44.8  O 44.8  O 44.8  O 44.8  O 128  O.28  O.28  O.28  O.28  O.28  O.29  O.28  O.28  O.29  O.28  O.29  O.3  O.31  A X U (W/K) k-value (W/K)  K-value (W/K)  K-value (W/K)  K-value (W/K)  A X U (W	ΑXk
3. Heat losses and heat loss parameter:  ELEMENT Gross area (m²) Openings area (m²) Net Area W/m2K A x U (W/K) kJ/m²·K  Windows Type 1 4.5 x1/[1/(1.2)+0.04] = 5.15  Windows Type 2 2.26 x1/[1/(1.2)+0.04] = 2.59  Windows Type 3 4.5 x1/[1/(1.2)+0.04] = 5.15  Walls Type1 50.09 20.26 29.83 x 0.18 = 5.37  Walls Type2 25.36 0 25.36 x 0.23 = 5.76  Roof 44.8 0 44.8 x 0.13 = 5.82  Total area of elements, m²	ΑXk
ELEMENT         Gross area (m²)         Openings m²         Net Area A ,m²         U-value W/m2K         A X U (W/K)         k-value kJ/m²-K           Windows Type 1         4.5         x1/[1/(1.2) + 0.04] = 5.15         5.15           Windows Type 2         2.26         x1/[1/(1.2) + 0.04] = 2.59           Windows Type 3         4.5         x1/[1/(1.2) + 0.04] = 5.15           Walls Type 1         50.09         20.26         29.83         x 0.18         = 5.37           Walls Type 2         25.36         0         25.36         x 0.23         = 5.76           Roof         44.8         0         44.8         x 0.13         = 5.82           Total area of elements, m²         120.25	
Net Area   U-value   A X U   K-value   KJ/m²-K	
area (m²)       m²       A ,m²       W/m2K       (W/K)       kJ/m²·K         Vindows Type 1       4.5       x1/[1/(1.2)+0.04] = 5.15         Vindows Type 2       2.26       x1/[1/(1.2)+0.04] = 5.15         Vindows Type 3       4.5       x1/[1/(1.2)+0.04] = 5.15         Valls Type 1       50.09       20.26       29.83       x 0.18       = 5.37         Valls Type 2       25.36       0       25.36       x 0.23       = 5.76         Roof       44.8       0       44.8       x 0.13       = 5.82         Total area of elements, m²       120.25	
Vindows Type 2       2.26       x1/[1/(1.2)+0.04] = 2.59         Vindows Type 3       4.5       x1/[1/(1.2)+0.04] = 5.15         Valls Type1       50.09       20.26       29.83       x 0.18       = 5.37         Valls Type2       25.36       0       25.36       x 0.23       = 5.76         Roof       44.8       0       44.8       x 0.13       = 5.82         Total area of elements, m²       120.25	10/11
Vindows Type 3       4.5       x1/[1/(1.2)+0.04] = 5.15         Valls Type1       50.09       20.26       29.83       x 0.18       = 5.37         Valls Type2       25.36       0       25.36       x 0.23       = 5.76         Roof       44.8       0       44.8       x 0.13       = 5.82         Total area of elements, m²       120.25	(2
Valls Type1       50.09       20.26       29.83       x       0.18       =       5.37         Valls Type2       25.36       0       25.36       x       0.23       =       5.76         Roof       44.8       0       44.8       x       0.13       =       5.82         Total area of elements, m²       120.25	(2
Valls Type2       25.36       0       25.36       x       0.23       =       5.76         Roof       44.8       0       44.8       x       0.13       =       5.82         Total area of elements, m²       120.25	(2
Roof 44.8 0 44.8 × 0.13 = 5.82 Total area of elements, m <sup>2</sup>	(2
Fotal area of elements, m <sup>2</sup> 120.25	(2
	(3
Party wall 24.73 x 0 = 0	(3
	(3
for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2	
* include the areas on both sides of internal walls and partitions	
(40) (40) (40) (40)	0.16
The same I was a proposed of (TAAD Core of TEA) in Is March	27.45
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Low  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f	100
an be used instead of a detailed calculation.	
Thermal bridges: S (L x Y) calculated using Appendix K	3.82
details of thermal bridging are not known (36) = 0.15 x (31)	
	3.97
/entilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
38)m= 14.63 14.48 14.34 13.6 13.46 12.73 12.73 12.58 13.02 13.46 13.75 14.04	
Heat transfer coefficient, W/K (39)m = (37) + (38)m	(3
39)m= 68.6 68.46 68.31 67.58 67.43 66.7 66.5 66.99 67.43 67.73 68.02	(%

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 1.26	1.25	1.25	1.24	1.23	1.22	1.22	1.22	1.23	1.23	1.24	1.25		
	!		<u>.                                    </u>	!		!	!		Average =	Sum(40) <sub>1</sub>	12 /12=	1.24	(40)
Number of day	1	<u> </u>	· ·			<del></del>			<u> </u>	<del></del>			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
											1350 /		
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		83		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o		7.57		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea				Table 1c x		! '	!	!	<u> </u>		
(44)m= 85.33	82.23	79.12	76.02	72.92	69.82	69.82	72.92	76.02	79.12	82.23	85.33		
					100 1/1		·			ım(44) <sub>112</sub> =	L	930.87	(44)
Energy content of										1			
(45)m= 126.54	110.67	114.21	99.57	95.54	82.44	76.39	87.66	88.71	103.38	112.85	122.55	4000.50	(45)
If instantaneous w	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	ım(45) <sub>112</sub> =	- [	1220.52	(45)
(46)m= 18.98	16.6	17.13	14.94	14.33	12.37	11.46	13.15	13.31	15.51	16.93	18.38		(46)
Water storage	loss:			ļ				ļ			<u> </u>		
Storage volum	ne (litres	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			_			, ,	a	a	(47)			
Otherwise if no Water storage		not wate	er (uns ir	iciudes i	nstantar	ieous co	ווטט וטוווו	ers) ente	er o in (	(47)			
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	m wate	r storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
b) If manufact			-										(=4)
Hot water stor	•			ie z (KVV	n/iitre/ua	iy)				0.	02		(51)
Volume factor	_									1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (	55)								1.	03		(55)
Water storage	loss cal	culated f	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 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 Appendi	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	e 3							0		(58)
Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)													
,			ı —				<del></del>	<u> </u>	1	<del>-                                    </del>	00.00		(EO)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss	calculated	for each	month (	(61)m =	(60) ÷ 3	865 <b>x</b> (41	)m							
(61)m= 0	0	0	0	0	0	0	)   0		0	0	0	0	1	(61)
	auired for	water h	Leating ca	L	L I for eac	h month	(62)	—— m =	0 85 x (	 ′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 181.8	<del>-i</del>	169.48	153.06	150.81	135.94		142	_	142.2	158.66	166.34	177.83	]	(62)
Solar DHW inp	ut calculated	using App	endix G or	· Appendix	H (negat	tive quantity	y) (ent	er '0'	if no sola	r contribu	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= 181.8	32 160.6	169.48	153.06	150.81	135.94	131.67	142	.94	142.2	158.66	166.34	177.83	1	
	•		•	•	•	•		Outp	out from wa	ater heate	er (annual) <sub>1</sub>	12	1871.36	(64)
Heat gains f	rom water	heating	, kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	١]	
(65)m= 86.3	3 76.74	82.19	75.9	75.99	70.21	69.62	73.	37	72.29	78.6	80.32	84.97	]	(65)
include (5	7)m in cal	culation	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	gains (see	Table 5	and 5a	):										
Metabolic ga	ains (Table	e 5), Wat	its											
Jar		Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	]	
(66)m= 91.3°	1 91.31	91.31	91.31	91.31	91.31	91.31	91.	31	91.31	91.31	91.31	91.31	]	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
(67)m= 14.19	9 12.61	10.25	7.76	5.8	4.9	5.29	6.8	88	9.23	11.72	13.68	14.59	]	(67)
Appliances (	gains (calc	ulated ir	n Append	dix L, eq	uation L	_13 or L1	3a), a	also	see Tal	ble 5		_	-	
(68)m= 159.2	21 160.86	156.69	147.83	136.64	126.13	119.1	117	.45	121.62	130.48	141.67	152.18	]	(68)
Cooking gai	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a	), als	o se	e Table	5	-	-		
(69)m= 32.13	3 32.13	32.13	32.13	32.13	32.13	32.13	32.	13	32.13	32.13	32.13	32.13	]	(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.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -73.0	5 -73.05	-73.05	-73.05	-73.05	-73.05	-73.05	-73.	.05	-73.05	-73.05	-73.05	-73.05	]	(71)
Water heatir	ng gains (T	able 5)											_	
(72)m= 115.9	9 114.2	110.48	105.42	102.13	97.51	93.58	98.	61	100.4	105.64	111.55	114.21	]	(72)
Total intern	al gains =				(66	6)m + (67)m	า + (68	3)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	_	
(73)m= 339.7	78 338.06	327.82	311.4	294.97	278.93	268.37	273	.34	281.65	298.24	317.3	331.37	]	(73)
6. Solar ga														
Solar gains ar		•				•	ations	to co		e applica		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
Foot							1							1,,
East 0.9		X				19.64	X		0.5	╣ <sup>╵</sup> ┞	0.7	=	64.31	(76)
East 0.9		X				19.64	X		0.5	_  ×	0.7	=	10.77	(76)
East 0.9		X				38.42	X		0.5		0.7	=	125.81	[76]
East 0.9		X		==		38.42	X		0.5	╣ <sup>╵</sup> ┞	0.7	_ =	21.06	(76)
East 0.9	x 3	X	4.	5	X	63.27	X		0.5	X	0.7	=	207.18	(76)

_	-					,			,			_					_
East	0.9x	1		X	2.26	X	6	3.27	X		0.5	X	0.7		=	34.68	(76)
East	0.9x	3		X	4.5	X		2.28	X		0.5	X	0.7		=	302.16	(76)
East	0.9x	1		x	2.26	X		2.28	X		0.5	X	0.7		=	50.58	(76)
East	0.9x	3		x	4.5	X	1	13.09	X		0.5	X	0.7		=	370.31	(76)
East	0.9x	1		x	2.26	X	1	13.09	X		0.5	X	0.7		=	61.99	(76)
East	0.9x	3		x	4.5	X	1	15.77	X		0.5	X	0.7		=	379.08	(76)
East	0.9x	1		x	2.26	X	1	15.77	X		0.5	X	0.7		=	63.46	(76)
East	0.9x	3		x	4.5	X	1	10.22	X		0.5	X	0.7		=	360.9	(76)
East	0.9x	1		x	2.26	X	1	10.22	X		0.5	X	0.7		=	60.42	(76)
East	0.9x	3		x	4.5	X	9	4.68	X		0.5	X	0.7		=	310.01	(76)
East	0.9x	1		x	2.26	X	9	4.68	X		0.5	X	0.7		=	51.9	(76)
East	0.9x	3		x	4.5	X	7	3.59	X		0.5	X	0.7		=	240.96	(76)
East	0.9x	1		x	2.26	X	7	3.59	X		0.5	X	0.7		=	40.34	(76)
East	0.9x	3		x	4.5	X	4	5.59	x		0.5	X	0.7		=	149.28	(76)
East	0.9x	1		x	2.26	X	4	5.59	X		0.5	X	0.7		=	24.99	(76)
East	0.9x	3		x	4.5	X	2	4.49	X		0.5	x	0.7		=	80.19	(76)
East	0.9x	1		x	2.26	X	2	4.49	X		0.5	X	0.7		=	13.42	(76)
East	0.9x	3		x	4.5	X	1	6.15	X		0.5	X	0.7		=	52.89	(76)
East	0.9x	1		x	2.26	X	1	6.15	X		0.5	X	0.7		=	8.85	(76)
South	0.9x	0.77		x	4.5	X	4	6.75	X		0.5	X	0.7		=	51.03	(78)
South	0.9x	0.77		x	4.5	X	7	6.57	X		0.5	X	0.7		=	83.57	(78)
South	0.9x	0.77		x	4.5	X	9	7.53	X		0.5	X	0.7		=	106.46	(78)
South	0.9x	0.77		x	4.5	X	1	10.23	X		0.5	X	0.7		=	120.32	(78)
South	0.9x	0.77		x	4.5	X	1	14.87	X		0.5	X	0.7		=	125.38	(78)
South	0.9x	0.77		x	4.5	X	1	10.55	x		0.5	X	0.7		=	120.66	(78)
South	0.9x	0.77		x	4.5	X	1	08.01	X		0.5	x	0.7		=	117.89	(78)
South	0.9x	0.77		x	4.5	X	1	04.89	x		0.5	x	0.7		=	114.49	(78)
South	0.9x	0.77		x	4.5	X	1	01.89	X		0.5	x	0.7		=	111.21	(78)
South	0.9x	0.77		x	4.5	X	8	2.59	X		0.5	x	0.7		=	90.14	(78)
South	0.9x	0.77		x	4.5	X	5	5.42	X		0.5	X	0.7		=	60.49	(78)
South	0.9x	0.77		x	4.5	X		40.4	x		0.5	x	0.7		=	44.09	(78)
	_			,													_
Solar	ains in	watts, ca	alculate	ed	for each mon	th			(83)m	n = Su	um(74)m .	(82)m	1			•	
(83)m=	126.11	230.44	348.32	ㅗ	473.07 557.6		563.2	539.21	476	6.4	392.51	264.4	1 154.1	105	.83		(83)
_				_	(84)m = $(73)$ r	_	, ,				ı		1			1	
(84)m=	465.89	568.49	676.14		784.47 852.6	6 8	342.13	807.58	749	.74	674.15	562.6	5 471.39	437	7.2		(84)
7. Me	an inter	nal temp	eratur	e (	heating seaso	on)											
Temp	erature	during h	eating	ре	eriods in the li	iving	area	from Tal	ole 9	, Th	1 (°C)					21	(85)
Utilisa	ation fac		ains fo	r li	ving area, h1	,m (s	see Ta	ble 9a)						_		 1	
	Jan	Feb	Mar	1	Apr Ma	у	Jun	Jul	A	ug	Sep	Ос	t Nov	D	ес		
(86)m=	0.93	0.9	0.83		0.73 0.6		0.46	0.34	0.3	38	0.57	0.79	0.9	0.9	94		(86)
Mean	interna	l temper	ature ir	า li	ving area T1	(follo	ow ste	ps 3 to 7	7 in T	able	e 9c)					<u>.</u>	
(87)m=	18.76	19.13	19.65		20.22 20.63	3	20.87	20.95	20.	94	20.76	20.18	3 19.36	18.	68		(87)

Town every service a heating position in root of divelling from Toble 0. Th 2 /9C)		
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 19.88 19.88 19.88 19.89 19.89 19.9 19.9		(88)
(88)m= 19.88 19.88 19.88 19.89 19.89 19.9 19.9		(00)
(89)m= 0.92 0.88 0.81 0.69 0.55 0.39 0.27 0.3 0.5 0.75 0.89 0.93		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 16.93 17.45 18.19 18.97 19.5 19.79 19.87 19.86 19.67 18.94 17.81 16.83		(90)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.58	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	0.00	(0.7
(92)m= 17.99 18.42 19.03 19.69 20.15 20.41 20.5 20.49 20.3 19.66 18.71 17.9		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		
(93)m= 17.99 18.42 19.03 19.69 20.15 20.41 20.5 20.49 20.3 19.66 18.71 17.9		(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate utilisation factor for gains using Table 9a	ulate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 0.9 0.86 0.79 0.69 0.56 0.42 0.31 0.34 0.53 0.74 0.87 0.91		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 420.46 488.21 534.85 539.37 478.68 355.93 249.64 258.05 357.5 418.07 408.06 399.16		(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 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= 938.9 925.71 856.1 729.35 570.06 387.72 260.01 271.9 415.35 610.92 786.11 932.05		(97)
(97)m= 938.9 925.71 856.1 729.35 570.06 387.72 260.01 271.9 415.35 610.92 786.11 932.05 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		(91)
(98)m= 385.72 294 239.01 136.78 67.99 0 0 0 143.48 272.2 396.47		
Total per year (kWh/year) = Sum(98) <sub>1.5.9.12</sub> =	1935.65	(98)
Space heating requirement in kWh/m²/year	35.44	(99)
9b. Energy requirements – Community heating scheme		ı
This part is used for space heating, space cooling or water heating provided by a community scheme.		1,000
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	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	0.5	(303a)
Fraction of community heat from heat source 2	0.5	(303b)
Fraction of total space heat from Community heat pump (302) x (303a) =	0.5	(304a)
Fraction of total space heat from community heat source 2 (302) x (303b) =	0.5	(304b)
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 heating requirement	1935.65	]

Space heat from Community heat pump		(98) x (304a) x	(305) x (306) =	1016.22	(307a)
Space heat from heat source 2		(98) x (304b) x	1016.22	(307b)	
Efficiency of secondary/supplementary heating	system in % (from Table	4a or Appen	idix E)	0	(308
Space heating requirement from secondary/su	pplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating					_
Annual water heating requirement				1871.36	
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x	(305) x (306) =	982.46	(310a)
Water heat from heat source 2		(64) x (303b) x	(305) x (306) =	982.46	(310b)
Electricity used for heat distribution	0.01	× [(307a)(307	'e) + (310a)(310e)] =	39.97	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system	m, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (mechanical ventilation - balanced, extract or p	,			178.42	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =	178.42	(331)
Energy for lighting (calculated in Appendix L)				250.66	(332)
Electricity generated by PVs (Appendix M) (ne	gative quantity)			-333.46	(333)
Electricity generated by wind turbine (Appendi	x M) (negative quantity)			0	(334)
12b. CO2 Emissions – Community heating sch	neme				
		ergy h/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water he Efficiency of heat source 1 (%)	eating (not CHP)  If there is CHP using two fuels	s repeat (363) to	(366) for the second fue	425	(367a)
Efficiency of heat source 2 (%)	If there is CHP using two fuels	repeat (363) to	(366) for the second fue	91	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x 1	100 ÷ (367b) x	0.52	244.07	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x 1	100 ÷ (367b) x	0.22	474.41	(368)
Electrical energy for heat distribution	[(313) x		0.52	20.75	(372)
Total CO2 associated with community systems	S (363)(36	66) + (368)(372	2) =	739.23	(373)
CO2 associated with space heating (secondar	y) (309) x		0 =	0	(374)
CO2 associated with water from immersion he	ater or instantaneous hea	ater (312) x	0.52	0	(375)
Total CO2 associated with space and water he	eating (373) + (3	74) + (375) =		739.23	(376)
CO2 associated with electricity for pumps and	fans within dwelling (331	)) x	0.52	92.6	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	130.09	(379)
Energy saving/generation technologies (333) t	o (334) as applicable		0.52 x 0.01 =	-173.06	(380)

Total CO2, kg/year sum of (376)...(382) = Dwelling CO2 Emission Rate  $(383) \div (4) =$  El rating (section 14)

788.86	(383)
14.44	(384)
89.39	(385)