

**Energy Statement** 

Land to North of Cornells Lane, Widdington, Essex

Mr And Mrs M. Tee

Report No: PA-ES-MT-WN-21-01

Report Date: June 2021

Page 1



Contents

1.	Assessme	NT INFORMATION
2.	EXECUTIVE	SUMMARY
3.	INTRODUC	TION
4.	Planning	Роцсу
5.	DEVELOPN	12 IENT APPROACH
6.	ENERGY C	ALCULATIONS (BASELINE)
	6.2 6.3	Calculation of Baseline Energy and CO <sub>2</sub> Emissions
7.	PASSIVE D	ESIGN AND ENERGY EFFICIENT MEASURES (BE LEAN)
	7.1 7.2 7.3 7.4	Passive design15Building Fabric15Fabric Energy Efficiency (FEE)16Energy And CO2 Demand (Be Lean)16
8.	SUPPLY EN	ERGY EFFICIENTLY (BE CLEAN)
9.	Renewab	LES OR LZC TECHNOLOGY (BE GREEN)
	9.1 9.2 9.3	Air Source Heat Pumps (ASHP)18Photovoltaics (PV)19Energy And CO2 Demand (Be Green)21
10	. Su	MMER OVERHEATING AND COOLING
	10.1	Over Heating Results: SAP calculations22
12	. Co	NCLUSIONS
13	. Ар	PENDICES
	13.1 13.2 13.3 13.4	Appendix A: Energy and CO2 Performance Type By Type       28         Appendix B: Renewable Energy Options       29         Appendix C: ASHP Details       30         Appendix E: SAP Output Sheets       32

## Energy Statement

## Widdington

### LIST OF TABLES

TABLE 1: CARBON CONVERSION FACTORS	12
TABLE 2: RESIDENTIAL MIX	13
TABLE 3: BASELINE DESIGN SPECIFICATION 2013	14
TABLE 4: PREDICTED CARBON EMISSIONS: PART L1A 2013 BASELINE UNIT (TER)	14
TABLE 5: PROPOSED U-VALUES	15
TABLE 6: RESIDENTIAL FEE PERFORMANCE	16
TABLE 7: PREDICTED ENERGY DEMAND AND CARBON EMISSIONS: BE LEAN	16
TABLE 8: CO <sub>2</sub> Savings: Be Lean	16
TABLE 9: PROPOSED PV SCHEDULE	20
TABLE 10: POTENTIAL ENERGY AND CO <sub>2</sub> abatement from PV	21
TABLE 11: PREDICTED ENERGY DEMAND AND CARBON EMISSIONS: BE GREEN	21
TABLE 12: $CO_2$ and Energy Savings: Be Green compared against Gas baseline	21
TABLE 13: $CO_2$ and Energy Savings: Be Green compared against Building Regulation TER	21
TABLE 14: RESULTS OF OVERHEATING ASSESSMENT - SAP	22
TABLE 15: SPECIFICATION OF FLOW RATES AND VOLUMES FOR WATER USING APPLIANCES	23
TABLE 16: WATER CALCULATIONS	23
TABLE 17: PROPOSED ENERGY STRATEGY	24
TABLE 18: SUMMARY OF CO <sub>2</sub> Savings Over Gas Baseline	24
TABLE 19: CARBON EMISSIONS BUILDING REGULATION'S (TER) COMPARISON	25
TABLE 20: ENERGY USAGE AND SAVINGS	25
TABLE 21: RESIDENTIAL FEE PERFORMANCE	25

### LIST OF FIGURES

FIGURE 1: SITE PLAN	6
FIGURE 2: EXAMPLE DIAGRAM OF ASHP SYSTEM	18
FIGURE 3: PROPOSED ASHP LOCATIONS	19
FIGURE 4: ROOF ELEVATIONS ALLOCATED FOR PV PANELS	20



## Energy Statement

Widdington

## 1. Assessment Information

Project Name	Widdington	
Project Address	Land to North of Cornells Lane, Widdington, Essex	
Developer	Mr and Mrs M. Tee	
Developer Address	ТВС	
Architect	The Clarke Smith Partnership	
Architect's Address	Unit 1, Chuck A Bush, Farm Barn, Royston Road, Whittlesford, Cambridge, CB22 4NW	
Project Description	Erection of 4 no. detached dwellings and associated works.	

	Author	Date	Email Address
Produced by	MH	24/06/21	mike.hassett@abbey-consultants.com
Reviewed by			

lssue Number	Author	Date	Reason
01	MH	24/06/21	Initial Issue
02			
03			

This document has been prepared for Mr and Mrs M. Tee only and solely for the purposes expressly defined herein. We owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein



## 2. EXECUTIVE SUMMARY

This report considers the predicted energy and  $CO_2$  demand for the proposed development at the Land to North of Cornells Lane, Widdington, Essex which is located in Uttlesford District Council.

The report complies with the policy requirements at both national and local level, as set out in the National Planning Policy Framework (2019) and the Uttlesford District Council's Local Plan (2005). Uttlesford District Council are in the early stages of preparing a new Local Plan. In the meantime, and to bridge the gap between the current Local Plan (2005) and the upcoming one, an Interim Climate Change Planning Policy document has been produced on a non-statutory basis. This report also adheres to the interim policies included within the Uttlesford District Council's Interim Climate Change Planning Policy document.

The proposed site will be built under Part L 2013 (with 2016 amendments) of the Building Regulations and in line with Uttlesford District Council's Interim Policy 12 target to achieve a 19% minimum reduction of the Dwelling Emission Rate (DER) against the Target Emission Rate (TER) as defined in the 2013 Building Regulations.

The development will reduce regulated  $CO_2$  emissions by integrating a range of passive design and energy efficiency measures throughout the building. These measures include improving building fabric standards beyond the requirements of Part L of the Building Regulations. These measures enable the proposed scheme to go beyond Target Emission Rates (TER) and Target Fabric Energy Efficiency (TFEE) minimum standards via energy efficiency measures alone.

Following reduction of the energy demand through fabric and energy efficiency improvements, individual Air Source Heat Pumps (ASHP) have been proposed to supply hot water and space heating to the dwellings. In addition, it is proposed to install 7.5 kWp of PV to the east facing roof elevations across the development.

The regulated energy  $CO_2$  savings expressed in terms of actual and percentage reduction after each stage of the energy hierarchy for the residential parts of the development are provided in the following tables.

The proposed individual ASHPs and inclusion of 7.5 kWp of PV, along with energy efficiency improvements, save 5.11 tonnes of  $CO_2$  per year which represents a 41.85% saving over a gas baseline unit and is in excess of a 60% improvement over a Building Regulations baseline. This exceeds the requirements of Uttlesford District Council's Interim Policy 12, which stipulates a minimum 19% reduction is to be achieved.

Total energy demand savings are also expressed after each stage of the energy hierarchy for the development. The 'Be Green' measures alone will provide a saving of 35.16 MWh per year which contributes towards a 74.15% saving in total energy demand compared to a Building Regulations baseline.

Element	CO2 - Regulated (tonnes/year)	Total CO <sub>2</sub> Savings	% Saving
Baseline	12.21	0.00	0.00
Be Lean	11.44	0.77	6.31
After Heat Network	11.44	0.77	6.31
Be Green	7.10	5.11	41.85

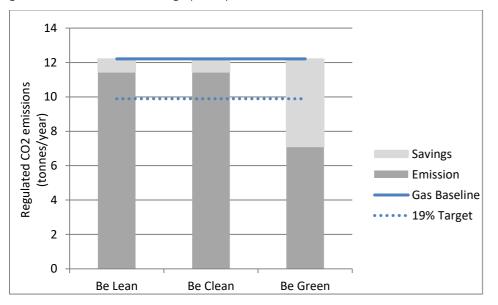
### Carbon Emissions Gas Baseline

Building Regulations assessment of the TER allows a fuel factor for use of electricity and therefore the baseline carbon emissions are different than for a gas heated dwelling. When the energy strategy after 'Be Green' is compared against a baseline of Building Regulations the carbon savings are much greater. The following table shows the carbon savings against a TER.

## Carbon emissions Building Regulation's comparison

Element	CO₂ - Regulated (tonnes/year)	Improvement %
Baseline	18.18	
Be Green	7.10	60.95%

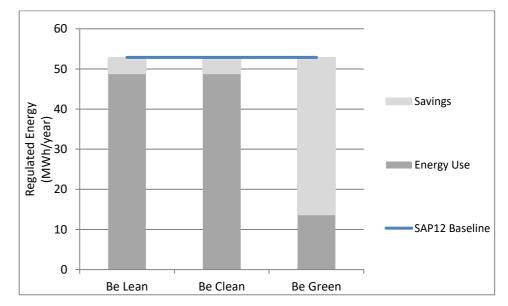




The overall reduction in regulated carbon emission to the residential units compared to a gas baseline can be illustrated graphically as below.

## Energy Usage and Savings

Element	Energy - Regulated (MWh/year)	Total Savings (MWh/year)	% Saving
Residential Baseline	52.88	0	0.00
Be Lean	48.83	4.05	7.66
After Heat Network	48.83	4.05	7.66
Be Green	13.67	39.21	74.15



The overall reduction in energy usage to the residential units can be illustrated graphically as below.

The proposed strategy has first reduced energy demand through fabric and energy efficiency measures. The overall Part L Fabric Energy Efficiency (FEE) performance has been reviewed for the 'be lean' position and compared to the baseline stage of the energy hierarchy. The results of this can be seen in the table below. The total improvement has been shown to be 16.74% over Building Regulations.

Element	Target Fabric Energy Efficiency (TFEE) kWh/m²/year	Dwelling Fabric Energy Efficiency (DFEE) kWh/m²/year	Improvement (%)
Development Total	62.53	52.06	16.74



#### Summary

The proposed energy strategy achieves and meets the following requirements:

- Complies with Part L 2013 building regulations (with 2016 amendments) and shows a 60.95% carbon saving over a Building Regulations baseline (TER).
- Exceeds the 19.00% minimum reduction on the dwelling (carbon dioxide) emission rate (DER) against the Target Emission Rate (TER) of 2013 Building Regulations as required in Uttlesford District Council's Interim Policy 12.
- Saves 5.11 tonnes of carbon per year over a gas baseline.
- Shows a 41.85% carbon saving over a gas baseline.
- Total energy saving of 74.15% compared to a Building Regulations baseline (TER).
- Includes improved optimal building fabric improvements, energy efficient design of building services.
- An energy saving of 35.16 MWh/year is to be achieved through the inclusion of individual Air Source Heat Pumps and 7.5 kWp of PV across the scheme.
- Includes improved optimal building fabric improvements and energy efficient design of building services.
- Exceeds the TFEE minimum reduction requirements by 16.74%.



## 3. INTRODUCTION

This document has been prepared by Abbey Consultants (Southern) Ltd, a specialist environmental and energy consultancy on behalf of Mr and Mrs M. Tee.

The following report establishes a baseline assessment of the energy demands and associated  $CO_2$  emissions for the development. The energy hierarchy approach of Be Lean, Be Clean and Be Green is then followed to ensure the maximum viable reductions in energy and regulated  $CO_2$  emissions is achieved.

The proposed development is described as:

Erection of 4 no. detached dwellings and associated works.

The report takes into consideration the layout, use and requirements for the development to recommend a strategy that integrates the most suitable technologies available that are commercially viable, whilst also achieving compliance with all policies both at National and Local level applicable to this development.

Figure 1 presents the proposed site layout.

#### Figure 1: Site Plan



## Widdington



## 4. PLANNING POLICY

## 4.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF) 2019

The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

## Chapter 14 Meeting the challenge of climate change, flooding and coastal change

The following paragraphs set out the Government's position in response to reducing carbon emissions:

Paragraph 150: New development should be planned for in ways that:

- **a.** avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- **b.** can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

Paragraph 151. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- **a.** provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- **b.** consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
- **c.** identify opportunities for development to draw its energy supply from decentralised, renewable, or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

Paragraph 153: In determining planning applications, local planning authorities should expect new development to:

- **a.** comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- **b.** take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

Paragraph 154: When determining planning applications for renewable and low carbon development, local planning authorities should:

- **a.** not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
- **b.** approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.



## 4.2 PLANNING UPDATE MARCH 2015

The following written statement was published by the Ministry of Housing, Communities & Local Government and The Rt Hon Lord Pickles on the 25<sup>th</sup> March 2015:

#### **Housing Standard Review**

Following the technical Housing Standards Review, Government issued a Ministerial Statement in March 2015 withdrawing all national standards that applied to residential development. This had the impact of cancelling the Code for Sustainable Homes and BREEAM as it pertains to residential development, aside from the management of legacy cases.

### Zero Carbon Homes: supporting small builders

The government highlighted their commitment to implementing the zero carbon homes standard in 2016 and in addition to the future strengthening of minimum on-site energy performance requirements introduced in the Infrastructure Act 2015 the powers needed to enable off-site carbon abatement measures (Allowable Solutions) to contribute to achieving the zero carbon standards. However they recognised achieving the zero carbon standards would be a challenge for home builders and in particular smaller home builders and consulted on how an exemption for small sites could operate.

It was decided there would be an exemption for small housing sites of 10 units or fewer, which are most commonly developed by small scale home builders and can be more expensive to develop irrespective of the size of the builder, from the allowable solutions element of the zero carbon homes target. All new homes will be required to meet the strengthened on-site energy performance standard but those building on small sites will not be required to support any further off-site carbon abatement measures.

## Housing standards: streamlining the system

It was agreed that all new homes need to be high quality, accessible and sustainable. To achieve this, the government created a new approach for the setting of technical standards for new housing. This rationalises the many differing existing standards into a simpler, streamlined system which it is hoped would reduce burdens and help bring forward much needed new homes.

The new system comprises new additional optional Building Regulations on water and access, and a new national space standard (hereafter referred to as "the new national technical standards"). This system complements the existing set of Building Regulations.

### Plan making

Since the date the Deregulation Bill 2015 was given Royal Assent, local planning authorities and qualifying bodies preparing neighbourhood plans should not set in their emerging Local Plans, neighbourhood plans, or supplementary planning documents, any additional local technical standards or requirements relating to the construction, internal layout or performance of new dwellings. This includes any policy requiring any level of the Code for Sustainable Homes to be achieved by new development; the government has now withdrawn the code, aside from the management of legacy cases.

Local planning authorities and qualifying bodies preparing neighbourhood plans are to consider their existing plan policies on technical housing standards or requirements and update them as appropriate, for example through a partial Local Plan review, or a full neighbourhood plan replacement in due course. Local planning authorities may also need to review their local information requirements to ensure that technical detail that is no longer necessary is not requested to support planning applications.

The optional new national technical standards should only be required through any new Local Plan policies if they address a clearly evidenced need, and where their impact on viability has been considered, in accordance with the National Planning Policy Framework and Planning Guidance. Neighbourhood plans should not be used to apply the new national technical standards.

For the specific issue of energy performance, local planning authorities will continue to be able to set and apply policies in their Local Plans which require compliance with energy performance standards that exceed the energy requirements of Building Regulations until commencement of amendments to the Planning and Energy Act 2008 in the Deregulation Bill 2015.

This was expected to happen alongside the introduction of zero carbon homes policy in late 2016. The government stated that, from then, the energy performance requirements in Building Regulations will be set at a level equivalent to the (outgoing) Code for Sustainable Homes Level 4. Until the amendment is commenced, it is expected local planning authorities to take this statement of the government's intention into account in applying existing policies and not set conditions with requirements above a Code level 4 equivalent. This statement does not modify the National Planning Policy Framework policy allowing the connection of new housing development to low carbon infrastructure such as district heating networks.



### Decision taking, transition and compliance:

Where there is an existing plan policy which references the Code for Sustainable Homes, it was decided authorities may continue to apply a requirement for a water efficiency standard equivalent to the new national technical standard, or in the case of energy a standard consistent with Code Level 4.

## 4.3 LOCAL POLICY

**Uttlesford District Council** 

Uttlesford Local Plan

Adopted January 2005

## Policy ENV15 – Renewable Energy

Small scale renewable energy development schemes to meet local needs will be permitted if they do not adversely affect the character of sensitive landscapes, nature conservation interests or residential and recreational amenity.

## Policy GEN2 – Design:

Development will not be permitted unless its design meets all the following criteria and has regard to adopted Supplementary Design Guidance and Supplementary Planning Documents.

- a) It is compatible with the scale, form, layout, appearance and materials of surrounding buildings;
- b) It safeguards important environmental features in its setting, enabling their retention and helping to reduce the visual impact of new buildings or structures where appropriate;
- c) It provides an environment, which meets the reasonable needs of all potential users.
- d) It helps reduce the potential for crime;
- e) It helps to minimise water and energy consumption;
- f) It has regard to guidance on layout and design adopted as supplementary planning guidance to the development plan.
- g) It helps to reduce waste production and encourages recycling and reuse.

- h) It minimises the environmental impact on neighbouring properties by appropriate mitigating measures.
- i) It would not have a materially adverse effect on the reasonable occupation and enjoyment of a residential or other sensitive property, as a result of loss of privacy, loss of daylight, overbearing impact or overshadowing.

## **Uttlesford District Council**

## Interim Climate Change Planning Policy

#### February 2021

To bridge the gap between the Council's adopted 2005 local plan and the new one, an Interim Climate Change Planning Policy document has been produced on a non-statutory basis. The main purpose of the document is to reiterate to developers that Uttlesford District Council is resolute about climate change mitigation and adaption measures. The Council expects to see this taken on board, when building new developments. It should also help officers in their negotiations to bring forward more climate friendly proposals.

The policies relevant to this Energy Statement are as follows:

## Interim Policy 1:

Developers should demonstrate the path that their proposals take towards achieving net-zero carbon by 2030, and all the ways their proposals are working towards this in response to planning law, and also to the guidance set out in the NPPF and Planning Policy Guidance. This should include:

- i. Locating the development where the associated climate change impacts and carbon emissions, including those derived from transport associated with the intended use of the development can be minimised, and
- ii. Promoting development which minimises carbon emissions and greenhouse gas emissions and maximises the use of renewable or low carbon energy generation.

## **Interim Policy 2:**

Developers should demonstrate how site surroundings and heritage have influenced their choices over climate change mitigation and adaption proposals.



## **Interim Policy 3:**

Development should be designed to minimise consumption of water, and should make adequate and appropriate provision for water recycling. Development should also protect and enhance local water quality including measures to support improvement to a water body's Water Framework Directive status. A condition on all planning permissions for the erection of new residential development will be imposed to trigger the optional requirement under Part G of the Building Regulations for the maximum potential consumption of wholesome water of 110 litres per person per day.

## Interim Policy 12:

Developers should demonstrate how green and intelligent design and green infrastructure have contributed to the sustainability of their proposals by reference to the themes in Paragraph 5.1, the general recommendations set out in Paragraph 5.3 and the energy hierarchy in Paragraph 5.37.

### Paragraph 5.1

This section covers materials used in individual buildings and associated outdoor private areas. It firstly outlines general requirements and then looks at how this can be achieved through more detailed thematically structured advice and requirements. Themes covered, and which relate to climate change mitigation and adaption are:

- Sustainable materials;
- Living walls and roofs as part of green and blue infrastructure;
- Reducing waste;
- Natural temperature, lighting and air quality control;
- Renewable energy; and
- Future proofing.

## Paragraph 5.3

The following recommendations will help developers meet the Council's commitment to achieve net-zero carbon status by 2030, supported and moderated by national policy and local authority guidance, for example contained in the UKGBC Policy Playbook.

1. If permitted by emerging national policy, all new homes (including conversions) should meet the Future Homes Standard and be net-zero carbon;

- 2. In the meantime, all new homes (including conversions) should achieve:
  - Code for Sustainable Homes Level 4 or equivalent;
  - A 19% minimum reduction on the dwelling (carbon dioxide) emission rate (DER) against the Target Emission Rate (TER) as defined in the 2013 Building Regulations, and
  - Future proofing to enable all new homes to be easily and affordably upgraded to be net-zero carbon by 2030 without diminishing the overall design;
- 3. All new non-residential development (including conversions) providing more than 25m<sup>2</sup> of floor space should achieve net-zero carbon status;
- 4. Applicants should calculate indoor air quality (CO2 and humidity) and overheating risk performance for all new buildings (including conversions) providing more than 25m<sup>2</sup> of floor space, ensuring buildings will operate in accordance with appropriate recommended levels for that use;
- 5. Applicants should demonstrate how the development maximises opportunities for renewable energy but an absolute minimum of 25% renewables should be achieved;
- 6. Applicants should assure that performance will match design stage predictions for all new buildings (including conversions) providing more than 25m<sup>2</sup> of floor space. This can be done through:
  - Demonstration of the development teams own internal processes and quality controls;
  - Demonstration of working within a third party process or system to ensure that standards are met on site, e.g. BEPIT Better Building Tool Kit or NEF's Assured Performance Toolkit;
  - Certification against independent assessment frameworks, e.g.
     Home Quality Mark (HQM), BREEAM, Passivhaus and Energiesprong; and
  - Energy assessment which, as a minimum should include the following:
    - i. A calculation of the energy demand and carbon dioxide emissions for the proposed buildings using approved Building Regulations software and carried out by a qualified energy assessor;
    - *ii.* Evidence that, as far as practicable, the development's design has been optimised to take into account solar gain, daylighting, ventilation and air quality (Design Optimisation);



- iii. Evidence that, as far as practicable, the development's fabric performance minimises energy loss (Fabric Improvement); and
- *iv.* Evidence that renewable energy sources have been considered and incorporated into the development where appropriate.

## Paragraph 5.37

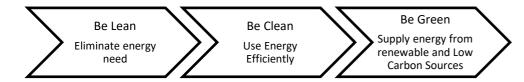
The energy hierarchy had five priorities:

- Priority 1 Energy conservation
- Priority 2 Energy efficiency
- Priority 3 Renewables
- Priority 4 Low emission
- Priority 5 Conventional



## 5. DEVELOPMENT APPROACH

The proposed energy strategy follows the established and widely accepted Energy Hierarchy of eliminate energy need (Be Lean), Use energy efficiently (Be Clean) and supply energy from renewable and low carbon sources (Be Green) to enable the maximum viable reductions in regulated and total CO<sub>2</sub> emissions over the baseline.



The proposed energy supply solutions aim to match energy profiles of the development ensuring effective use. The proposed solutions consider viability and flexibility of the scheme from both a technical and economic point of view by identifying best combination of energy efficiency measures as well as decentralised and renewable energy supply solutions.

Using these principles, The Developer will deliver the following objectives:

- Comply with the relevant regulatory requirements.
- Ensure that a reduction in CO<sub>2</sub> beyond Part L 2013 standards is achieved across the site through fabric and energy efficiency measures.
- To propose to reduce energy consumption and carbon dioxide emissions further through the use of on-site renewable or low and zero carbon technologies (LZC).

## 5.1 CARBON CONVERSION FACTORS

The report has been prepared using current SAP 2012 Building Regulation carbon conversion factors as detailed in the table below.

#### Table 1: Carbon conversion factors

Fuel Type	SAP 2012 CO <sub>2</sub> Conversion Factors (kg/kWh)
Natural Gas	0.216
Grid Electricity	0.519



## 6. ENERGY CALCULATIONS (BASELINE)

A baseline total energy demand has been established for the proposed development. Reductions in demand due to energy conservation measures are considered and form the basis of the energy strategy which follows.

Floor plans for the development have been used in conjunction with proposed building specifications to prepare the sample SAP calculations.

SAP calculations have been carried out to Approved Document Part L1A 2013. The relevant energy loads have been collated from the full SAP calculation sheets and entered into a spread sheet that can be found in the appendices, which calculates the total energy and  $CO_2$  demand.

Regulated Energy Demand is calculated from the energy associated with space heating, hot water and fixed electrical demands (for lights, fans and pumps).

Unregulated energy is the annual electrical energy demand from appliances and would be calculated using the methodology as suggested by SAP2012. SAP calculations are extended to allow for  $CO_2$  emissions associated with appliances and cooking, and to allow for site-wide electricity generation technologies.

Total Energy Demand for the development is calculated from the regulated energy demand figures given above and an additional energy demand associated with unregulated energy.

Energy savings are measured in terms of a reduction in CO<sub>2</sub> emissions and kWh, which are calculated from their association with a particular fuel source. CO<sub>2</sub> Conversion Factors have been taken from Table 2, Building Regulations Part L1A 2013.

## 6.1 SAMPLE SAP UNITS

The regulated  $CO_2$  emissions baseline has been established using a Part L1A 2013 Target Emission Rate (TER) of the sample of representative dwellings.

The following table provides the mix used to determine the baseline energy and  $CO_2$  demand for the residential units.

#### Table 2: Residential Mix

Unit Reference	No. of Units
Plot 1	1
Plot 2	1
Plot 3	1
Plot 4	1
TOTAL:	4



## 6.2 CALCULATION OF BASELINE ENERGY AND CO<sub>2</sub> EMISSIONS

Thermal insulation levels and air tightness standards for the baseline case are assumed to just meet the requirements Part L1A 2013 of Building Regulations. The baseline specification as determined by SAP12 is detailed in the table below.

#### Table 3: Baseline design specification 2013

Element	Baseline Design Specification
Ground Floor	0.13 W/m2K
Exposed Floor	0.13 W/m2K
External Wall	0.18 W/m2K
Party Wall	0.00 W/m2K
Roof – insulated at ceiling	0.13 W/m2K
Roof – insulated at slope	0.13 W/m2K
Roof – flat	0.13 W/m2K
Glazing U-Value	1.40 W/m2K
Door U-Value	1.2 W/m2K
Design Air Permeability	5.00
Space Heating	Mains Gas 88.6% efficient
Heating Controls	Heating System controls
Domestic Hot water	Mains Gas
Ventilation	Natural ventilation with intermittent fans
Low Energy Lighting	100%
Thermal Bridging	Appendix R values

## 6.3 ENERGY AND CO<sub>2</sub> DEMAND (BASELINE)

Using the specification detailed and the outputs from SAP for the sample units, the baseline energy and carbon figures for the development are detailed in the table below.

#### Table 4: Predicted Carbon Emissions: Part L1A 2013 Baseline Unit (TER)

Element Part L1A 2013	Space Heating Demand	Hot Water demand	Pumps and fans	Lighting	Totals
Energy: Baseline (kWh p.a.)	39,864	10,413	300	2,299	52,876
CO2 Associated with total Energy Demand (kgCO2 p.a./a)	8,611	2,249	156	1,193	12,209



## 7. PASSIVE DESIGN AND ENERGY EFFICIENT MEASURES (BE LEAN)



In accordance with the Energy Hierarchy, the energy demands of the development should be reduced as much as practically viable. The desire is to achieve Part L 2013 Building Regulations compliance before low carbon or renewable measures are introduced.

A range of measures to reduce  $CO_2$  emissions and increase resilience to climate change are proposed in the building design including good building fabric standards as well as energy efficient M&E systems and lighting.

## 7.1 PASSIVE DESIGN

The development will incorporate a range of passive design measures and energy efficient building fabric that will reduce the demand for space heating, ventilation, and artificial lighting.

Passive design utilises daylight, solar energy and shading to illuminate, heat and shade where necessary and ventilate/cool the buildings, thus requiring less (mechanical) energy to achieve the performance standards for the health and wellbeing of the occupants.

Openable windows are proposed but are not essential to provide a fresh air supply.

Natural ventilation has been considered but is judged to be inappropriate due to the high energy efficiency requirements and the CO<sub>2</sub> reduction target. Therefore, decentralised system 3 mechanical ventilation has been specified as a more suitable approach to extract air from the dwellings.

The ventilation strategy will be reviewed again and developed as the design progresses to ensure compliance with all the relevant regulations and standards. It is assumed, in this scenario, that all windows can still be opened (albeit intermittently) for purge ventilation.

The proposed glazed areas have been designed to maximise daylight and optimise solar gains. This is enhanced by the linear south facing front elevations of the dwellings. The glazing specification has been reviewed to ensure that they provide a balance between solar control and solar gain.

## 7.2 BUILDING FABRIC

To reduce demand for space heating, emphasis has been placed on providing a very high standard of fabric efficiency and reducing heat loss through the building envelope. Approved Document Part L1A 2013 sets out the limiting fabric parameters for each of the building elements. Each stated value represents the area-weighted average U-value. The following table details the proposed U-values to be used in the described exposed element within the fabric of the development.

To further minimise heat loss through the building envelope, air leakage will be made a priority. The airtightness of the dwelling will be set to a level of  $4.65 \text{ m}^3/\text{h/m}^2$  and will utilise continuously running decentralised extract fans (system 3) to ensure the airtightness of the dwellings can be kept low, without compromising on the necessity for good ventilation.

Element	Baseline Design Specification	Maximum Allowable SAP 2012	Proposed Design Stage Specification
Ground Floor	0.13 W/m <sup>2</sup> K	0.25 W/m <sup>2</sup> K	0.12 W/m <sup>2</sup> K
Exposed Floor	0.13 W/m <sup>2</sup> K	0.25 W/m <sup>2</sup> K	N/A
External Wall	0.18 W/m <sup>2</sup> K	0.30 W/m <sup>2</sup> K	0.19 W/m <sup>2</sup> K
Communal Wall	0.18 W/m <sup>2</sup> K	0.30 W/m <sup>2</sup> K	N/A
Party Wall	0.00 W/m <sup>2</sup> K	0.20 W/m <sup>2</sup> K	N/A
Roof – insulated at ceiling	0.13 W/m <sup>2</sup> K	0.20 W/m <sup>2</sup> K	0.11 W/m <sup>2</sup> K
Roof – insulated at slope	0.13 W/m <sup>2</sup> K	0.20 W/m <sup>2</sup> K	0.15 W/m <sup>2</sup> K
Roof – flat	0.13 W/m <sup>2</sup> K	0.20 W/m <sup>2</sup> K	0.15 W/m <sup>2</sup> K
Glazing U-Value	1.40 W/m <sup>2</sup> K	2.00 W/m <sup>2</sup> K	U = 1.40 W/m <sup>2</sup> K G = 0.63
Door U-Value	1.20 W/m <sup>2</sup> K	2.00 W/m <sup>2</sup> K	1.50 W/m <sup>2</sup> K
Design Air Permeability (DAP)	5.00	10.00	4.65

### Table 5: Proposed U-Values



## 7.3 FABRIC ENERGY EFFICIENCY (FEE)

Using the specification detailed previously the overall Part L Fabric Energy Efficiency (FEE) performance has been reviewed for the 'be lean' position and compared to the baseline stage of the energy hierarchy. The results are shown in the following table.

## Table 6: Residential FEE Performance

Element	Target Fabric Energy Efficiency (TFEE) kWh/m <sup>2</sup> /year	Dwelling Fabric Energy Efficiency (DFEE) kWh/m <sup>2</sup> /year	Improvement (%)
Development Total	62.53	52.06	16.74

## 7.4 ENERGY AND CO<sub>2</sub> DEMAND (BE LEAN)

Using the specification detailed and the outputs from SAP for the sample units, the 'Be Lean' energy and carbon figures for the development are detailed in the table below, and an improvement can be seen when compared to the baseline figures outlined previously in Table 4.

## Table 7: Predicted Energy Demand and Carbon Emissions: Be Lean

Element Part L1A 2013	Space Heating Demand	Hot Water demand	Pumps and fans	Lighting	Totals
Energy: Be Lean (kWh p.a.)	35,676	10,199	651	2,299	48,825
CO2 Associated with total Energy Demand (kgCO2 p.a./a)	7,706	2,203	338	1,193	11,440

A summary of the  $CO_2$  and energy savings at the 'Be Lean' stage can be found in Table 8 below.

### Table 8: CO<sub>2</sub> Savings: Be Lean

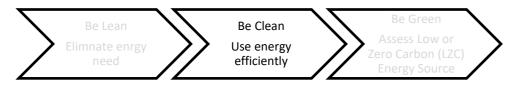
Element	CO2 – Regulated (tonnes/year)	Energy Demand (MWh/year)
Gas Baseline	12.21	52.88
After energy demand reductions	11.44	48.83
Saving	0.77	4.05
Improvement	6%	8%



## **Energy Statement**

#### Widdington

## 8. SUPPLY ENERGY EFFICIENTLY (BE CLEAN)



### Combined Heat and Power (CHP)

Decentralised energy refers to energy that is generated off the main grid. This may include micro-renewables, heating and cooling. It can also refer to energy from waste plants, combined heat and power, district heating and cooling, as well as geothermal, biomass or solar energy. Decentralised Energy schemes can serve a single building or a whole community, even being built out across entire cities.

The heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

- 1. Connect to local or existing planned heat networks.
  - a. Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required).
  - b. Use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network).
  - c. Use ultra-low NOx gas boilers.
- 2. CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements of national and local planning policy.
- 3. Where a heat network is planned but not yet in existence the development should be designed for connection at a later date.

There are many benefits of decentralised heat generation and Combined Heat and Power (CHP) in terms of cost and CO<sub>2</sub> emissions savings. However, technology such as this is more significant for larger developments, ideally complimented with some non-residential use of heat and electricity. The proposed development size of 4 dwellings is at the very low end of what the industry tends to view as viable for such systems. The development is for

residential only and this will result in 'peaky' thermal demands with little anchor load to enable efficient operation of gas fired CHP. This option also risks the potential to increase costs to residents.

The site is neither sufficiently dense nor large enough to warrant investment from 3rd party managing agents or Energy Supply Companies (ESCos). The proposed development would need to be run by an independent agent/company and there would be very little if any interest among existing ESCos in servicing such a small-scale system. Even if it was possible, the cost of managing fuel procurement, customer billing, operation and maintenance would lead to disproportionally and unnecessary high service charges to residents compared to the provision of heat from individual gas boilers.

Based on the anticipated timescale of the proposed development and the predicted trajectory of the national electricity grid decarbonisation, the development of a district heat network powered by fossil fuels is also not considered to be the most carbon efficient approach.

The incorporation of a gas fired combined heat and power (CHP) network will lock the development into relatively carbon intensive gas-fired heating and hot water technology, and will not facilitate the transition to less carbon intensive solutions.

It should also be noted that there is currently no mains gas connection in the village of Widdington. This would increase the level of intrusion and complexity with regards to constructing a gas fired combined heat and power (CHP) network for this development.



## 9. RENEWABLES OR LZC TECHNOLOGY (BE GREEN)



The following low and zero carbon technologies have been considered for this scheme:

- Air Source Heat Pump (ASHP)
- Photovoltaic Panels (PV)
- Ground Source Heat Pump (GSHP)
- Wind Turbines
- Biomass Boiler
- Solar Thermal

The assessment has shown that individual Air Source Heat Pumps (ASHPs) and Photovoltaics (PV) are considered to be the most suitable renewable energy options for this development.

All other renewable energy technology options are summarised in the appendices and have been deemed as not appropriate for this development.

## 9.1 AIR SOURCE HEAT PUMPS (ASHP)

Air at any temperature above absolute zero contains some energy. An air source heat pump transfers some of this energy as heat from one place to another, for example, between the outside and inside of a building. This can provide space heating and hot water. A system can be designed to transfer heat in either direction, to heat or cool the interior of the building in winter and summer respectively. For simplicity, the description below focuses on use for interior heating.

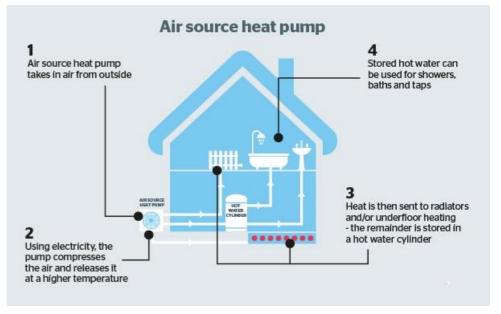
The technology is similar to a refrigerator/freezer or air conditioning unit. The different effect is due to the physical location of the different system components. Just as the pipes on the back of a refrigerator become warm as the interior cools, so an ASHP warms the inside of a building whilst cooling the outside air.

The main components of an ASHP are:

- An outdoor heat exchanger coil, which extracts heat from ambient air.
- An indoor heat exchanger coil, which transfers the heat into hot air ducts, an indoor heating system such as water-filled radiators or underfloor circuits and a domestic hot water tank.

The figure below demonstrates the typical operation of an ASHP system used to supply space heating and hot water to a property.

### Figure 2: Example diagram of ASHP System



Some of the key advantages of ASHPs are listed below:

- ASHPs save carbon emissions. Unlike burning oil, gas, LPG or biomass, a heat pump produces no carbon emissions on-site (and no carbon emissions at all, if a renewable energy source is used to power them).
- They save space. There are no fuel storage requirements.
- They require less maintenance than combustion based heating systems.
- Heat pumps can provide cooling in summer, as well as heating in winter.
- There is no combustion involved and no direct emission of harmful gases.



The use of individual Air Source Heat Pumps (ASHP) is proposed for this development to efficiently supply the dwellings with space heating and hot water. The ASHP are to be situated on the ground floor at the rear/side of the houses.

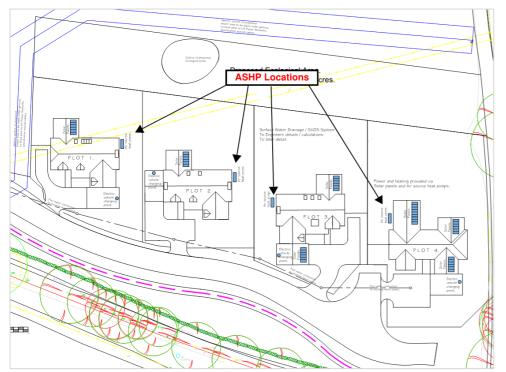
ASHPs will require electricity to operate, however this electricity can be supplied by renewable sources. This will future proof the home against the decarbonisation of the electricity grid.

A datasheet for the ASHP specified within the SAP calculations for the purpose of this report, has been included within the appendices.

The design of this system will be further developed during the detailed design stage.

The figure below shows the proposed location of the ASHP units.

#### Figure 3: Proposed ASHP locations



## 9.2 PHOTOVOLTAICS (PV)

In addition to the use of individual ASHPs, it is proposed that the development will further reduce its net carbon and energy consumption by utilising solar photovoltaics (PV) panels. The following section explores the potential benefits of PV being added to the development and provides a proposal for the inclusion of PV panels.

### Typical 300w Panel



Solar PV technology offers advantages over other low carbon and renewable energy technologies for the following reasons:

#### Density/scale

- Solar technologies are modular and can be sized to available space constraints and would easily be integrated into the roofscape of the proposed development.
- Solar PV technologies typically require 2-3 times more space to generate the equivalent energy or abate similar emissions as solar thermal panels, but they can be sized to the maximum available roof space.

## **Technology Integration**

• Solar technologies can be easily integrated into the built environment using available roof space. Since they are modular and easily fixed to buildings they can access solar irradiation in almost any location. The technologies can be integrated



on almost any roof structure or vertical façade without compromising structural or aesthetic requirements.

• Solar PV systems are generally connected to the dwelling or block via an inverter and any excess generation not utilised on-site is exported seamlessly to the local grid.

#### Cost-effectiveness

• Solar PV costs have reduced dramatically in the last 2-3 years in the UK, due to increasing demand for the technology driven by sustainability requirements and the Government's stimulus package known as the Feed-In Tariffs (FiTs) scheme which rewards renewable electricity generation with premium tariffs.

#### CO<sub>2</sub> Abatement Capacity

• Solar PV generates electricity and abates ~2.5 - 3 times more CO<sub>2</sub> than an alternative renewable energy technology that displaces use of gas (e.g. solar hot water technology and/or biomass boilers). Solar PV is well proven with good historical data showing that its performance credentials generally match or exceed manufacturers' claims/modelled generation profiles.

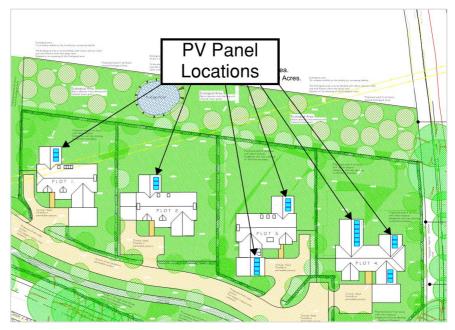
Although the south facing roof elevations on the development are the most efficient in terms of PV cell orientation, they are not deemed appropriate as dormers and gables have been specified in these locations which will limit the capacity for PV. The south facing roofs also face directly onto the new internal access road, and are therefore deemed inappropriate in order to lessen the visual impact of the PV cells. In addition, this PV proposal has given consideration to Uttlesford District Council's Interim Policy 2 and following advice from the Heritage Consultant a decision has been made not to propose installing any PV to the west facing roof elevations, as the PV panels would face toward the conservation area. However, it should be noted that the Applicants are willing to increase the quantity of PV to include the west facing roof elevations if Uttlesford District Council determine that it is appropriate to do so.

In light of the above, the east facing roof elevations are deemed most appropriate in this instance for PV. The table and figure across the page provide full detail of the PV proposal.

#### Table 9: Proposed PV Schedule

Plot	Roof Elevation Allocated For PV	No. of Panels	Total kWp of PV
Plot 1	East	3	0.9 kWp
Plot 2	East	3	0.9 kWp
Plot 3	East	7	2.1 kWp
Plot 4	East	12	3.6 kWp
	TOTAL:	25	7.5 kWp

Figure 4: Roof Elevations Allocated for PV Panels





The calculated  $CO_2$  and energy savings through the introduction of the photovoltaic panels can be summarised as detailed in the table below and would abate the following in terms of energy and  $CO_2$ .

#### Table 10: Potential Energy and CO<sub>2</sub> abatement from PV

Item	Amount	Metric
Energy	5,118	kWh/year
CO <sub>2</sub>	2,656	kgCO <sub>2</sub> /year

The above table shows that PV would provide an additional saving of 2.66 tonnes of  $CO_2/year. \end{tabular}$ 

## 9.3 ENERGY AND CO<sub>2</sub> DEMAND (BE GREEN)

Using the specification detailed and the outputs from SAP for the sample units, the 'Be Green' energy and carbon figures for the development are detailed in the table below, and an improvement can be seen when compared to Table 4 (baseline) and Table 7 (be lean).

## Table 11: Predicted Energy Demand and Carbon Emissions: Be Green

Element Part L1A 2013	Space Heating Demand	Hot Water demand	Pumps and fans	Lighting	Electricity generated by PV	Totals
Energy: Be Green (kWh p.a.)	11,765	4,376	351	2,299	- 5,118	13,673
CO <sub>2</sub> Associated with total Energy Demand (kgCO <sub>2</sub> p.a./a)	6,106	2,271	182	1,193	- 2,656	7,096

A summary of the  $CO_2$  and energy savings at the 'Be Lean' stage can be found in the table below.

Table 12:  $\mbox{CO}_2$  and Energy Savings: Be Green compared against Gas baseline

Element	CO2 — Regulated (tonnes/year)	Energy Demand (MWh/year)
Gas Baseline	12.21	52.88
After 'Be Green'	7.10	13.67
Saving	5.11	39.21
Improvement	42%	74%

Building Regulations assessment of the TER allows a fuel factor for use of electricity and therefore the baseline carbon emissions are different than for a gas heated dwelling. When the 'Be Green' proposals are compared against a baseline of Building Regulations the carbon savings are much greater. The following table shows the 'Be Green' carbon savings against a Building Regulations TER.

Table 13: CO<sub>2</sub> and Energy Savings: Be Green compared against Building Regulation TER

Element	CO2 – Regulated (tonnes/year)
Building Regulations Baseline (TER)	18.18
After 'Be Green'	7.10
Saving	11.08
Improvement	60.95%



## 10. SUMMER OVERHEATING AND COOLING

With a continual drive for energy efficiency through both the Building Regulations and Local Planning Authority requirements, the risk of overheating to dwellings in the summer months is becoming more prevalent. Overheating can be a mild discomfort or a hazard to health if managed incorrectly, so it is vitally important that overheating risk be mitigated to ensure the dwelling will be both energy efficient and comfortable to live in.

Summer overheating is caused when there is excess build-up of heat within a dwelling. This can occur where there is excessive solar gain and limited means to absorb excess heat into the building fabric or purge this heat through ventilation. Summer overheating can be managed through a variety of measures and the chosen solution will vary from development to development. These measures can include:

## Limiting solar gain

Glazing g value: This is a measure of how much solar radiation penetrates the glazing. The lower the g value the less solar gain enters a dwelling. Glazing with low g values may have a darker tint to the glazing, so aesthetic considerations are also a factor. Lower g values (below 0.5) are often required in apartments with single facades. Specifying g values below 0.2 will increase cost substantially and also limit the number of available suppliers for glazing.

External shading: Windows can be shaded with Brise Soleil or balconies of the dwelling above to reduce solar gain the in the summer months. If aligned correctly external shading can reduce solar gain in summer and still allow for it in winter when the sun is lower.

Internal Shading: Blinds can be used to limit solar gain in a dwelling. They can either be automatic, triggered by the sun's presence on the window, or operated manually. Manual operation requires the occupant to be present however, so this option is not a reliable option when trying to mitigate overheating risk.

## Purging excess heat build up

Thermal Mass: thermal mass is the measure of a dwellings ability to absorb energy. A dwelling with a high thermal mass (high proportion of concrete) has the ability to absorb heat during the day, which helps maintain a steady internal temperature. This heat can be

released back into the dwelling at night time, when the temperature of the dwelling is lower, helping to maintain a consistent internal temperature.

Ventilation: A dwelling can be ventilated to purge excess heat build-up. This can be done through openable windows, especially where cross ventilation is possible. Where ventilation through windows isn't possible, due to security, noise or pollution issues, Mechanical Ventilation can be used. The ventilation rates required to purge a dwelling can often be quite high, requiring oversized systems.

The SAP calculations have been used to assess the risk of overheating. The results of the assessment show that the dwellings have only a slight risk of overheating at worst and are therefore acceptable in terms of meeting Building Regulations requirements. This has been achieved using the following strategy:

- Thermal Mass
- Decentralised Mechanical Ventilation (continuously running decentralised extract fans)
- A G figure of 0.63 to the glazing

## 10.1 Over Heating Results: SAP calculations

The dwellings have been assessed as per the requirements of SAP 2012 Appendix P. The results are detailed as below and are shown to comply with Building Regulations.

#### Table 14: Results of overheating Assessment - SAP

Dwelling	Dwelling Type	Overheating June	Overheating July	Overheating August
Plot 1	House	Not significant	Slight	Slight
Plot 2	House	Not significant	Slight	Slight
Plot 3	House	Not significant	Slight	Slight
Plot 4	Bungalow	Not significant	Slight	Slight



## 11. WATER SAVING MEASURES

The following devices will be incorporated within each home:

- Water efficient taps.
- Water efficient cisterns.
- Low output showers.
- Flow restrictors to manage water pressures to achieve optimum levels.
- Water meters to all premises with guidance on water consumption and savings.

The following specification or similar will be adopted on the development to ensure that the internal water use is reduced to a maximum of 110 litres per head per day in line with Uttlesford District Council's Interim Policy 3.

## Table 15: Specification of flow rates and volumes for water using appliances

Water using Appliance	Comment
WC Cisterns	Dual Flush to be limited to maximum of 6/3
Baths	Capacity no greater than 190 litres
Basin taps	Flow rates to be no greater than 3 litres/minute
Kitchen taps	Flow rates to be no greater than 6 litres/minute
Shower	Flow rates to be no greater than 8 litres/minute
Water softener	Not to be installed
Washing Machine	Water usage to be limited to 8.17 Litres per KG
Dishwasher	Water Usage to be limited to 1.25 litres per place setting

#### **Table 16: Water Calculations**

Installation Type	Unit	Capacity	Use Factor	Fixed use	Total Use
	onne		OSC FUCIO		
		Flow rate		(l/p/day)	(l/p/day)
WC Single Flush	Volume (l)	0.00	4.42	0.00	0.00
WC Dual Flush	Full Flush (l)	6.00	1.46	0.00	8.76
	Pt Flush (l)	3.00	2.96	0.00	8.88
WC's (Multiple)	Volume (l)	0.00	4.42	0.00	0.00
Taps Exc. Kitchen	Flow Rate	3.00	1.58	1.58	6.32
Bath (shower present)	(l/s)	190.00	0.11	0.00	20.90
Shower (bath present)	(l/s)	8.00	4.37	0.00	34.96
Bath Only	(I)	0.00	0.50	0.00	0.00
Shower Only	(l/s)	0.00	5.60	0.00	0.00
Kitchen Taps	(l/s)	6.00	0.44	10.36	13.00
Washing Machines	(l/kg/dry)	8.17	2.10	0.00	17.16
Dishwashers	(l/place)	1.25	3.60	0.00	4.50
Waste Disposal	(l/s)	0.00	3.08	0.00	0.00
Water Softener	(l/s)	0.00	1.00	0.00	0.00
Total Calculated Water Use	e (l/p/day)				114.50
Grey/Rain Water Reused (				0.00	
Normalisation Factor	(Factor)				0.91
Total Internal Consumptio	n (l/p/day)	1			104.20
External Water Use Allowa				5.00	
Total Consumption Part G	(l/p/day)	1			109.20



## 12. CONCLUSIONS

The energy strategy has followed the accepted Energy Hierarchy Be Lean, Be Clean and Be Green. The energy strategy proposed for the development can be summarised as below.

The proposed individual ASHPs and inclusion of 7.5 kWp of PV, along with energy efficiency improvements, save 5.11 tonnes of  $CO_2$  per year which represents a 41.85% saving over a gas baseline unit and is in excess of a 60% improvement over a Building Regulations baseline. This exceeds the requirements of Uttlesford District Council's Interim Policy 12, which stipulates a minimum 19% reduction is to be achieved.

Total energy demand savings are also expressed after each stage of the energy hierarchy for the development. The 'Be Green' measures alone will provide a saving of 35.16 MWh per year which contributes towards a 74.15% saving in total energy demand compared to a Building Regulations baseline.

### Table 17: Proposed Energy Strategy

Element	Measure
Passive	Optimised design to enable controlled solar gain and improved direct and indirect natural lighting
Fabric	Building fabric U values have been enhanced over and above those detailed with Part L1A 2013
Heating	Individual ASHP to supply heat (refer to appendices for product datasheet)
Hot Water	Individual ASHP to supply heat (refer to appendices for product datasheet)
Ventilation	Mechanical ventilation System 3 Low design air permeability (DAP)
Lighting	Energy efficient LED Lighting where applicable
Renewables	7.5 kWp of PV to east facing roof elevations

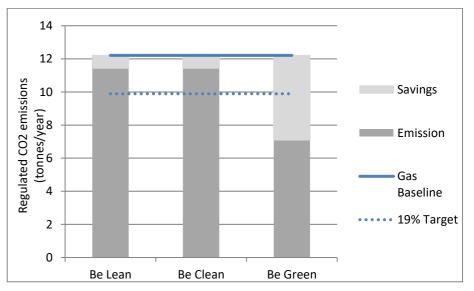
## $12.1 \quad \text{Total Residential CO}_2 \text{ And Energy Savings}$

The summary of the overall reduction in residential  $CO_2$  emissions after each stage of the energy hierarchy is summarised in the table below.

#### Table 18: Summary of CO<sub>2</sub> Savings Over Gas Baseline

Element	CO <sub>2</sub> - Regulated (tonnes/year)	Total CO <sub>2</sub> Savings	% Saving
Gas Baseline	12.21	0.00	0.00
Be Lean	11.44	0.77	6.31
After Heat Network	11.44	0.77	6.31
Be Green	7.10	5.11	41.85

The overall reduction in regulated carbon emission to the residential units can be illustrated graphically as below.





Building Regulations assessment of the TER allows a fuel factor for use of electricity and therefore the baseline carbon emissions are different than for a gas heated dwelling. When the energy strategy after 'Be Green' is compared against a baseline of Building Regulations the carbon savings are much greater. The following table shows the carbon savings against a TER.

## Table 19: Carbon Emissions Building Regulation's (TER) comparison

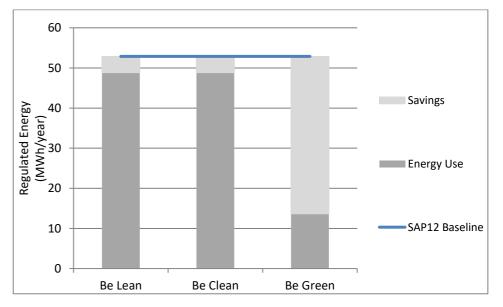
Element	CO₂ - Regulated (tonnes/year)	Improvement %
Baseline	18.18	
Be Green	7.10	60.95%

The summary of the overall reduction in residential energy after each stage of the energy hierarchy is summarised in the table below.

## Table 20: Energy Usage and Savings

Element	Energy - Regulated (MWh/year)	Total Savings (MWh/year)	% Saving
Residential Baseline	52.88	0	0.00
Be Lean	48.83	4.05	7.66
After Heat Network	48.83	4.05	7.66
Be Green	13.67	39.21	74.15

The overall reduction in energy usage to the residential units can be illustrated graphically as below.



The proposed strategy has first reduced energy demand through fabric and energy efficiency measures. The overall Part L Fabric Energy Efficiency (FEE) performance has been reviewed for the 'be lean' position and compared to the baseline stage of the energy hierarchy. The improvement has been shown to be 16.74%.

#### Table 21: Residential FEE Performance

Element	Target Fabric Energy Efficiency (TFEE) kWh/m <sup>2</sup> /year	Dwelling Fabric Energy Efficiency (DFEE) kWh/m²/year	Improvement (%)
Development Total	62.53	52.06	16.74



#### Summary

The proposed energy strategy achieves and meets the following requirements:

- Complies with Part L 2013 building regulations (with 2016 amendments) and shows a 60.95% carbon saving over a Building Regulations baseline (TER).
- Exceeds the 19.00% minimum reduction on the dwelling (carbon dioxide) emission rate (DER) against the Target Emission Rate (TER) of 2013 Building Regulations as required in Uttlesford District Council's Interim Policy 12.
- Saves 5.11 tonnes of carbon per year over a gas baseline.
- Shows a 41.85% carbon saving over a gas baseline.
- Total energy saving of 74.15% compared to a Building Regulations baseline (TER).
- Includes improved optimal building fabric improvements, energy efficient design of building services.
- An energy saving of 35.16 MWh/year is to be achieved through the inclusion of individual Air Source Heat Pumps and 7.5 kWp of PV across the scheme.
- Includes improved optimal building fabric improvements and energy efficient design of building services.
- Exceeds the TFEE minimum reduction requirements by 16.74%.



## 13. APPENDICES

The following pages detail:

- The calculated energy and CO<sub>2</sub> outputs on a type by type basis
- Review of options for renewable energy generation
- Details on the ASHPs
- SAP output sheets



## 13.1 APPENDIX A: ENERGY AND CO<sub>2</sub> Performance Type By Type

Energy	Include	Unregulated	l Energy	No	2013		Predicted Ene	ergy Demano	I
Туре	Dwelling Name	TFA	No of Types	Main Heating Fuel Requirement (DER)	Water Fuel Requirement (DER)	Electricity Pumps Fans Requirement (DER)	Electricity Lighting Requirement (DER)	Unit Total	Development Total
Plot 1	House	204.28	1	3096	1098	95	601	4890	4890
Plot 2	House	204.28	1	3096	1098	95	601	4890	4890
Plot 3	House	204.28	1	3096	1098	95	601	4890	4890
Plot 4	Bungalow	144.43	1	2476	1082	67	497	4122	4122
Totals		757.27	4	11,765	4,376	351	2,299	18,791	18,791

CO2	Include	Unregulated	Energy	No	2013		Predicted C	O2 Demand	
Туре	Dwelling Name	TFA	No of Types	Main Heating Fuel Requirement (DER)	Water Fuel Requirement (DER)	Electricity Pumps Fans Requirement (DER)	Electricity Lighting Requirement (DER)	Unit Total	Development Total
Plot 1	House	204.28	1	1607	570	49	312	2538	2538
Plot 2	House	204.28	1	1607	570	49	312	2538	2538
Plot 3	House	204.28	1	1607	570	49	312	2538	2538
Plot 4	Bungalow	144.43	1	1285	561	35	258	2140	2140
Totals		757.27	4	6,106	2,271	182	1,193	9,753	9,753

Widdington



## 13.2 APPENDIX B: RENEWABLE ENERGY OPTIONS

The following alternative options to supply low carbon and renewable energy generation have been explored and discounted based on the following reasons:

## Wind Turbines

Wind turbines come in a variety of sizes and shapes. Turbines of 1 Kw can be installed to single house and large-scale turbines of 1-2 MW can be installed on a development to generate electricity to multiple dwellings and other buildings. In both instances the electricity generated can be used on site or exported to the grid. Vertical- or horizontal-axis turbines are available.

A roof-mounted 1 kW micro wind system costs up to £3,000. A 2.5 kW pole-mounted system costs between £9,900 and £19,000. A 6 kW pole-mounted system costs between £21,000 and £30,000 (taken from the Energy Saving Trust, TBC by supplier)

- Local average wind speed is a determining factor. A minimum average wind speed of 6 m/s is required.
- Noise considerations can be an issue dependent on density and build-up of the surrounding area.
- Buildings in the immediate area can disrupt wind speed and reduce performance of the system.
- Planning permission will be required along with suitable space to site the turbine, whether ground installed or roof mounted.

Wind turbines have been discounted due to concerns over reliable wind resources. The use of wind turbines is likely to present aesthetic as well as nuisance issues.

#### **Biomass Boilers**

Providing a heating system fuelled by plant-based materials such as wood, crops or food waste. Biomass boilers generate heat for space heating and domestic hot water through the combustion of biofuels, such as woodchip, wood pellets or potentially biofuel or bio diesel. Biomass is considered to be virtually zero carbon. They can be used on an individual scale or for multiple dwellings as part of a district-heating network. A back-up heat source should be provided as consistent delivery of fuel is necessary for continued operation.

Biomass is considered a technically-viable option for this development scheme as there are no apparent physical constraints on site in terms of installing biomass boilers or storing a sufficient supply.

- There are, however, concerns regarding a sustainable supply of biomass to the site.
- The capital installation cost would also be high which leads us to the conclusion that biomass would not be a commercially-viable option for this development scheme.

## Ground Source Heat Pumps (GSHP)

Ground Source Heat Pumps (GSHPs) operate on the same principle as an Air Source Heat Pump (ASHP) in that they extract heat from a source (in this instance the ground) and compress this energy to increase temperature for space heating and hot water. Pipework is installed into the ground, either through coils or in bore holes and piles, circulating a mix of water and antifreeze to extract energy from the ground, where the year-round temperature is relatively consistent (approx. 10° C at 4 metres depth). This leads to a reliable source of heat for the building.

Again, an electrically powered pump circulates the liquid and powers the compressor, however annual efficiencies for GSHPs tend to be higher than those of ASHPs.

Discounted on the grounds of costs and available space. Incompatible with individual gas boilers and blocks of apartments.

## Solar Thermal

Solar Thermal generates domestic hot water from the sun's radiation. Glycol circulates within either flat plate or evacuated tube panels, absorbing heat from the sun, and transferring this energy to a water cylinder. A well designed solar thermal system will account for 50-60% of a dwelling's annual hot water demand. Sizing the system to meet a higher demand will lead to excess heat generation in the summer months and overheating of the system.

Unsuitable for blocks of flats and low carbon reduction efficiency compared to photovoltaic systems. Solar hot water systems for flatted blocks are only suitable where a central boiler plant room is provided to accommodate a central thermal store.



## 13.3 APPENDIX C: ASHP DETAILS



# Ultra Quiet Ecodan

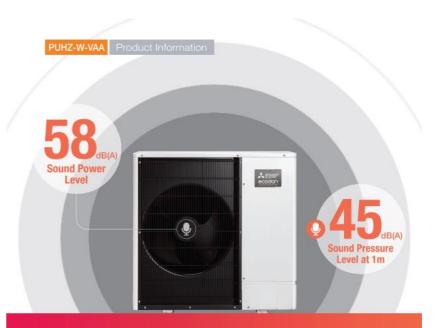




**3 Times Quieter** than previous equivalent models, virtually eliminating planning restrictions







Our market leading Ecodan air source heat pumps are designed to provide a home with reliable, trouble free renewable heating and hot water.

## The New Ultra Quiet Ecodan takes air source heat pumps to the next level

These new models offer superb style, market leading energy efficiency and sound levels. Designed especially for residential applications the 8.5kW and 11.2kW units are **3 times quieter than previous models**, virtually eliminating planning restrictions.

Typical sound pressure levels:



This means the Ultra Quiet Ecodan has a sound pressure level similar to a Library.

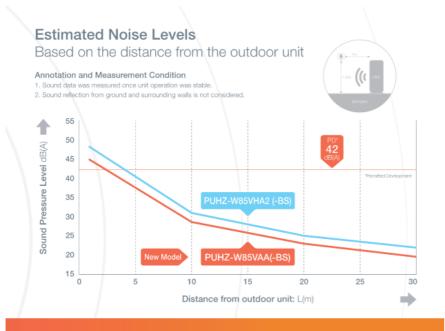
Widdington

O dB(A) drop in

sound power

Widdington

# **ABBEY**CONSULTANTS



## Low Sound = Heat Pump Placement Flexibility

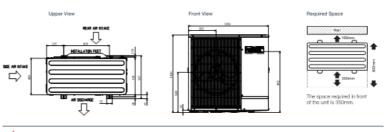
One of the regulations under Permitted Development, is that the sound pressure level of an air source heat pump must not exceed 42dB(A) 1m from the neighbours nearest room (Assessment Position).



Mcs V V V	Product Informa		
OUTDOOR UNIT		PUHZ-W85VAA(-BS)	PUHZ-W112VAA(-BS)
HEAT PUMP SPACE	ErP Rating	A++	A++
HEATER - 55°C	ቢ	137%	133%
	SCOP	3.50	3.40
HEAT PUMP SPACE	ErP Rating	A++	A++
HEATER - 35°C	η,	171%	170%
	SCOP	4.35	4.34
HEAT PUMP COMBINATION	ErP Rating	A	A
HEATER - Large Profile"	η <sub>un</sub>	104%	100%
HEATING <sup>2</sup>	Capacity (kW)	8.3	11.0
(A-3/W35)	Power Input (kW)	2.86	3.73
	COP	2.90	2.95
OPERATING AMBIENT TEMP	PERATURE ("C DB)	-20 ~ +35°C	-20 ~ +35*C
SOUND DATA <sup>2</sup>	Pressure Level at 1m (dBA)	45	47
	Power Level (dBA)*	58	60

	Power Level (dBA) <sup>-4</sup>	58	60
WATER DATA	Pipework Size (mm)	28	28
	Flow Rate (I/min)	25.8	32.1
	Water Pressure Drop (kPa)	16.1	24.4
DIMENSIONS (mm)7	Width	1050	1050
	Depth	480	490
	Height	1020	1020
WEIGHT (kg)		97	118
ELECTRICAL DATA	Electrical Supply	220-240v, 50Hz	220-240v, 50Hz
	Phase	Single	Single
	Nominal Running Current [MAX] (A)	9.1 [22.0]	10.9 [28.0]
	Fuse Rating - MCB Sizes (A)*	25	32
REFRIGERANT CHARGE (kg) / CO <sub>2</sub> EQUIVALENT (()	R410A (GWP 2088)	2.4/5.01	3.3/6.89
*2 Under normal leading conditions at putdogr b	<sup>2</sup> Lindermornal leading conditions at outdoor temp: -3 <sup>2</sup> step: 74258 / 64598, outlet value tamp 5540, internation ione systems PAD-FOI28-E Dimensions WeDoH (sml) - 5	COR / -4*OVR, outlet water temp SE*C, inter water temp 30*C. • temp 42*C as tested to BS EN1 4511. *4 Sound power level tested to BS EN131 (20c1SDe50)	12. "5 MCR Sizes BS DWOODS-2 & BS DWOOS7-0.
A is the seasonal space heating energy efficience	$_{\rm F}(52\text{-}22)$ $~R_{\rm e}$ is the value heating energy efficiency		

#### Product Dimensions PUHZ-W85 / 112VAA(-BS)



Changes for the Batter Telephone: 01707 278666 email: heating@meuk.mee.com wold: heating@meuk.mee.com	Green * Gateway
UNITED KNOCOM Mitsubales Electrics Europe Lings Drivorment Systems Division Taskers Lane, Hardkinski, Hardkinski, A. Lo 1008, Digland C. Amarali Dravision Biakpinova: 011707 2528380 Task: 01707 2738801 TRELAND Mitsubales Electrics Europe Westgabe Burgnerses Tark, Balymours, Cukin 24, Instand TRELAND Mitsubales Electrics Europe Westgabe Burgnerses Tark, Balymours, Cukin 24, Instand TRELAND Mitsubales Electrics Europe Westgabe Burgnerses Tark, Balymours, Cukin 24, Instand TRELAND Mitsubales Electrics Europe Westgabe Burgnerses Tark, Balymours, Cukin 24, Instand Targetonics Cukin 19, 141 8800 TRELAND, Balymours, Bark, Bark	Follow us timeskijke Follow us timeskijke Massiski filomie Uving Erwissmental Systems UK in initialahisischicz dehulamitsabishisischiczouwik
Me 22 22 CE Ethective as of April 2018 BAP No. 338239	



13.4 APPENDIX E: SAP OUTPUT SHEETS



Baseline SAP Sheets

Widdington

## TER WorkSheet: New dwelling design stage

User Details:														
Assessor Na Software Nar	ne: Stroma FSAP 2012						Software Version: Vers					003572 n: 1.0.5.41		
						roperty	Address	: Plot 1						
Address :	Address : Plot 1, Widdington, TBC 1. Overall dwelling dimensions:													
1. Overall dwell	ing dir	nension	s:			_								
0 10							ea(m²)	I	Av. He	ight(m)	1	Volume(m <sup>3</sup> )	-	
Ground floor							119.31	(1a) x	2	2.5	(2a) =	298.27	(3a)	
First floor							84.97	(1b) x	2	.56	(2b) =	217.61	(3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 204.28 (4)														
Dwelling volume				(3a)+(3b	)+(3c)+(3d	l)+(3e)+	.(3n) =	515.88	(5)					
2. Ventilation rate:														
			main heating		econdar neating	у	other		total			m <sup>3</sup> per hour		
Number of chimr	neys	Ĺ	0	+	0	] + [	0	] = [	0	x 4	40 =	0	(6a)	
Number of open	flues	Ē	0	_ + _	0		0	_ _ = _	0	x 2	20 =	0	(6b)	
Number of interm	nittent	fans						Γ	4	x ′	10 =	40	(7a)	
Number of passive vents $0 \times 10 =$										10 =	0	(7b)		
Number of flueless gas fires 0 x 40 =											0	(7c)		
								L			<b>A</b> <sup>1</sup> <b>I</b>			
												anges per ho	_	
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 40$ If a prospurisation test has been carried out or is intended, proceed to (17) otherwise continue from (0) to (16)												0.08	(8)	
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)												0	(9)	
Additional infilt	•		ennig (n	-)						[(9)-	-1]x0.1 =	0	(10)	
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction											0			
if both types of	wall are	e present,	use the va	lue corres				•				<u> </u>		
deducting areas If suspended v	,	0 //	,		ed) or 0	.1 (seal	ed), else	enter 0				0	(12)	
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0												0	(13)	
Percentage of windows and doors draught stripped												0	(14)	
Window infiltration 0.25 - [0.2 x (14) ÷ 100] =											0	(15)		
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$											0	(16)		
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area											area	5	(17)	
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$												0.33	(18)	
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used														
Number of sides sheltered							(20) = 1 - [0.075 x (19)] =					2	(19)	
Shelter factor Infiltration rate incorporating shelter factor							$(20) = (18) \times (20) =$					0.85	(20)	
		-					(∠1) = (18	) x (∠∪) =				0.28	(21)	
Infiltration rate m			<u> </u>	· ·	i	1, .1	۸	- Co	0.00	Next	Dee			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Monthly average		•	i					<u> </u>			·	l		
(22)m= 5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7			

Wind F	actor (2	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.35	0.35	0.34	0.31	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.33		
			-	rate for t	he appli	cable ca	se			•		•	• 	
	echanica			andix NL (0	12h) (00a	) <b>E</b> my (a	austion (N		nuice (22h	·) (22a)				0 (23a)
			• • •	endix N, (2	, ,	, ,				)) = (23a)				0 (23b)
			-	iency in %	•						00L) F	4 (00 )		0 (23c)
	i		<b></b>	1	1	i		<u> </u>	ŕ	r í	r <u>, -</u>	1 – (23c)	÷ 100] I	(240)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
			<b></b>	<b></b>	1	i	r	r Ó	ŕ	2b)m + (2	, 		1	(0.4h)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,				ntilation o		•				E (00h				
	<u> </u>	0			(230) = (230)			C = (22L)		.5 × (23b	0	0	1	(24c)
(24c)m=					-		-		_	0	0	0		(240)
,				ole hous $m = (22)$						0.51				
(24d)m=	r í í	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d)
		change	rate - er	nter (24a	) or (24t	) or (24	c) or (24	d) in boy	r (25)				1	
(25)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
0.11					I		I	1	1	I	I	1	1	
I X He	at losses	s and ne			ar									
				paramete										
ELEN		Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-ł		A X k kJ/K
	IENT	Gros	SS	Openin	gs						K)			
ELEN	<b>IENT</b> Type 1	Gros	SS	Openin	gs	A ,n	m²	W/m2	2K	(W/I	K)			kJ/K
ELEN Doors Doors	<b>IENT</b> Type 1	Gros area	SS	Openin	gs	A ,r	m <sup>2</sup> x	W/m2	2K	(W/I 2.652	K)			kJ/K (26)
ELEN Doors Doors Window	<b>IENT</b> Type 1 Type 2	Gros area	SS	Openin	gs	A ,r 2.21 1.89	m <sup>2</sup> x x 2 x <sup>1,</sup>	W/m2 1.2 1.2	2K = = 0.04] =	(W/I 2.652 2.268	K)			kJ/K (26) (26)
ELEN Doors Doors Window Window	<b>IENT</b> Type 1 Type 2 ws Type	Gros area	SS	Openin	gs	A ,r 2.21 1.89 16.92	n <sup>2</sup> x x x 2 x <sup>1</sup> / x <sup>1</sup> /	W/m2 1.2 1.2 /[1/(1.4)+	2K = = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43	<pre>k)</pre>			kJ/K (26) (26) (27)
ELEN Doors Doors Window Window	Type 1 Type 2 ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6	n <sup>2</sup> x x x x x x x 1/2 x	W/m2 1.2 1.2 /[1/(1.4)+ /[1/(1.4)+	2K = = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77	<>			kJ/K (26) (26) (27) (27)
ELEN Doors Doors Window Window Window	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72 9.9	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K = = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12	<pre>k)</pre>			kJ/K (26) (27) (27) (27) (27)
ELEN Doors Doors Window Window	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K = = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77 0.95				kJ/K (26) (26) (27) (27) (27)
ELEN Doors Doors Window Window Window Rooflig	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3	ss (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7) +	2K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672				kJ/K (26) (27) (27) (27) (27) (27) (27b)
ELEN Doors Doors Window Window Window Rooflig Floor	Type 1 Type 2 ws Type ws Type ws Type ws Type hts	Gros area 1 2 3 4 170.	ss (m <sup>2</sup> ) 21	Openin rr	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 )+ 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29)
ELEN Doors Doors Window Window Window Rooflig Floor Walls	Type 1 Type 2 ws Type ws Type ws Type ws Type hts Type1 Type2	Gros area 1 2 3 4 170. 82.8	21 25	Openin m 35.2-	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ 0.13 0.18 0.18	K       =         0.04]       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91				kJ/K (26) (27) (27) (27) (27) (27) (27b) (28) (29) (29)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof 1	Type 1 Type 2 ws Type ws Type ws Type ws Type hts Type1 Type2 Type1	Gros area 1 2 3 4 170. 82.8 58.7	21 21 21 21	Openin m 35.24	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7) + 0.13 0.18 0.18 0.13	K       =         0.04]       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.510 24.29 14.91 7.64				kJ/K (26) (27) (27) (27) (27) (27b) (27b) (28) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type thts Type1 Type2 Type2	Gros area 1 2 3 4 170. 82.8 58.7 18.6	21 21 23 24	Openin m 35.2 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13	K       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5100 24.29 14.91 7.64 2.42				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Walls Roof Roof Roof	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type fype1 Type2 Type2 Type3	Gros area 1 2 3 4 1 7 0. 82.8 58.7 18.6 16.3	21 21 35 74 35	Openin m 35.2 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         1       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91 7.64 2.42 2.13				kJ/K (26) (27) (27) (27) (27) (27b) (27b) (28) (29) (29) (29) (30) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type hts Type1 Type2 Type3 Type3 Type4	Gros area 1 2 3 4 170. 82.8 58.7 18.6 16.3 37.	SS (m <sup>2</sup> ) 21 35 74 35 1	Openin m 35.2 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13	K       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5100 24.29 14.91 7.64 2.42				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (30) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Total a	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type hts Type1 Type2 Type3 Type3 Type4 rea of e	Gros area 1 2 3 4 170. 82.8 58.7 18.6 16.3 37.	SS (m <sup>2</sup> ) 21 35 74 35 1	Openin m 35.2 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         1       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91 7.64 2.42 2.13				kJ/K (26) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29) (29) (29) (30) (30) (30) (30) (31)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof Total a Interna	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type hts Type1 Type2 Type3 Type3 Type4	Gros area 4 2 3 4 4 170. 82.6 58.7 18.6 16.3 37. Iements	SS (m <sup>2</sup> ) 21 35 74 35 1	Openin m 35.2 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         1       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91 7.64 2.42 2.13				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (30) (30) (30)

Interna	al floor					84.97	7				Г				(32d)
Interna	al ceiling					84.97	7				Ī		<b>-</b> -		(32e)
					ndow U-va Is and part		lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2		_
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	) + (32) =				121.0	9	(33)
Heat c	apacity	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	26228.	76	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250		(35)
	0		ere the de tailed calci		constructi	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f			
Therm	al bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	K						22.25	5	(36)
			are not kn	own (36) =	= 0.05 x (3	1)				(2.2)					-
	abric he									(36) =			143.3	4	(37)
Ventila			alculated							1	25)m x (5)	i	l		
(20)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	-		(20)
(38)m=	95.85	95.43	95.02	93.1	92.75	91.08	91.08	90.77	91.72	92.75	93.47	94.23			(38)
		coefficier							· · ·	= (37) + (3	, 1		I		
(39)m=	239.19	238.77	238.36	236.44	236.08	234.41	234.41	234.1	235.06	236.08	236.81	237.57			
Heat lo	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39)₁. · (4)	12 /12=	236.4	4	(39)
(40)m=	1.17	1.17	1.17	1.16	1.16	1.15	1.15	1.15	1.15	1.16	1.16	1.16			
									I,	Average =	Sum(40)1.	<sub>12</sub> /12=	1.16		(40)
Numbe	er of day	rs 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	gy requi	irement:								kWh/y	ear:		
Assum	ed occu	ipancy, I	N								3	01			(42)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13.		01			( /
	A £ 13.9		torugo	no in litro	o por de	w Vd ov	orogo -	(25 v NI)	1.26				l		(42)
								(25 x N) to achieve		se target o		5.63			(43)
not more	e that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)								
	Jan	Feb	Mar	Apr	Мау	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 T	Table 1c x	(43)					_		
(44)m=	116.19	111.97	107.74	103.52	99.29	95.07	95.07	99.29	103.52	107.74	111.97	116.19			_
Enorm	contant of	hot wator	upped col	ouloted m	onthly _ 1	100 v Vd r	т v рт v Г	)Tm / 2600			m(44) <sub>112</sub> = ables 1b, 1		1267.5	53	(44)
							. <u> </u>	. <u> </u>	i				1		
(45)m=	172.31	150.7	155.51	135.58	130.09	112.26	104.02	119.37	120.79	140.77	153.67	166.87			
lf instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		l otal = Su	m(45) <sub>112</sub> =	-	1661.9	94	(45)
(46)m=	25.85	22.61	23.33	20.34	19.51	16.84	15.6	17.91	18.12	21.12	23.05	25.03			(46)
	storage		includin	0 201/ 0	alar or M	////HDC	etorado	within sa	mayaa	مما		450	I		(47)
-		. ,					) litres in			301		150			(47)
	•	•			•			ombi boil	ers) ente	er '0' in (	(47)				

Water storage loss:

a) If m	nanufact	urer's d	eclared l	oss fact	or is kno	wn (kWł	n/day):				1.	55	(4)	B)
Tempe	erature f	actor fro	m Table	2b							0.	54	(4	9)
			r storage	-				(48) x (49	) =		0.	84	(5)	D)
Hot wa	ater stor	age loss	eclared of factor fi see secti	rom Tab								0	(5	1)
		from Ta										0	(5)	1
			m Table									0	(5:	3)
•••			r storage	e, kWh/y	ear			(47) x (51	) x (52) x (	53) =		0	(54	
	. ,	(54) in (క		faraab	ma a sa th			((50)			0.	84	(5	) )
			culated		,		. <u> </u>	··· ·	(55) × (41)					
(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(5)	3)
-		s dedicate	d solar sto	orage, (57)	i	x [(50) – (	1	· · ·	7)m = (56)		H11) IS Tro	m Append	l	
(57)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(5	7)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0	(58	B)
	•		lculated rom Tab				. ,	• •		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	9)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(6)	1)
Total h	heat requ	uired 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=	221.55	195.18	204.75	183.23	179.33	159.91	153.27	168.61	168.45	190.02	201.32	216.11	(62	2)
Solar DI	HW input	L calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contributi	ion to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63	3)
Output	t from w	ater hea	iter	•						•	•			
(64)m=	221.55	195.18	204.75	183.23	179.33	159.91	153.27	168.61	168.45	190.02	201.32	216.11		
			<u>.</u>	!				Out	out from w	ater heate	r (annual)₁	12	2241.73 (64	4)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)n	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	96.69	85.69	91.1	83.2	82.65	75.45	73.98	79.08	78.29	86.2	89.22	94.88	(6	5)
inclu	ude (57)	m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a	):									
Metab	olic gair	is (Table	e 5), Wat	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	(6)	6)
Lightin	g gains	(calcula	ted in A	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	34	30.2	24.56	18.59	13.9	11.73	12.68	16.48	22.12	28.09	32.78	34.95	(6	7)
Applia	nces ga	ins (calc	ulated ir	n Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	375.1	378.99	369.18	348.3	321.94	297.17	280.62	276.72	286.53	307.41	333.77	358.54	(6)	B)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	tion L15	or L15a	), also se	ee Table	5			I	
(69)m=	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	(69	9)
Pumps	s and fai	ns gains	(Table :	5a)	•		•	•	•				1	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(7)	D)

Losse	s e.g. e	vaporatio	n (nega	ive valu	es) (Ta	able	5)										
(71)m=	-120.3	-120.3	-120.3	-120.3	-120.3	;   - <sup>,</sup>	120.3	-120.3	-12	0.3 -120.3	3 -1	120.3	-120.3	-120.3	3		(71)
Water	heating	gains (T	able 5)			•	•										
(72)m=	129.95	127.51	122.45	115.56	111.09	) 1	04.79	99.44	106	6.3 108.73	3 1 <sup>.</sup>	15.86	123.91	127.5	2		(72)
Total	interna	l gains =					(66) m	n + (67)m	1 + (68	3)m + (69)m -	+ (70)	m + (	(71)m + (72)	m			
(73)m=	610.17	607.82	587.3	553.56	518.04	4 4	184.8	463.85	470	.61 488.5	5 52	22.48	561.58	592.1	3		(73)
6. So	lar gain	IS:							-								
Solar (	gains are	calculated u	using sola	r flux from	Table 6a	a and	l associa	ted equa	tions	to convert to	the a	pplica	able orientati	on.			
Orient		Access F Table 6d	actor	Area m²			Flux	e 6a		g_ Table 6l	h	-	FF Table 6c			Gains	
								eoa	,			r			г	(VV)	-
North	0.9x	0.77	X	16.	92	x	10	.63	X	0.63		×	0.7	=	۶	54.98	(74)
North	0.9x	0.77	X	16.	92	x	20	.32	X	0.63		×	0.7	=	۶Ļ	105.08	(74)
North	0.9x	0.77	X	16.	92	x	34	.53	×	0.63		×	0.7	*	- [	178.56	(74)
North	0.9x	0.77	X	16.		x	55	.46	X	0.63		×	0.7	*	= [	286.81	(74)
North	0.9x	0.77	X	16.	92	x	74	.72	X	0.63		×	0.7	*	۶Ļ	386.35	(74)
North	0.9x	0.77	X	16.	92	x	79	.99	x	0.63		×	0.7	•	۶ļ	413.6	(74)
North	0.9x	0.77	x	16.	92	x	74	.68	×	0.63		×	0.7	•	۶ļ	386.15	(74)
North	0.9x	0.77	x	16.	92	x	59	.25	×	0.63		×	0.7		= [	306.36	(74)
North	0.9x	0.77	x	16.	92	x	41	.52	x	0.63		×	0.7		-	214.68	(74)
North	0.9x	0.77	X	16.	92	x	24	.19	×	0.63		x	0.7	-	=	125.08	(74)
North	0.9x	0.77	x	16.	92	x	13	.12	x	0.63		×	0.7		= [	67.83	(74)
North	0.9x	0.77	x	16.	92	x	8.	86	X	0.63		×	0.7		= [	45.84	(74)
East	0.9x	0.77	х	3.	6	x	19	.64	x	0.63		x	0.7	-	= [	21.61	(76)
East	0.9x	0.77	x	3.	6	x	38	.42	×	0.63		×	0.7	-	- [	42.27	(76)
East	0.9x	0.77	x	3.	6	x	63	.27	x	0.63		<b>x</b> [	0.7	-	- [	69.61	(76)
East	0.9x	0.77	x	3.	6	x	92	.28	x	0.63		<b>x</b> [	0.7	-	- [	101.53	(76)
East	0.9x	0.77	x	3.	6	x	113	3.09	x	0.63		×	0.7	-	= [	124.43	(76)
East	0.9x	0.77	x	3.	6	x	115	5.77	×	0.63		<b>x</b>	0.7	=	- [	127.37	(76)
East	0.9x	0.77	x	3.	6	x	110	).22	x	0.63		<b>x</b> [	0.7	=	= [	121.26	(76)
East	0.9x	0.77	x	3.	6	x	94	.68	x	0.63		×	0.7		- [	104.16	(76)
East	0.9x	0.77	x	3.	6	x	73	.59	×	0.63		×	0.7	-	- [	80.96	(76)
East	0.9x	0.77	x	3.	6	x	45	.59	x	0.63		×	0.7	-	- [	50.16	(76)
East	0.9x	0.77	x	3.	6	x	24	.49	x	0.63		× [	0.7	-	- [	26.94	(76)
East	0.9x	0.77	x	3.	6	x	16	.15	x	0.63		× [	0.7	-	- [	17.77	(76)
South	0.9x	0.77	x	9.	9	x	46	.75	x	0.63		× [	0.7	-	- [	141.45	(78)
South	0.9x	0.77	x	9.	9	x	76	.57	×	0.63		× [	0.7	-	= [	231.66	(78)
South	0.9x	0.77	x	9.	9	x	97	.53	×	0.63		× [	0.7		- [	295.1	(78)
South	0.9x	0.77	x	9.	9	x	110	).23	×	0.63		× [	0.7	-	- [	333.52	(78)
South	0.9x	0.77	x	9.	9	x	114	4.87	×	0.63		× [	0.7	-	- [	347.55	(78)
South	0.9x	0.77	x	9.	9	x	110	0.55	×	0.63		x	0.7		= [	334.47	(78)

South       0.9x       0.77       x       9.9       x       108.01       x       0.63       x       0.7       =       326.8         South       0.9x       0.77       x       9.9       x       104.89       x       0.63       x       0.7       =       317.37         South       0.9x       0.77       x       9.9       x       101.89       x       0.63       x       0.7       =       326.8         South       0.9x       0.77       x       9.9       x       101.89       x       0.63       x       0.7       =       249.87         South       0.9x       0.77       x       9.9       x       55.42       x       0.63       x       0.7       =       122.23         West       0.9x       0.77       x       0.72       x       19.64       x       0.63       x       0.7       =       122.23         West       0.9x       0.77       x       0.72       x       38.42       x       0.63       x       0.7       =       4.32         West       0.9x       0.77       x       0.72       x       13.92       x       0	(78) (78) (78) (78) (78) (78) (80) (80) (80) (80) (80) (80) (80)
South       0.9x       0.77       x       9.9       x       101.89       x       0.63       x       0.7       =       308.26         South       0.9x       0.77       x       9.9       x       82.59       x       0.63       x       0.7       =       308.26         South       0.9x       0.77       x       9.9       x       82.59       x       0.63       x       0.7       =       249.87         South       0.9x       0.77       x       9.9       x       55.42       x       0.63       x       0.7       =       249.87         South       0.9x       0.77       x       9.9       x       55.42       x       0.63       x       0.7       =       147.67         South       0.9x       0.77       x       0.72       x       19.64       x       0.63       x       0.7       =       4.32         West       0.9x       0.77       x       0.72       x       38.42       x       0.63       x       0.7       =       13.92         West       0.9x       0.77       x       0.72       x       113.09       x       0	(78) (78) (78) (78) (80) (80) (80) (80) (80) (80)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $82.59$ $x$ $0.63$ $x$ $0.7$ $=$ $249.87$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $1467.67$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $147.67$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $142.23$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $24.39$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ </td <td>(78) (78) (78) (80) (80) (80) (80) (80)</td>	(78) (78) (78) (80) (80) (80) (80) (80)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $167.67$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $122.23$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $22.489$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ <	(78) (78) (80) (80) (80) (80) (80) (80)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $122.23$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $8.45$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ <t< td=""><td>(78) (80) (80) (80) (80) (80) (80)</td></t<>	(78) (80) (80) (80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ <t< td=""><td>(80) (80) (80) (80) (80) (80)</td></t<>	(80) (80) (80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $8.45$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ <td>(80) (80) (80) (80) (80)</td>	(80) (80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	(80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $225.47$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$	(80) (80)
West       0.9x       0.77       x       0.72       x       113.09       x       0.63       x       0.7       =       24.89         West       0.9x       0.77       x       0.72       x       115.77       x       0.63       x       0.7       =       24.89         West       0.9x       0.77       x       0.72       x       115.77       x       0.63       x       0.7       =       25.47         West       0.9x       0.77       x       0.72       x       110.22       x       0.63       x       0.7       =       24.25         West       0.9x       0.77       x       0.72       x       110.22       x       0.63       x       0.7       =       24.25         West       0.9x       0.77       x       0.72       x       94.68       x       0.63       x       0.7       =       20.83         West       0.9x       0.77       x       0.72       x       73.59       x       0.63       x       0.7       =       16.19         West       0.9x       0.77       x       0.72       x       24.49       x       0.6	(80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $25.47$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	(80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $z$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $5.39$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $5.39$	(80)
West $0.9x$ $0.77$ x $0.72$ x $45.59$ x $0.63$ x $0.7$ = $10.03$ West $0.9x$ $0.77$ x $0.72$ x $45.59$ x $0.63$ x $0.7$ = $10.03$ West $0.9x$ $0.77$ x $0.72$ x $24.49$ x $0.63$ x $0.7$ = $5.39$	(80)
West $0.9x$ $0.77$ x $0.72$ x $24.49$ x $0.63$ x $0.7$ = $5.39$	(80)
	(80)
West 0.9x 0.77 x 0.72 x 16.15 x 0.63 x 0.7 = 3.55	(80)
	(80)
Rooflights 0.9x         1         x         2.16         x         15.3         x         0.63         x         0.7         =         13.11	(82)
Rooflights 0.9x 1 x 2.16 x 28.48 x 0.63 x 0.7 = 24.41	(82)
Rooflights 0.9x 1 x 2.16 x 50.24 x 0.63 x 0.7 = 43.07	(82)
Rooflights 0.9x 1 x 2.16 x 89.03 x 0.63 x 0.7 = 76.33	(82)
Rooflights 0.9x 1 x 2.16 x 129.88 x 0.63 x 0.7 = 111.35	(82)
Rooflights 0.9x 1 x 2.16 x 143.74 x 0.63 x 0.7 = 123.22	(82)
Rooflights 0.9x 1 x 2.16 x 132.31 x 0.63 x 0.7 = 113.43	(82)
Rooflights 0.9x 1 x 2.16 x 98.56 x 0.63 x 0.7 = 84.5	(82)
Rooflights 0.9x 1 x 2.16 x 62.62 x 0.63 x 0.7 = 53.69	(82)
Rooflights 0.9x 1 × 2.16 × 34.05 × 0.63 × 0.7 = 29.19	(82)
Rooflights 0.9x 1 × 2.16 × 18.64 × 0.63 × 0.7 = 15.98	(82)
Rooflights 0.9x 1 × 2.16 × 12.94 × 0.63 × 0.7 = 11.1	(82)
	4
Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m	
(83)m= 235.48 411.88 600.26 818.49 994.56 1024.14 971.89 833.22 673.79 464.33 283.82 200.49	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 845.65 1019.7 1187.56 1372.05 1512.6 1508.95 1435.74 1303.83 1162.29 986.81 845.4 792.62	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21	(85)
	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21         Utilisation factor for gains for living area, h1,m (see Table 9a)       21	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21         Utilisation factor for gains for living area, h1,m (see Table 9a)         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         (86)m=       1       1       0.99       0.95       0.83       0.67       0.75       0.94       0.99       1       1	
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21         Utilisation factor for gains for living area, h1,m (see Table 9a)       30         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec	

Temp	perature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	19.94	19.95	19.95	19.95	19.96	19.96	19.96	19.96	19.96	19.96	19.95	19.95		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	1	1	0.98	0.92	0.75	0.54	0.61	0.9	0.99	1	1		(89)
Mean	n interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18	18.22	18.59	19.1	19.58	19.88	19.95	19.94	19.73	19.13	18.47	17.97		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.11	(91)
Mean	n interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	A) × T2					-
(92)m=	18.18	18.39	18.74	19.24	19.7	19.99	20.07	20.06	, 19.85	19.26	18.63	18.15		(92)
Apply	adjustr	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.18	18.39	18.74	19.24	19.7	19.99	20.07	20.06	19.85	19.26	18.63	18.15		(93)
8. Spa	ace hea	ting req	uirement											
			ternal ter			ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	Jan	Feb	or gains Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Juli	Jui	Aug	Oep	001		Dec		
(94)m=	1	1	0.99	0.97	0.91	0.75	0.55	0.63	0.89	0.99	1	1		(94)
Usefu	ul gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	844.92	1017.37	1179.43	1337.43	1378.11	1135.94	791.75	817.52	1034.49	973.34	843.72	792.13		(95)
Month	hly aver	age exte	ernal tem	perature	e 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)
	<b></b>		an intern	· · ·									1	
(97)m=			2918.51					855.74			2731.26	3313.15		(97)
-			ement fo				i				· · · · · · · · · · · · · · · · · · ·	4075.04		
(98)m=	1840.88	1480.28	1293.87	797.05	380.12	0	0	0	0	797.44		1875.64	9824.3	(98)
					.,			Tota	l per year	(KVVII/year	) = Sum(9	0)15,912 =		4
			ement in		•								48.09	(99)
			nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatir	-	at from s	econdari	v/sunnla	montary	svetom						0	(201)
	•		at from m			mentary	-	(202) = 1 -	- (201) -					(202)
				-	. ,				(201) – 02) × [1 – (	(202)1 -		·	1	4
			ng from	-				(204) = (2	02) × [1 – 1	(203)] =			1	(204)
	-	-	ace heat									-	93.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	ı, %				-		0	(208)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space		· ·	ement (c		,			-						
	1840.88	1480.28	1293.87	797.05	380.12	0	0	0	0	797.44	1359.03	1875.64	I	
(211)m		· · · ·	04)]	· · · ·	· ·		i	i			1		1	(211)
	1968.85	1583.19	1383.82	852.45	406.54	0	0	0	0	852.87	1453.5	2006.03		٦
								lota	l (kWh/yea	ar) =Sum(2	211) <sub>15,10</sub> 12	=	10507.27	(211)
•		•	econdar		month									
= {[(98 (215)m=		01)]}X1	00 ÷ (20 0	8)	0	0	0	0	0	0	0	0		
(210)III=		0		Ū	Ū	Ū	U U		l (kWh/yea	-	-		0	(215)
										,	7/15,1012		0	(210)

#### Water heating

Output from water heater (calculated a			. <u> </u>	. <u> </u>					1						
221.55 195.18 204.75 183.23	179.33	159.91	153.27	168.61	168.45	190.02	201.32	216.11		_					
Efficiency of water heater								-	79.8	(216)					
(217)m= 89.21 89.11 88.87 88.29	86.77	79.8	79.8	79.8	79.8	88.22	88.96	89.26		(217)					
Fuel for water heating, kWh/month															
(219)m = (64)m x 100 ÷ (217)m															
(219)m= 248.33 219.04 230.39 207.54	206.67	200.39	192.06	211.29	211.09	215.38	226.3	242.11							
				Tota	al = Sum(2)	19a) <sub>112</sub> =			2610.59	(219)					
Annual totals						k	Wh/yea	r	kWh/year	-					
Space heating fuel used, main system	1								10507.27						
Water heating fuel used									2610.59						
Electricity for pumps, fans and electric															
central heating pump:	ral heating pump:														
boiler with a fan-assisted flue								45		(230e)					
Total electricity for the above, kWh/ye	ar			sum	of (230a).	(230g) =			75	(231)					
Electricity for lighting									600.52	(232)					
Total delivered energy for all uses (21	1) (221)	+ (231)	+ (232)	(237h)	_				13793.39	] (338)					
·	, , ,	. ,	, ,	, ,					107 00.00						
12a. CO2 emissions – Individual hea	ling syste	Ins incl	uaing mi												
		En	ergy			Emiss	ion fac	tor	Emissions						
		k٧	/h/year			kg CO	2/kWh		kg CO2/yea	ar					
Space heating (main system 1)		(21	1) x			0.2	16	=	2269.57	(261)					
Space heating (secondary)		(21	5) x			0.5	19	=	0	(263)					
Water heating		(21	9) x			0.2	16	=	563.89	(264)					
Space and water heating		(26	1) + (262)	+ (263) + (	(264) =				2833.46	(265)					
Electricity for pumps, fans and electric	keep-hot	(23	1) x			0.5	19	=	38.93	(267)					
Electricity for lighting		(23	2) x			0.5	19	=	311.67	(268)					
Total CO2, kg/year					sum o	of (265)(2	271) =		3184.05	(272)					
									L	4					

TER =

15.59 (273)

				User D	etails:						
Assessor Name: Software Name:	Matt Fitzpa Stroma FS				Strom Softwa	are Ver				003572 n: 1.0.5.41	
				roperty	Address	: Plot 2					
Address :	Plot 2, Wido	lington, T	BC								
1. Overall dwelling dime	ensions:			_							
					a(m²)		Av. Hei	• • •		Volume(m <sup>3</sup> )	
Ground floor				1	19.31	(1a) x	2	5	(2a) =	298.27	(3a)
First floor				8	34.97	(1b) x	2.	.56	(2b) =	217.61	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)	+(1n	) 2	04.28	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	515.88	(5)
2. Ventilation rate:											
	main heating		condar eating	у	other		total			m <sup>3</sup> per hour	
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					- F	4	x 1	0 =	40	(7a)
Number of passive vents						Γ	0	x 1	0 =	0	(7b)
Number of flueless gas fi	res					Γ	0	x 4	40 =	0	(7c)
											-
									Air ch	anges per hou	ur 
Infiltration due to chimne						Ļ	40		÷ (5) =	0.08	(8)
If a pressurisation test has b			d, proceed	d to (17),	otherwise o	continue fr	om (9) to (	16)	I	-	٦
Number of storeys in the Additional infiltration	ie uweining (in	>)						[(0)]	1]x0.1 =	0	(9) (10)
Structural infiltration: 0	25 for steel o	r timber fr	ame or	0 35 fo	r masoni	v constr	uction	[(3)-	1,0.1 -	0	(10)
if both types of wall are pl						•	uction		l	0	
deducting areas of openin	0 // 1		(d) or 0	1 (222)	ad) alaa	ontor O			1		
If suspended wooden f If no draught lobby, en			a) or 0.	r (seale	eu), eise	enter U				0	(12)
Percentage of windows			innod							0	(13)
Window infiltration	s anu uoors ui	augin sui	ippeu		0.25 - [0.2	× (14) ∸ 1	001 =		l	0	(14) (15)
Infiltration rate					(8) + (10)			+ (15) =	l	0	(15)
Air permeability value,	a50 expresse	ed in cubi	c metre	s ner ho					area	5	(17)
If based on air permeabil						•		molopo	ulou	0.33	(17)
Air permeability value applie							is being us	sed	l	0.00	
Number of sides sheltere	ed								[	2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporat	ting shelter fac	tor			(21) = (18	) x (20) =			l	0.28	(21)
Infiltration rate modified f	or monthly wir	nd speed									
Jan Feb	Mar Apr	May	Jun	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 F	actor (2	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.35	0.35	0.34	0.31	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.33		
			-	rate for t	he appli	cable ca	se			•		•	• 	
	echanica			andix NL (0	12h) (00a	) <b>E</b> my (a	austion (N		nuice (22h	·) (22e)				0 (23a)
			• • •	endix N, (2	, ,	, ,				)) = (23a)				0 (23b)
			-	iency in %	•						00L) F	4 (00 )		0 (23c)
	i		<b></b>	1	1	i		<u> </u>	ŕ	1 <sup>·</sup>	r <u>, -</u>	1 – (23c)	i ÷ 100] I	(240)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
			<b></b>	<b></b>	1	i	r	r Ó	ŕ	2b)m + (2	, 		1	(0.4h)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,				ntilation o		•				E (00h				
	<u> </u>	0			(230) = (230)			C = (22L)		.5 × (23b	0	0	1	(24c)
(24c)m=					-		-		_	0	0	0		(240)
,				ole hous $m = (22)$						0.51				
(24d)m=	r í í	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d)
		change	rate - er	nter (24a	) or (24t	) or (24	c) or (24	d) in boy	r (25)				1	
(25)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
0.11					I		I	1	1	I	I	1	1	
I X He	at losses	s and ne			ar									
				paramete										
ELEN		Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-ł		A X k kJ/K
	IENT	Gros	SS	Openin	gs						K)			
ELEN	<b>IENT</b> Type 1	Gros	SS	Openin	gs	A ,n	m²	W/m2	2K	(W/I	K)			kJ/K
ELEN Doors Doors	<b>IENT</b> Type 1	Gros area	SS	Openin	gs	A ,r	m <sup>2</sup> x	W/m2	2K	(W/I 2.652	K)			kJ/K (26)
ELEN Doors Doors Window	<b>IENT</b> Type 1 Type 2	Gros area	SS	Openin	gs	A ,r 2.21 1.89	m <sup>2</sup> x x 2 x <sup>1,</sup>	W/m2 1.2 1.2	2K = = 0.04] =	(W/I 2.652 2.268	K)			kJ/K (26) (26)
ELEN Doors Doors Window Window	<b>IENT</b> Type 1 Type 2 ws Type	Gros area	SS	Openin	gs	A ,r 2.21 1.89 16.92	n <sup>2</sup> x x x 2 x <sup>1</sup> / x <sup>1</sup> /	W/m2 1.2 1.2 /[1/(1.4)+	2K = = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43	<pre>k)</pre>			kJ/K (26) (26) (27)
ELEN Doors Doors Window Window	Type 1 Type 2 ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6	n <sup>2</sup> x x x x x x x x 1/2	W/m2 1.2 1.2 /[1/(1.4)+ /[1/(1.4)+	2K = = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77	<>			kJ/K (26) (26) (27) (27)
ELEN Doors Doors Window Window Window	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72 9.9	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K = = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12	<pre>k)</pre>			kJ/K (26) (27) (27) (27) (27)
ELEN Doors Doors Window Window	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K = = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77 0.95				kJ/K (26) (26) (27) (27) (27)
ELEN Doors Doors Window Window Window Rooflig	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3	ss (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7) +	2K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672				kJ/K (26) (27) (27) (27) (27) (27) (27b)
ELEN Doors Doors Window Window Window Rooflig Floor	Type 1 Type 2 ws Type ws Type ws Type ws Type hts	Gros area 1 2 3 4 170.	ss (m <sup>2</sup> ) 21	Openin rr	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 )+ 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29)
ELEN Doors Doors Window Window Window Rooflig Floor Walls	Type 1 Type 2 ws Type ws Type ws Type ws Type hts Type1 Type2	Gros area 1 2 3 4 170. 82.8	21 25	Openin m 35.2-	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ 0.13 0.18 0.18	K       =         0.04]       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91				kJ/K (26) (27) (27) (27) (27) (27) (27b) (28) (29) (29)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof 1	Type 1 Type 2 ws Type ws Type ws Type ws Type hts Type1 Type2 Type1	Gros area 1 2 3 4 170. 82.8 58.7	21 21 21 21	Openin m 35.24	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7) + 0.13 0.18 0.18 0.13	K       =         0.04]       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.510 24.29 14.91 7.64				kJ/K (26) (27) (27) (27) (27) (27b) (27b) (28) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type thts Type1 Type2 Type2	Gros area 1 2 3 4 170. 82.8 58.7 18.6	21 21 23 24	Openin m 35.2 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13	K       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5100 24.29 14.91 7.64 2.42				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Walls Roof Roof Roof	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type fype1 Type2 Type2 Type3	Gros area 1 2 3 4 1 7 0. 82.8 58.7 18.6 16.3	21 21 35 74 35	Openin m 35.2 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         1       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91 7.64 2.42 2.13				kJ/K (26) (27) (27) (27) (27) (27b) (27b) (28) (29) (29) (29) (30) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type hts Type1 Type2 Type3 Type3 Type4	Gros area 1 2 3 4 170. 82.8 58.7 18.6 16.3 37.	SS (m <sup>2</sup> ) 21 35 74 35 1	Openin m 35.2 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13	K       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5100 24.29 14.91 7.64 2.42				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (30) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Total a	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type hts Type1 Type2 Type3 Type3 Type4 rea of e	Gros area 1 2 3 4 170. 82.8 58.7 18.6 16.3 37.	SS (m <sup>2</sup> ) 21 35 74 35 1	Openin m 35.2 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         1       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91 7.64 2.42 2.13				kJ/K (26) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29) (29) (29) (30) (30) (30) (30) (31)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof Total a Interna	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type hts Type1 Type2 Type3 Type3 Type4	Gros area 4 2 3 4 4 170. 82.6 58.7 18.6 16.3 37. Iements	SS (m <sup>2</sup> ) 21 35 74 35 1	Openin m 35.2 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         1       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91 7.64 2.42 2.13				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (30) (30) (30)

Interna	al floor					84.97	7				Г				(32d)
Interna	al ceiling					84.97	7				Ī		<b>-</b> -		(32e)
					ndow U-va Is and part		lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2		_
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	) + (32) =				121.0	9	(33)
Heat c	apacity	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	26228.	76	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250		(35)
	0		ere the de tailed calci		constructi	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f			
Therm	al bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	K						22.25	5	(36)
			are not kn	own (36) =	= 0.05 x (3	1)									-
	abric he									(36) =	(		143.3	4	(37)
Ventila			alculated							1	25)m x (5)	i	l		
(20)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	-		(20)
(38)m=	95.85	95.43	95.02	93.1	92.75	91.08	91.08	90.77	91.72	92.75	93.47	94.23			(38)
		coefficier							· · ·	= (37) + (3	, 1		I		
(39)m=	239.19	238.77	238.36	236.44	236.08	234.41	234.41	234.1	235.06	236.08	236.81	237.57			
Heat lo	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39)₁. · (4)	12 /12=	236.4	4	(39)
(40)m=	1.17	1.17	1.17	1.16	1.16	1.15	1.15	1.15	1.15	1.16	1.16	1.16			
									I,	Average =	Sum(40)1.	<sub>12</sub> /12=	1.16		(40)
Numbe	er of day	rs 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	gy requi	irement:								kWh/y	ear:		
Assum	ed occu	ipancy, I	N								3	01			(42)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13.		01			( /
	A £ 13.9		tor upor	no in litro	o por de	w Vd ov	orogo –	(25 v NI)	1.26				l		(42)
								(25 x N) to achieve		se target o		5.63			(43)
not more	e that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)								
	Jan	Feb	Mar	Apr	Мау	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 T	Table 1c x	(43)					_		
(44)m=	116.19	111.97	107.74	103.52	99.29	95.07	95.07	99.29	103.52	107.74	111.97	116.19			_
Enorm	contant of	hot wator	upped col	ouloted m	onthly _ 1	100 v Vd r	т v рт v Г	)Tm / 2600			m(44) <sub>112</sub> = ables 1b, 1		1267.5	53	(44)
								. <u> </u>	i				1		
(45)m=	172.31	150.7	155.51	135.58	130.09	112.26	104.02	119.37	120.79	140.77	153.67	166.87			
lf instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		l otal = Su	m(45) <sub>112</sub> =	-	1661.9	94	(45)
(46)m=	25.85	22.61	23.33	20.34	19.51	16.84	15.6	17.91	18.12	21.12	23.05	25.03			(46)
	storage		includin	0 201/ 0	alar or M	////HDC	etorado	within sa	mayaa	مما		450	I		(47)
-		. ,					) litres in			301		150			(47)
	•	•			•			ombi boil	ers) ente	er '0' in (	(47)				

Water storage loss:

a) If m	nanufact	urer's d	eclared l	oss fact	or is kno	wn (kWł	n/day):				1.	55	(4)	B)
Tempe	erature f	actor fro	m Table	2b							0.	54	(4	9)
			r storage	-				(48) x (49	) =		0.	84	(5)	D)
Hot wa	ater stor	age loss	eclared of factor fi see secti	rom Tab								0	(5	1)
		from Ta										0	(5)	1
			m Table									0	(5:	3)
•••			r storage	e, kWh/y	ear			(47) x (51	) x (52) x (	53) =		0	(54	
	. ,	(54) in (క		faraab	ma a sa th			((50)			0.	84	(5	) )
			culated		,		. <u> </u>	··· ·	(55) × (41)					
(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(5)	3)
-		s dedicate	d solar sto	orage, (57)	i	x [(50) – (	1	· · ·	7)m = (56)		H11) IS Tro	m Append	l	
(57)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(5	7)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0	(58	B)
	•		lculated rom Tab				. ,	• •		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	9)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(6)	1)
Total h	heat requ	uired 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=	221.55	195.18	204.75	183.23	179.33	159.91	153.27	168.61	168.45	190.02	201.32	216.11	(62	2)
Solar DI	HW input	L calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contributi	ion to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63	3)
Output	t from w	ater hea	iter	•						•	•			
(64)m=	221.55	195.18	204.75	183.23	179.33	159.91	153.27	168.61	168.45	190.02	201.32	216.11		
			<u>.</u>	!				Out	out from w	ater heate	r (annual)₁	12	2241.73 (64	4)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)n	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	96.69	85.69	91.1	83.2	82.65	75.45	73.98	79.08	78.29	86.2	89.22	94.88	(6	5)
inclu	ude (57)	m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a	):									
Metab	olic gair	is (Table	e 5), Wat	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	(6)	6)
Lightin	g gains	(calcula	ted in A	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	34	30.2	24.56	18.59	13.9	11.73	12.68	16.48	22.12	28.09	32.78	34.95	(6	7)
Applia	nces ga	ins (calc	ulated ir	n Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	375.1	378.99	369.18	348.3	321.94	297.17	280.62	276.72	286.53	307.41	333.77	358.54	(6)	B)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	tion L15	or L15a	), also se	ee Table	5			I	
(69)m=	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	(69	9)
Pumps	s and fai	ns gains	(Table :	5a)	•		•	•	•				I	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70	D)

Losse	s e.g. e	vaporatio	n (nega	ive valu	es) (Ta	able	5)										
(71)m=	-120.3	-120.3	-120.3	-120.3	-120.3	-   -	120.3	-120.3	-12	0.3 -120.3	3 -1	120.3	-120.3	-120.3	3		(71)
Water	heating	gains (T	able 5)			•	•										
(72)m=	129.95	127.51	122.45	115.56	111.09	) 1	04.79	99.44	106	6.3 108.73	3 1 <sup>.</sup>	15.86	123.91	127.5	2		(72)
Total	interna	l gains =					(66) m	n + (67)m	1 + (68	3)m + (69)m -	+ (70)	m + (	(71)m + (72)	m			
(73)m=	610.17	607.82	587.3	553.56	518.04	4 4	184.8	463.85	470	.61 488.5	5 52	22.48	561.58	592.1	3		(73)
6. So	lar gain	IS:							-								
Solar (	gains are	calculated u	using sola	r flux from	Table 6a	a and	l associa	ted equa	tions	to convert to	the a	pplica	able orientati	on.			
Orient		Access F Table 6d	actor	Area m²			Flux	e 6a		g_ Table 6l	h	-	FF Table 6c			Gains	
								eoa	,			r			г	(VV)	-
North	0.9x	0.77	X	16.	92	x	10	.63	X	0.63		×	0.7	=	- [	54.98	(74)
North	0.9x	0.77	X	16.	92	x	20	.32	X	0.63		×	0.7	=	۶Ļ	105.08	(74)
North	0.9x	0.77	X	16.	92	x	34	.53	×	0.63		×	0.7	*	- [	178.56	(74)
North	0.9x	0.77	X	16.		x	55	.46	X	0.63		×	0.7	*	= [	286.81	(74)
North	0.9x	0.77	X	16.	92	x	74	.72	X	0.63		×	0.7	*	۶Ļ	386.35	(74)
North	0.9x	0.77	X	16.	92	x	79	.99	x	0.63		×	0.7	•	۶ļ	413.6	(74)
North	0.9x	0.77	x	16.	92	x	74	.68	×	0.63		×	0.7	:	۶ļ	386.15	(74)
North	0.9x	0.77	x	16.	92	x	59	.25	×	0.63		×	0.7		= [	306.36	(74)
North	0.9x	0.77	x	16.	92	x	41	.52	x	0.63		×	0.7		-	214.68	(74)
North	0.9x	0.77	X	16.	92	x	24	.19	×	0.63		x	0.7	-	=	125.08	(74)
North	0.9x	0.77	x	16.	92	x	13	.12	x	0.63		×	0.7		= [	67.83	(74)
North	0.9x	0.77	x	16.	92	x	8.	86	X	0.63		×	0.7		= [	45.84	(74)
East	0.9x	0.77	х	3.	6	x	19	.64	x	0.63		x	0.7	-	= [	21.61	(76)
East	0.9x	0.77	x	3.	6	x	38	.42	×	0.63		×	0.7	-	- [	42.27	(76)
East	0.9x	0.77	x	3.	6	x	63	.27	x	0.63		<b>x</b> [	0.7	-	- [	69.61	(76)
East	0.9x	0.77	x	3.	6	x	92	.28	x	0.63		<b>x</b> [	0.7	-	- [	101.53	(76)
East	0.9x	0.77	x	3.	6	x	113	3.09	x	0.63		×	0.7	-	= [	124.43	(76)
East	0.9x	0.77	x	3.	6	x	115	5.77	×	0.63		<b>x</b>	0.7	=	- [	127.37	(76)
East	0.9x	0.77	x	3.	6	x	110	).22	x	0.63		<b>x</b> [	0.7	=	= [	121.26	(76)
East	0.9x	0.77	x	3.	6	x	94	.68	x	0.63		×	0.7		- [	104.16	(76)
East	0.9x	0.77	x	3.	6	x	73	.59	×	0.63		×	0.7	-	- [	80.96	(76)
East	0.9x	0.77	x	3.	6	x	45	.59	x	0.63		×	0.7	-	- [	50.16	(76)
East	0.9x	0.77	x	3.	6	x	24	.49	x	0.63		× [	0.7	-	- [	26.94	(76)
East	0.9x	0.77	x	3.	6	x	16	.15	x	0.63		× [	0.7	-	- [	17.77	(76)
South	0.9x	0.77	x	9.	9	x	46	.75	x	0.63		× [	0.7	-	- [	141.45	(78)
South	0.9x	0.77	x	9.	9	x	76	.57	×	0.63		× [	0.7	-	= [	231.66	(78)
South	0.9x	0.77	x	9.	9	x	97	.53	×	0.63		× [	0.7		- [	295.1	(78)
South	0.9x	0.77	x	9.	9	x	110	).23	×	0.63		× [	0.7	-	- [	333.52	(78)
South	0.9x	0.77	x	9.	9	x	114	4.87	×	0.63		× [	0.7	-	- [	347.55	(78)
South	0.9x	0.77	x	9.	9	x	110	0.55	×	0.63		x	0.7		= [	334.47	(78)

South       0.9x       0.77       x       9.9       x       108.01       x       0.63       x       0.7       =       326.8         South       0.9x       0.77       x       9.9       x       104.89       x       0.63       x       0.7       =       317.37         South       0.9x       0.77       x       9.9       x       101.89       x       0.63       x       0.7       =       326.8         South       0.9x       0.77       x       9.9       x       101.89       x       0.63       x       0.7       =       249.87         South       0.9x       0.77       x       9.9       x       55.42       x       0.63       x       0.7       =       122.23         West       0.9x       0.77       x       0.72       x       19.64       x       0.63       x       0.7       =       122.23         West       0.9x       0.77       x       0.72       x       38.42       x       0.63       x       0.7       =       4.32         West       0.9x       0.77       x       0.72       x       13.92       x       0	(78) (78) (78) (78) (78) (78) (80) (80) (80) (80) (80) (80) (80)
South       0.9x       0.77       x       9.9       x       101.89       x       0.63       x       0.7       =       308.26         South       0.9x       0.77       x       9.9       x       82.59       x       0.63       x       0.7       =       308.26         South       0.9x       0.77       x       9.9       x       82.59       x       0.63       x       0.7       =       249.87         South       0.9x       0.77       x       9.9       x       55.42       x       0.63       x       0.7       =       249.87         South       0.9x       0.77       x       9.9       x       55.42       x       0.63       x       0.7       =       147.67         South       0.9x       0.77       x       0.72       x       19.64       x       0.63       x       0.7       =       4.32         West       0.9x       0.77       x       0.72       x       38.42       x       0.63       x       0.7       =       13.92         West       0.9x       0.77       x       0.72       x       113.09       x       0	(78) (78) (78) (78) (80) (80) (80) (80) (80) (80)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $82.59$ $x$ $0.63$ $x$ $0.7$ $=$ $249.87$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $1467.67$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $147.67$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $142.23$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $24.39$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ </td <td>(78) (78) (78) (80) (80) (80) (80) (80)</td>	(78) (78) (78) (80) (80) (80) (80) (80)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $167.67$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $122.23$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $22.489$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ <	(78) (78) (80) (80) (80) (80) (80) (80)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $122.23$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $8.45$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $22.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ <t< td=""><td>(78) (80) (80) (80) (80) (80) (80)</td></t<>	(78) (80) (80) (80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ <t< td=""><td>(80) (80) (80) (80) (80) (80)</td></t<>	(80) (80) (80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $8.45$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ <td>(80) (80) (80) (80) (80)</td>	(80) (80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	(80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $25.47$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$	(80) (80)
West       0.9x       0.77       x       0.72       x       113.09       x       0.63       x       0.7       =       24.89         West       0.9x       0.77       x       0.72       x       115.77       x       0.63       x       0.7       =       24.89         West       0.9x       0.77       x       0.72       x       115.77       x       0.63       x       0.7       =       25.47         West       0.9x       0.77       x       0.72       x       110.22       x       0.63       x       0.7       =       24.25         West       0.9x       0.77       x       0.72       x       110.22       x       0.63       x       0.7       =       24.25         West       0.9x       0.77       x       0.72       x       94.68       x       0.63       x       0.7       =       20.83         West       0.9x       0.77       x       0.72       x       73.59       x       0.63       x       0.7       =       16.19         West       0.9x       0.77       x       0.72       x       24.49       x       0.6	(80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $25.47$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	(80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $z$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $5.39$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $5.39$	(80)
West $0.9x$ $0.77$ x $0.72$ x $45.59$ x $0.63$ x $0.7$ = $10.03$ West $0.9x$ $0.77$ x $0.72$ x $45.59$ x $0.63$ x $0.7$ = $10.03$ West $0.9x$ $0.77$ x $0.72$ x $24.49$ x $0.63$ x $0.7$ = $5.39$	(80)
West $0.9x$ $0.77$ x $0.72$ x $24.49$ x $0.63$ x $0.7$ = $5.39$	(80)
	(80)
West 0.9x 0.77 x 0.72 x 16.15 x 0.63 x 0.7 = 3.55	(80)
	(80)
Rooflights 0.9x         1         x         2.16         x         15.3         x         0.63         x         0.7         =         13.11	(82)
Rooflights 0.9x 1 x 2.16 x 28.48 x 0.63 x 0.7 = 24.41	(82)
Rooflights 0.9x 1 x 2.16 x 50.24 x 0.63 x 0.7 = 43.07	(82)
Rooflights 0.9x 1 x 2.16 x 89.03 x 0.63 x 0.7 = 76.33	(82)
Rooflights 0.9x 1 x 2.16 x 129.88 x 0.63 x 0.7 = 111.35	(82)
Rooflights 0.9x 1 x 2.16 x 143.74 x 0.63 x 0.7 = 123.22	(82)
Rooflights 0.9x 1 x 2.16 x 132.31 x 0.63 x 0.7 = 113.43	(82)
Rooflights 0.9x 1 x 2.16 x 98.56 x 0.63 x 0.7 = 84.5	(82)
Rooflights 0.9x 1 x 2.16 x 62.62 x 0.63 x 0.7 = 53.69	(82)
Rooflights 0.9x 1 × 2.16 × 34.05 × 0.63 × 0.7 = 29.19	(82)
Rooflights 0.9x 1 × 2.16 × 18.64 × 0.63 × 0.7 = 15.98	(82)
Rooflights 0.9x 1 × 2.16 × 12.94 × 0.63 × 0.7 = 11.1	(82)
	4
Solar gains in watts, calculated for each month $(83)m = Sum(74)m(82)m$	
(83)m= 235.48 411.88 600.26 818.49 994.56 1024.14 971.89 833.22 673.79 464.33 283.82 200.49	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 845.65 1019.7 1187.56 1372.05 1512.6 1508.95 1435.74 1303.83 1162.29 986.81 845.4 792.62	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21	(85)
	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21         Utilisation factor for gains for living area, h1,m (see Table 9a)       21	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21         Utilisation factor for gains for living area, h1,m (see Table 9a)         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         (86)m=       1       1       0.99       0.95       0.83       0.67       0.75       0.94       0.99       1       1	
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21         Utilisation factor for gains for living area, h1,m (see Table 9a)       30         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec	

Temp	perature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	19.94	19.95	19.95	19.95	19.96	19.96	19.96	19.96	19.96	19.96	19.95	19.95		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	1	1	0.98	0.92	0.75	0.54	0.61	0.9	0.99	1	1		(89)
Mean	n interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18	18.22	18.59	19.1	19.58	19.88	19.95	19.94	19.73	19.13	18.47	17.97		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.11	(91)
Mean	n interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	A) × T2					-
(92)m=	18.18	18.39	18.74	19.24	19.7	19.99	20.07	20.06	, 19.85	19.26	18.63	18.15		(92)
Apply	adjustr	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.18	18.39	18.74	19.24	19.7	19.99	20.07	20.06	19.85	19.26	18.63	18.15		(93)
8. Spa	ace hea	ting req	uirement											
			ternal ter			ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	Jan	Feb	or gains Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Juli	Jui	Aug	Oep	001		Dec		
(94)m=	1	1	0.99	0.97	0.91	0.75	0.55	0.63	0.89	0.99	1	1		(94)
Usefu	ul gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	844.92	1017.37	1179.43	1337.43	1378.11	1135.94	791.75	817.52	1034.49	973.34	843.72	792.13		(95)
Month	hly aver	age exte	ernal tem	perature	e 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)
	<b></b>		an intern	· · ·									1	
(97)m=			2918.51					855.74			2731.26	3313.15		(97)
-			ement fo				i				· · · · · · · · · · · · · · · · · · ·	4075.04		
(98)m=	1840.88	1480.28	1293.87	797.05	380.12	0	0	0	0	797.44		1875.64	9824.3	(98)
					.,			Tota	l per year	(Kvvn/year	) = Sum(9	0)15,912 =		4
			ement in		•								48.09	(99)
			nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatir	-	at from s	econdari	v/sunnla	montary	svetom						0	(201)
	•		at from m			mentary	-	(202) = 1 -	- (201) -					(202)
				-	. ,				(201) – 02) × [1 – (	(202)1 -		·	1	4
			ng from	-				(204) = (2	02) × [1 – 1	(203)] =			1	(204)
	-	-	ace heat									-	93.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	ı, %				-		0	(208)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space		· ·	ement (c		,			-						
	1840.88	1480.28	1293.87	797.05	380.12	0	0	0	0	797.44	1359.03	1875.64	I	
(211)m		· · · ·	04)]	· · · ·	· ·		i	i			1		1	(211)
	1968.85	1583.19	1383.82	852.45	406.54	0	0	0	0	852.87	1453.5	2006.03		٦
								lota	l (kWh/yea	ar) =Sum(2	211) <sub>15,10</sub> 12	=	10507.27	(211)
•		•	econdar		month									
= {[(98 (215)m=		01)]}X1	00 ÷ (20 0	8)	0	0	0	0	0	0	0	0		
(210)III=		0		Ū	Ū	Ū	U U		l (kWh/yea	-	-		0	(215)
										,	7/15,1012		0	(210)

#### Water heating

Output from water heater (calculated above)													
			. <u> </u>	. <u> </u>					1				
221.55 195.18 204.75 183.23	179.33	159.91	153.27	168.61	168.45	190.02	201.32	216.11		_			
Efficiency of water heater								-	79.8	(216)			
(217)m= 89.21 89.11 88.87 88.29	86.77	79.8	79.8	79.8	79.8	88.22	88.96	89.26		(217)			
Fuel for water heating, kWh/month													
(219)m = (64)m x 100 ÷ (217)m													
(219)m= 248.33 219.04 230.39 207.54	206.67	200.39	192.06	211.29	211.09	215.38	226.3	242.11					
				Tota	al = Sum(2)	19a) <sub>112</sub> =			2610.59	(219)			
Annual totals						k	Wh/yea	r	kWh/year	-			
Space heating fuel used, main system	1								10507.27				
Water heating fuel used									2610.59				
Electricity for pumps, fans and electric													
central heating pump:								30	]	(230c)			
boiler with a fan-assisted flue		(230e)											
Total electricity for the above, kWh/ye	75	(231)											
Electricity for lighting									600.52	(232)			
Total delivered energy for all uses (21	1) (221)	+ (231)	+ (232)	(237h)	_				13793.39	] (338)			
·	, , ,	. ,	, ,	, ,					107 00.00				
12a. CO2 emissions – Individual hea	ling syste	Ins incl	uaing mi										
		En	ergy			Emiss	ion fac	tor	Emissions				
		k٧	/h/year			kg CO	2/kWh		kg CO2/yea	ar			
Space heating (main system 1)		(21	1) x			0.2	16	=	2269.57	(261)			
Space heating (secondary)		(21	5) x			0.5	19	=	0	(263)			
Water heating		(21	9) x			0.2	16	=	563.89	(264)			
Space and water heating		2833.46	(265)										
Electricity for pumps, fans and electric	19	=	38.93	(267)									
Electricity for lighting		(23	2) x			0.5	19	=	311.67	(268)			
Total CO2, kg/year					sum o	of (265)(2	271) =		3184.05	(272)			
									L	4			

TER =

15.59 (273)

					User [	Details:						
Assessor Name: Software Name:		tt Fitzpa oma FS				Strom Softwa	are Vei				003572 n: 1.0.5.41	
					roperty	Address	: Plot 3					
Address :		t 3, Widc	lington,	ТВС								
1. Overall dwelling dir	nension	s:			_							
0 1 1						a(m²)	I	Av. Hei	ight(m)	1	Volume(m <sup>3</sup> )	-
Ground floor					1	19.31	(1a) x	2	2.5	(2a) =	298.27	(3a)
First floor						84.97	(1b) x	2	.56	(2b) =	217.61	(3b)
Total floor area TFA =	(1a)+(1t	o)+(1c)+(	(1d)+(1e	e)+(1r	n) 2	204.28	(4)					
Dwelling volume							(3a)+(3b	)+(3c)+(3d	)+(3e)+	.(3n) =	515.88	(5)
2. Ventilation rate:												
		main heating		econdar leating	у	other		total			m <sup>3</sup> per hour	
Number of chimneys	Ĺ	0	] + [	0	] + [	0	=	0	x 4	40 =	0	(6a)
Number of open flues	Ē	0	<u> </u> + [	0	<u> </u> + [	0	_ _ = _	0	x 2	20 =	0	(6b)
Number of intermittent	fans						Ē	4	<b>x</b> 1	10 =	40	(7a)
Number of passive ver	its						Γ	0	x 1	10 =	0	(7b)
Number of flueless gas	0	(7c)										
							L					
										Air ch	anges per ho	ur
Infiltration due to chimr								40		÷ (5) =	0.08	(8)
If a pressurisation test ha				ed, procee	d to (17),	otherwise	continue fr	om (9) to (	16)	1		
Number of storeys in Additional infiltration		ening (ne	»)						[(0)	-1]x0.1 =	0	(9) (10)
Structural infiltration:	0 25 fo	r steel or	timber t	frame or	0 35 fc	r mason	w constr	ruction	[(9)-	-1]x0.1 =	0	(10)
if both types of wall are							•	uction			0	
deducting areas of ope	0 //	,		od) or 0	1 (000)	od) oloo	optor 0					
If suspended woode					i (sear	eu), eise	enter U				0	(12)
Percentage of windo				rinned							0	(13)
Window infiltration	ws and		augin si	nppeu		0.25 - [0.2	2 x (14) ÷ 1	001 =		·	0	(14) (15)
Infiltration rate						(8) + (10)			+ (15) =		0	(13)
Air permeability valu	e a50 e	expresse	ed in cub	oic metre	s ner h					area	5	(17)
If based on air permea		•			•	•	•		molopo	aiou	0.33	(18)
Air permeability value app		,						is being us	sed		0.00	
Number of sides shelte							-	-			2	(19)
Shelter factor						(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpor	ating sh	nelter fac	tor			(21) = (18	) x (20) =				0.28	(21)
Infiltration rate modified	d for mo	nthly wir	nd speed	ł								
Jan Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average 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		

Wind F	actor (2	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.35	0.35	0.34	0.31	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.33		
			-	rate for t	he appli	cable ca	se			•		•	• 	
	echanica			andix NL (0	12h) (00a	) <b>F</b> rov <i>i</i> (a	austion (N		nuice (22h	·) (22a)				0 (23a)
			• • • •	endix N, (2	, ,	, ,				)) = (23a)				0 (23b)
			-	iency in %	•						00L) F	4 (00 )		0 (23c)
	i		<b></b>	1	i	i	<u> </u>	<u> </u>	ŕ	r í	r <u>, -</u>	1 – (23c)	i ÷ 100] I	(240)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
			<b></b>	<b></b>	1	1	r	r Ó	ŕ	2b)m + (2	, 		1	(0.4h)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,				ntilation o		•				E (00h				
	<u> </u>	0			(230) = (230)			C = (22L)		.5 × (23b	0	0	1	(24c)
(24c)m=					-		-		_	0	0	0		(240)
,				ole hous $m = (22)$						0.51				
(24d)m=	r í í	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d)
		change	rate - er	nter (24a	) or (24t	) or (24	c) or (24	d) in boy	r (25)				1	
(25)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
0.11					I		I	1	1	I	I	1	1	
I X He	at losses	s and ne			ar									
				paramete										
ELEN		Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-ł		A X k kJ/K
	IENT	Gros	SS	Openin	gs						K)			
ELEN	<b>IENT</b> Type 1	Gros	SS	Openin	gs	A ,n	m²	W/m2	2K	(W/I	K)			kJ/K
ELEN Doors Doors	<b>IENT</b> Type 1	Gros area	SS	Openin	gs	A ,r	m <sup>2</sup> x	W/m2	2K	(W/I 2.652	K)			kJ/K (26)
ELEN Doors Doors Window	<b>IENT</b> Type 1 Type 2	Gros area	SS	Openin	gs	A ,r 2.21 1.89	m <sup>2</sup> x x 2 x <sup>1,</sup>	W/m2 1.2 1.2	2K = = 0.04] =	(W/I 2.652 2.268	K)			kJ/K (26) (26)
ELEN Doors Doors Window Window	<b>IENT</b> Type 1 Type 2 ws Type	Gros area	SS	Openin	gs	A ,r 2.21 1.89 16.92	n <sup>2</sup> x x x 2 x <sup>1</sup> / x <sup>1</sup> /	W/m2 1.2 1.2 /[1/(1.4)+	2K = = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43	<pre>k)</pre>			kJ/K (26) (26) (27)
ELEN Doors Doors Window Window	Type 1 Type 2 ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6	n <sup>2</sup> x x x x x x x 1/2 x	W/m2 1.2 1.2 /[1/(1.4)+ /[1/(1.4)+	2K = = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77	<>			kJ/K (26) (26) (27) (27)
ELEN Doors Doors Window Window Window	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72 9.9	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K = = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12	<pre>k)</pre>			kJ/K (26) (27) (27) (27) (27)
ELEN Doors Doors Window Window	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	2K = = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77 0.95				kJ/K (26) (26) (27) (27) (27)
ELEN Doors Doors Window Window Window Rooflig	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type	Gros area 1 2 3	ss (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7) +	2K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672				kJ/K (26) (27) (27) (27) (27) (27) (27b)
ELEN Doors Doors Window Window Window Rooflig Floor	Type 1 Type 2 ws Type ws Type ws Type ws Type hts	Gros area 1 2 3 4 170.	ss (m <sup>2</sup> ) 21	Openin rr	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 )+ 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29)
ELEN Doors Doors Window Window Window Rooflig Floor Walls	Type 1 Type 2 ws Type ws Type ws Type ws Type hts Type1 Type2	Gros area 1 2 3 4 170. 82.8	21 25	Openin m 35.2-	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.7)+ 0.13 0.18 0.18	K       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91				kJ/K (26) (27) (27) (27) (27) (27) (27b) (28) (29) (29)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof 1	Type 1 Type 2 ws Type ws Type ws Type ws Type hts Type1 Type2 Type1	Gros area 1 2 3 4 170. 82.8 58.7	21 21 21 21	Openin m 35.24	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7) + 0.13 0.18 0.18 0.13	K       =         0.04]       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.510 24.29 14.91 7.64				kJ/K (26) (27) (27) (27) (27) (27b) (27b) (28) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type thts Type1 Type2 Type2	Gros area 1 2 3 4 170. 82.8 58.7 18.6	21 21 23 24	Openin m 35.2 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13	K       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5100 24.29 14.91 7.64 2.42				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Walls Roof Roof Roof	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type fype1 Type2 Type2 Type3	Gros area 1 2 3 4 170. 82.8 58.7 18.6 16.3	21 21 35 74 35	Openin m 35.2 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         1       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91 7.64 2.42 2.13				kJ/K (26) (27) (27) (27) (27) (27b) (27b) (28) (29) (29) (29) (30) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type hts Type1 Type2 Type3 Type3 Type4	Gros area 1 2 3 4 170. 82.8 58.7 18.6 16.3 37.	SS (m <sup>2</sup> ) 21 35 74 35 1	Openin m 35.2 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13	K       =         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/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5100 24.29 14.91 7.64 2.42				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (30) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Total a	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type hts Type1 Type2 Type3 Type3 Type4 rea of e	Gros area 1 2 3 4 170. 82.8 58.7 18.6 16.3 37.	SS (m <sup>2</sup> ) 21 35 74 35 1	Openin m 35.2 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         1       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91 7.64 2.42 2.13				kJ/K (26) (27) (27) (27) (27) (27b) (27b) (27b) (28) (29) (29) (29) (30) (30) (30) (30) (31)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof Total a Interna	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type hts Type1 Type2 Type3 Type3 Type4	Gros area 1 2 3 4 1 2 3 4 4 170. 82.6 58.7 18.6 16.3 37. Iements	SS (m <sup>2</sup> ) 21 35 74 35 1	Openin m 35.2 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	W/m2 1.2 1.2 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + 0.13 0.13 0.13 0.13 0.13	K       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         0.04]       =         1       =	(W/I 2.652 2.268 22.43 4.77 0.95 13.12 3.672 15.5103 24.29 14.91 7.64 2.42 2.13				kJ/K (26) (27) (27) (27) (27) (27b) (28) (29) (29) (30) (30) (30) (30)

Interna	al floor					84.97	7				Г				(32d)
Interna	al ceiling					84.97	7				Ī		<b>-</b> -		(32e)
					ndow U-va Is and part		lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2		_
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	) + (32) =				121.0	9	(33)
Heat c	apacity	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	26228.	76	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250		(35)
	0		ere the de tailed calci		constructi	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f			
Therm	al bridge	es : S (L	x Y) cal	culated (	using Ap	pendix l	K						22.25	5	(36)
			are not kn	own (36) =	= 0.05 x (3	1)				(2.2)					-
	abric he									(36) =	(		143.3	4	(37)
Ventila			alculated							1	25)m x (5)	i	l		
(20)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	-		(20)
(38)m=	95.85	95.43	95.02	93.1	92.75	91.08	91.08	90.77	91.72	92.75	93.47	94.23			(38)
		coefficier							· · ·	= (37) + (3	, 1		I		
(39)m=	239.19	238.77	238.36	236.44	236.08	234.41	234.41	234.1	235.06	236.08	236.81	237.57			
Heat lo	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39)₁. · (4)	12 /12=	236.4	4	(39)
(40)m=	1.17	1.17	1.17	1.16	1.16	1.15	1.15	1.15	1.15	1.16	1.16	1.16			
									I,	Average =	Sum(40)1.	<sub>12</sub> /12=	1.16		(40)
Numbe	er of day	rs 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	gy requi	irement:								kWh/y	ear:		
Assum	ed occu	ipancy, I	N								3	01			(42)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13.		01			( /
	A £ 13.9		torugo	no in litro	o por de	w Vd ov	orogo –	(25 v NI)	1.26				l		(42)
								(25 x N) to achieve		se target o		5.63			(43)
not more	e that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)								
	Jan	Feb	Mar	Apr	Мау	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 T	Table 1c x	(43)					_		
(44)m=	116.19	111.97	107.74	103.52	99.29	95.07	95.07	99.29	103.52	107.74	111.97	116.19			_
Enorm	contant of	hot wator	upped col	ouloted m	onthly _ 1	100 v Vd r	т v рт v Г	)Tm / 2600			m(44) <sub>112</sub> = ables 1b, 1		1267.5	53	(44)
								. <u> </u>	i				1		
(45)m=	172.31	150.7	155.51	135.58	130.09	112.26	104.02	119.37	120.79	140.77	153.67	166.87			
lf instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		l otal = Su	m(45) <sub>112</sub> =	-	1661.9	94	(45)
(46)m=	25.85	22.61	23.33	20.34	19.51	16.84	15.6	17.91	18.12	21.12	23.05	25.03			(46)
	storage		includin	0 201/ 0	alar or M	////HDC	etorado	within sa	mayaa	مما		450	I		(47)
-		. ,					) litres in			301		150			(47)
	•	•			•			ombi boil	ers) ente	er '0' in (	(47)				

Water storage loss:

a) If m	nanufact	urer's d	eclared l	oss fact	or is kno	wn (kWł	n/day):				1.	55	(4)	B)
Tempe	erature f	actor fro	m Table		0.	54	(4	9)						
			r storage	-				(48) x (49	) =		0.	84	(5)	D)
Hot wa	ater stor	age loss	eclared of factor fi see secti	rom Tab								0	(5	1)
		from Ta										0	(5)	1
			m Table									0	(5:	3)
•••			r storage	e, kWh/y	ear			(47) x (51	) x (52) x (	53) =		0	(54	
	. ,	(54) in (క		faraab	ma a sa th			((50)			0.	84	(5	) )
			culated		,		. <u> </u>	··· ·	(55) × (41)					
(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(5)	3)
-		s dedicate	d solar sto	orage, (57)	i	x [(50) – (	1	· · ·	7)m = (56)		H11) IS Tro	m Append	l	
(57)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(5	7)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0	(58	B)
	•		lculated rom Tab				. ,	• •		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	9)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(6)	1)
Total h	neat requ	uired 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=	221.55	195.18	204.75	183.23	179.33	159.91	153.27	168.61	168.45	190.02	201.32	216.11	(62	2)
Solar DI	HW input	L calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contributi	ion to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63	3)
Output	t from w	ater hea	iter	•						•	•			
(64)m=	221.55	195.18	204.75	183.23	179.33	159.91	153.27	168.61	168.45	190.02	201.32	216.11		
			<u>.</u>	!				Out	out from w	ater heate	r (annual)₁	12	2241.73 (64	4)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)n	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	96.69	85.69	91.1	83.2	82.65	75.45	73.98	79.08	78.29	86.2	89.22	94.88	(6	5)
inclu	ude (57)	m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a	):									
Metab	olic gair	is (Table	e 5), Wat	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	(6)	6)
Lightin	g gains	(calcula	ted in A	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	34	30.2	24.56	18.59	13.9	11.73	12.68	16.48	22.12	28.09	32.78	34.95	(6	7)
Applia	nces ga	ins (calc	ulated ir	n Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	375.1	378.99	369.18	348.3	321.94	297.17	280.62	276.72	286.53	307.41	333.77	358.54	(6)	B)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	tion L15	or L15a	), also se	ee Table	5			I	
(69)m=	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	(69	9)
Pumps	s and fai	ns gains	(Table :	5a)	•		•	•	•				I	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70	D)

Losses e.g. evaporation (negative values) (Table 5)																	
(71)m=	-120.3	-120.3	-120.3	-120.3	-120.3	;   - <sup>,</sup>	120.3	-120.3	-12	0.3 -120.3	3 -1	120.3	-120.3	-120.3	3		(71)
Water	heating	gains (T	able 5)			•	•										
(72)m=	129.95	127.51	122.45	115.56	111.09	) 1	04.79	99.44	106	6.3 108.73	3 1 <sup>.</sup>	15.86	123.91	127.5	2		(72)
Total	interna	l gains =					(66) m	n + (67)m	1 + (68	3)m + (69)m -	+ (70)	m + (	(71)m + (72)	m			
(73)m=	610.17	607.82	587.3	553.56	518.04	4 4	184.8	463.85	470	.61 488.5	5 52	22.48	561.58	592.1	3		(73)
6. So	lar gain	IS:							-								
Solar (	gains are	calculated u	using sola	r flux from	Table 6a	a and	l associa	ted equa	tions	to convert to	the a	pplica	able orientati	on.			
Orient		Access F Table 6d	actor	Area m²			Flux	e 6a		g_ Table 6l	h	-	FF Table 6c			Gains	
								eoa	,			r			г	(VV)	-
North	0.9x	0.77	X	16.	92	x	10	.63	X	0.63		×	0.7	=	- [	54.98	(74)
North	0.9x	0.77	X	16.	92	x	20	.32	X	0.63		×	0.7	=	۶Ļ	105.08	(74)
North	0.9x	0.77	X	16.	92	x	34	.53	×	0.63		×	0.7	*	- [	178.56	(74)
North	0.9x	0.77	X	16.		x	55	.46	X	0.63		×	0.7	*	= [	286.81	(74)
North	0.9x	0.77	X	16.	92	x	74	.72	x	0.63		×	0.7	*	۶Ļ	386.35	(74)
North	0.9x	0.77	X	16.	92	x	79	.99	x	0.63		×	0.7	•	۶ļ	413.6	(74)
North	0.9x	0.77	x	16.	92	x	74	.68	×	0.63		×	0.7	•	۶ļ	386.15	(74)
North	0.9x	0.77	x	16.	92	x	59	.25	×	0.63		×	0.7		= [	306.36	(74)
North	0.9x	0.77	x	16.	92	x	41	.52	x	0.63		×	0.7		-	214.68	(74)
North	0.9x	0.77	X	16.	92	x	24	.19	×	0.63		x	0.7	-	=	125.08	(74)
North	0.9x	0.77	x	16.	92	x	13	.12	x	0.63		×	0.7		= [	67.83	(74)
North	0.9x	0.77	x	16.	92	x	8.	86	X	0.63		×	0.7		= [	45.84	(74)
East	0.9x	0.77	х	3.	6	x	19	.64	x	0.63		x	0.7	-	= [	21.61	(76)
East	0.9x	0.77	x	3.	6	x	38	.42	×	0.63		×	0.7	-	- [	42.27	(76)
East	0.9x	0.77	x	3.	6	x	63	.27	x	0.63		<b>x</b> [	0.7	-	- [	69.61	(76)
East	0.9x	0.77	x	3.	6	x	92	.28	x	0.63		<b>x</b> [	0.7	-	- [	101.53	(76)
East	0.9x	0.77	x	3.	6	x	113	3.09	x	0.63		×	0.7	-	= [	124.43	(76)
East	0.9x	0.77	x	3.	6	x	115	5.77	×	0.63		<b>x</b>	0.7	=	- [	127.37	(76)
East	0.9x	0.77	x	3.	6	x	110	).22	x	0.63		<b>x</b> [	0.7	=	= [	121.26	(76)
East	0.9x	0.77	x	3.	6	x	94	.68	x	0.63		×	0.7		- [	104.16	(76)
East	0.9x	0.77	x	3.	6	x	73	.59	×	0.63		×	0.7	-	- [	80.96	(76)
East	0.9x	0.77	x	3.	6	x	45	.59	x	0.63		×	0.7	-	- [	50.16	(76)
East	0.9x	0.77	x	3.	6	x	24	.49	x	0.63		× [	0.7	-	- [	26.94	(76)
East	0.9x	0.77	x	3.	6	x	16	.15	x	0.63		× [	0.7	-	- [	17.77	(76)
South	0.9x	0.77	x	9.	9	x	46	.75	x	0.63		× [	0.7	-	- [	141.45	(78)
South	0.9x	0.77	x	9.	9	x	76	.57	×	0.63		× [	0.7	-	= [	231.66	(78)
South	0.9x	0.77	x	9.	9	x	97	.53	×	0.63		× [	0.7		- [	295.1	(78)
South	0.9x	0.77	x	9.	9	x	110	).23	×	0.63		× [	0.7	-	- [	333.52	(78)
South	0.9x	0.77	x	9.	9	x	114	4.87	×	0.63		× [	0.7	-	- [	347.55	(78)
South	0.9x	0.77	x	9.	9	x	110	0.55	×	0.63		x	0.7		= [	334.47	(78)

South       0.9x       0.77       x       9.9       x       108.01       x       0.63       x       0.7       =       326.8         South       0.9x       0.77       x       9.9       x       104.89       x       0.63       x       0.7       =       317.37         South       0.9x       0.77       x       9.9       x       101.89       x       0.63       x       0.7       =       326.8         South       0.9x       0.77       x       9.9       x       101.89       x       0.63       x       0.7       =       249.87         South       0.9x       0.77       x       9.9       x       55.42       x       0.63       x       0.7       =       122.23         West       0.9x       0.77       x       0.72       x       19.64       x       0.63       x       0.7       =       122.23         West       0.9x       0.77       x       0.72       x       38.42       x       0.63       x       0.7       =       4.32         West       0.9x       0.77       x       0.72       x       13.92       x       0	(78) (78) (78) (78) (78) (78) (80) (80) (80) (80) (80) (80) (80)
South       0.9x       0.77       x       9.9       x       101.89       x       0.63       x       0.7       =       308.26         South       0.9x       0.77       x       9.9       x       82.59       x       0.63       x       0.7       =       308.26         South       0.9x       0.77       x       9.9       x       82.59       x       0.63       x       0.7       =       249.87         South       0.9x       0.77       x       9.9       x       55.42       x       0.63       x       0.7       =       249.87         South       0.9x       0.77       x       9.9       x       55.42       x       0.63       x       0.7       =       147.67         South       0.9x       0.77       x       0.72       x       19.64       x       0.63       x       0.7       =       4.32         West       0.9x       0.77       x       0.72       x       38.42       x       0.63       x       0.7       =       13.92         West       0.9x       0.77       x       0.72       x       113.09       x       0	(78) (78) (78) (78) (80) (80) (80) (80) (80) (80)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $82.59$ $x$ $0.63$ $x$ $0.7$ $=$ $249.87$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $1467.67$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $147.67$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $142.23$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $24.39$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ </td <td>(78) (78) (78) (80) (80) (80) (80) (80)</td>	(78) (78) (78) (80) (80) (80) (80) (80)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $167.67$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $122.23$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $22.489$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ <	(78) (78) (80) (80) (80) (80) (80) (80)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $122.23$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $8.45$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ <t< td=""><td>(78) (80) (80) (80) (80) (80) (80)</td></t<>	(78) (80) (80) (80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $4.32$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ <t< td=""><td>(80) (80) (80) (80) (80) (80)</td></t<>	(80) (80) (80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $8.45$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ <td>(80) (80) (80) (80) (80)</td>	(80) (80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $13.92$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	(80) (80) (80) (80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $20.31$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $24.89$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $25.47$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$	(80) (80)
West       0.9x       0.77       x       0.72       x       113.09       x       0.63       x       0.7       =       24.89         West       0.9x       0.77       x       0.72       x       115.77       x       0.63       x       0.7       =       24.89         West       0.9x       0.77       x       0.72       x       115.77       x       0.63       x       0.7       =       25.47         West       0.9x       0.77       x       0.72       x       110.22       x       0.63       x       0.7       =       24.25         West       0.9x       0.77       x       0.72       x       110.22       x       0.63       x       0.7       =       24.25         West       0.9x       0.77       x       0.72       x       94.68       x       0.63       x       0.7       =       20.83         West       0.9x       0.77       x       0.72       x       73.59       x       0.63       x       0.7       =       16.19         West       0.9x       0.77       x       0.72       x       24.49       x       0.6	(80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $25.47$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $24.25$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	(80)
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $20.83$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $5.39$	
West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $16.19$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $z$ $10.03$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $5.39$ West $0.9x$ $0.77$ $x$ $0.72$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $5.39$	(80)
West $0.9x$ $0.77$ x $0.72$ x $45.59$ x $0.63$ x $0.7$ = $10.03$ West $0.9x$ $0.77$ x $0.72$ x $45.59$ x $0.63$ x $0.7$ = $10.03$ West $0.9x$ $0.77$ x $0.72$ x $24.49$ x $0.63$ x $0.7$ = $5.39$	(80)
West $0.9x$ $0.77$ x $0.72$ x $24.49$ x $0.63$ x $0.7$ = $5.39$	(80)
	(80)
West 0.9x 0.77 x 0.72 x 16.15 x 0.63 x 0.7 = 3.55	(80)
	(80)
Rooflights 0.9x         1         x         2.16         x         15.3         x         0.63         x         0.7         =         13.11	(82)
Rooflights 0.9x 1 x 2.16 x 28.48 x 0.63 x 0.7 = 24.41	(82)
Rooflights 0.9x 1 x 2.16 x 50.24 x 0.63 x 0.7 = 43.07	(82)
Rooflights 0.9x 1 x 2.16 x 89.03 x 0.63 x 0.7 = 76.33	(82)
Rooflights 0.9x 1 x 2.16 x 129.88 x 0.63 x 0.7 = 111.35	(82)
Rooflights 0.9x 1 x 2.16 x 143.74 x 0.63 x 0.7 = 123.22	(82)
Rooflights 0.9x 1 x 2.16 x 132.31 x 0.63 x 0.7 = 113.43	(82)
Rooflights 0.9x 1 x 2.16 x 98.56 x 0.63 x 0.7 = 84.5	(82)
Rooflights 0.9x 1 x 2.16 x 62.62 x 0.63 x 0.7 = 53.69	(82)
Rooflights 0.9x 1 × 2.16 × 34.05 × 0.63 × 0.7 = 29.19	(82)
Rooflights 0.9x 1 × 2.16 × 18.64 × 0.63 × 0.7 = 15.98	(82)
Rooflights 0.9x 1 × 2.16 × 12.94 × 0.63 × 0.7 = 11.1	(82)
	4
Solar gains in watts, calculated for each month $(83)m = Sum(74)m(82)m$	
(83)m= 235.48 411.88 600.26 818.49 994.56 1024.14 971.89 833.22 673.79 464.33 283.82 200.49	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 845.65 1019.7 1187.56 1372.05 1512.6 1508.95 1435.74 1303.83 1162.29 986.81 845.4 792.62	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21	(85)
	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21         Utilisation factor for gains for living area, h1,m (see Table 9a)       21	(85)
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21         Utilisation factor for gains for living area, h1,m (see Table 9a)         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         (86)m=       1       1       0.99       0.95       0.83       0.67       0.75       0.94       0.99       1       1	
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21         Utilisation factor for gains for living area, h1,m (see Table 9a)       30         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec	

Temp	perature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	19.94	19.95	19.95	19.95	19.96	19.96	19.96	19.96	19.96	19.96	19.95	19.95		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	1	1	0.98	0.92	0.75	0.54	0.61	0.9	0.99	1	1		(89)
Mean	n interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18	18.22	18.59	19.1	19.58	19.88	19.95	19.94	19.73	19.13	18.47	17.97		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.11	(91)
Mean	n interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	A) × T2					-
(92)m=	18.18	18.39	18.74	19.24	19.7	19.99	20.07	20.06	, 19.85	19.26	18.63	18.15		(92)
Apply	adjustr	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.18	18.39	18.74	19.24	19.7	19.99	20.07	20.06	19.85	19.26	18.63	18.15		(93)
8. Spa	ace hea	ting req	uirement											
			ternal ter			ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	Jan	Feb	or gains Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Juli	Jui	Aug	Oep	001		Dec		
(94)m=	1	1	0.99	0.97	0.91	0.75	0.55	0.63	0.89	0.99	1	1		(94)
Usefu	ul gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	844.92	1017.37	1179.43	1337.43	1378.11	1135.94	791.75	817.52	1034.49	973.34	843.72	792.13		(95)
Month	hly aver	age exte	ernal tem	perature	e 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)
	<b></b>		an intern	· · ·									1	
(97)m=			2918.51					855.74			2731.26	3313.15		(97)
-			ement fo				i				· · · · · · · · · · · · · · · · · · ·	4075.04		
(98)m=	1840.88	1480.28	1293.87	797.05	380.12	0	0	0	0	797.44		1875.64	9824.3	(98)
					.,			Tota	l per year	(Kvvn/year	) = Sum(9	0)15,912 =		4
			ement in		•								48.09	(99)
			nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatir	-	at from s	econdari	v/sunnla	montary	svetom						0	(201)
	•		at from m			mentary	-	(202) = 1 -	- (201) -					(202)
				-	. ,				(201) – 02) × [1 – (	(202)1 -		·	1	4
			ng from	-				(204) = (2	02) × [1 – 1	(203)] =			1	(204)
	-	-	ace heat									-	93.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	ı, %				-		0	(208)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space		· ·	ement (c		,			-						
	1840.88	1480.28	1293.87	797.05	380.12	0	0	0	0	797.44	1359.03	1875.64	I	
(211)m		· · · ·	04)]	· · · ·	· ·		i	i			1		1	(211)
	1968.85	1583.19	1383.82	852.45	406.54	0	0	0	0	852.87	1453.5	2006.03		٦
								lota	l (kWh/yea	ar) =Sum(2	211) <sub>15,10</sub> 12	=	10507.27	(211)
•		•	econdar		month									
= {[(98 (215)m=		01)]}X1	00 ÷ (20 0	8)	0	0	0	0	0	0	0	0		
(210)III=		0		Ū	Ū	Ū	U U		l (kWh/yea	-	-		0	(215)
										,	7/15,1012		0	(210)

#### Water heating

Output from water heater (calculated above)													
			. <u> </u>	. <u> </u>					1				
221.55 195.18 204.75 183.23	179.33	159.91	153.27	168.61	168.45	190.02	201.32	216.11		_			
Efficiency of water heater								-	79.8	(216)			
(217)m= 89.21 89.11 88.87 88.29	86.77	79.8	79.8	79.8	79.8	88.22	88.96	89.26		(217)			
Fuel for water heating, kWh/month													
(219)m = (64)m x 100 ÷ (217)m													
(219)m= 248.33 219.04 230.39 207.54	206.67	200.39	192.06	211.29	211.09	215.38	226.3	242.11					
				Tota	al = Sum(2)	19a) <sub>112</sub> =			2610.59	(219)			
Annual totals						k	Wh/yea	r	kWh/year	-			
Space heating fuel used, main system	1								10507.27				
Water heating fuel used									2610.59				
Electricity for pumps, fans and electric													
central heating pump:								30	]	(230c)			
boiler with a fan-assisted flue		(230e)											
Total electricity for the above, kWh/ye	75	(231)											
Electricity for lighting									600.52	(232)			
Total delivered energy for all uses (21	1) (221)	+ (231)	+ (232)	(237h)	_				13793.39	] (338)			
·	, , ,	. ,	, ,	, ,					107 00.00				
12a. CO2 emissions – Individual hea	ling syste	Ins incl	uaing mi										
		En	ergy			Emiss	ion fac	tor	Emissions				
		k٧	/h/year			kg CO	2/kWh		kg CO2/yea	ar			
Space heating (main system 1)		(21	1) x			0.2	16	=	2269.57	(261)			
Space heating (secondary)		(21	5) x			0.5	19	=	0	(263)			
Water heating		(21	9) x			0.2	16	=	563.89	(264)			
Space and water heating		2833.46	(265)										
Electricity for pumps, fans and electric	19	=	38.93	(267)									
Electricity for lighting		(23	2) x			0.5	19	=	311.67	(268)			
Total CO2, kg/year					sum o	of (265)(2	271) =		3184.05	(272)			
									L	4			

TER =

15.59 (273)

			User D	etails:						
Assessor Name: Software Name:	Matt Fitzpa Stroma FS			Stroma Softwa					003572 m: 1.0.5.41	
		F	Property A	Address:	Plot 4					
Address :	Plot 4, Widd	lington, TBC								
1. Overall dwelling dimer	isions:									
Ground floor				<b>a(m²)</b> 44.43	(1a) x	<b>Av. He</b> i	<b>ight(m)</b> 2.5	(2a) =	Volume(m <sup>3</sup> ) 361.07	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(	(1d)+(1e)+(1	n) 14	44.43	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	361.07	(5)
2. Ventilation rate:				- 41		4 - 4 - 1				
Number of chimneys	main heating	secondal heating	+	0 0	] = [	total 0		40 =	m <sup>3</sup> per hour	(6a)
Number of open flues	0	+ 0	+	0	=	0	X 2	20 =	0	(6b)
Number of intermittent fan	S					4	<b>x</b> 1	0 =	40	(7a)
Number of passive vents					Γ	0	x 1	0 =	0	(7b)
Number of flueless gas fire	es					0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney If a pressurisation test has be	-				continue fro	40 om (9) to (		÷ (5) =	0.11	(8)
Number of storeys in the							,		0	(9)
Additional infiltration							[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or	timber frame o	r 0.35 foi	r masonr	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening	gs); if equal user	0.35	-							_
If suspended wooden flo			.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente									0	(13)
Percentage of windows	and doors dra	aught stripped		0.25 - [0.2	× (1 1) + 1	001			0	(14)
Window infiltration				(8) + (10)		-	L (15) -		0	(15)
Infiltration rate Air permeability value, c		d in cubic motre				<i>·</i> · · ·		araa	0	(16)
If based on air permeabilit			•	•	•		inelope	alea	5 0.36	(17) (18)
Air permeability value applies	•					is being us	sed		0.50	
Number of sides sheltered	1		-		-	-			2	(19)
Shelter factor				(20) = 1 - [	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter fac	tor		(21) = (18)	) x (20) =				0.31	(21)
Infiltration rate modified fo	r monthly win	d speed								
Jan Feb I	vlar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table	e 7								
(22)m= 5.1 5 4	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltr	ation rat	e (allow	ing for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
	0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.34	0.36		
		al ventila	-	rate for ti	ne applik	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	) × Fmv (e	auation (N	(15)) . othei	rwise (23b	) = (23a)			0	(23b)
			• • • •	ciency in %	, ,	, ,				( )			0	(23c)
			-	entilation	-					2h)m + (2	23h) y [1	l – (23c)	-	(200)
(24a)m=	0				0	0	0	0	0	0	0	0	÷ 100]	(24a)
	halance	d mech:	anical ve	entilation	without	heat rec	overv (N	/\/) (24h	1 = (22)	2) m + (2	23h)			
(24b)m=	0	0			0	0	0	0	0		0	0		(24b)
	whole h	L OUSE EX	L tract ver	ntilation c	r positiv	e input v	ventilatio	n from c	L outside					
				then (24c	-	-				5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	e input v	ventilatio	on from I	oft	I				
i	f (22b)n	n = 1, the	en (24d)	m = (22b	)m othe	rwise (2	4d)m = (	0.5 + [(2	2b)m² x	0.5]			L	
(24d)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24d)
Effec	ctive air	change	rate - er	nter (24a	) or (24b	) or (240	c) or (24	d) in bo>	(25)				L	
(25)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN	IENT	Gros area		Openin m		Net Are A ,n		U-valı W/m2		A X U (W/ŀ	<)	k-value kJ/m²·l		A X k kJ/K
Doors	Type 1					2.55	x	1.2	=	3.06				(26)
Doors	Type 2					2.1	x	1.2	 ] = [	2.52	Ē			(26)
Window	ws Type	e 1				15.74	x1/	[1/( 1.4 )+	0.04] =	20.87	=			(27)
Window	ws Type	e 2				1.8		[1/( 1.4 )+	0.04] =	2.39	=			(27)
Window	ws Type	93				3.18		([1/( 1.4 )+	0.04] =	4.22	=			(27)
Window	ws Type	94				4.2		[1/( 1.4 )+	0.04] =	5.57	=			(27)
Floor						144.43	3 X	0.13	= [	18.7759				(28)
Walls		172.4	48	29.57	7	142.9		0.18		25.72			$\dashv$	(29)
Roof		144.		0		144.43		0.13		18.78	╡┟		$\exists$	(30)
	rea of e	lements		L		461.34		0.10	[	10.70	J L			(31)
	l wall **		,			248.99					Г			(32c)
			ows. use e	effective wil	ndow U-va			formula 1	/l(1/U-valu	e)+0.041 a	L s aiven in	paragraph	L 3.2	(020)
				nternal wall			5			·, · · ] ·	- 0	1		
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				101.89	) (33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	!) + (32a).	(32e) =	22947.6	63 <mark>(34)</mark>
Therma	al mass	parame	ter (TMI	<sup>-</sup> = Cm ÷	- TFA) in	kJ/m²K			Indica	tive Value:	Medium		250	(35)
	-	sments wh ad of a de		etails of the ulation.	constructi	on are not	known pre	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix k	<						19.07	(36)
			are not kr	nown (36) =	0.05 x (3	1)				(0.0)				
Fotal fa	abric he	at loss							(33) +	(36) =			120.97	7 (37)

Ventila	ation hea	t loss ca	alculated	d monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	68.69	68.33	67.99	66.36	66.05	64.63	64.63	64.37	65.18	66.05	66.67	67.31		(38)
Heat t	ransfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	189.65	189.3	188.95	187.32	187.02	185.6	185.6	185.34	186.15	187.02	187.64	188.28		
						-				•	Sum(39)1.	12 /12=	187.32	(39)
	oss para		<u> </u>	i	4.00	4.00	4.00		· · ·	= (39)m ÷	. ,			
(40)m=	1.31	1.31	1.31	1.3	1.29	1.29	1.29	1.28	1.29	1.29	1.3	1.3	1.2	(40)
Numb	er of day	s in moi	nth (Tab	le 1a)					,	<pre>Average =</pre>	Sum(40) <sub>1</sub> .	12 / 12=	1.3	(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)
				!				<b>!</b>						
4. Wa	ater heat	ing enei	rgy requ	irement:								kWh/ye	ear:	
	A > 13.9			(1 - exp	(-0.0003	349 x (TF	- A -13.9	)2)] + 0.(	)013 x (1	FA -13.		93	I	(42)
	A £ 13.9			(li onp	( 0.0000			/_/] · •			0)			
								(25 x N) to achieve		o toract o		3.67		(43)
		-		r day (all w		-	-	lo acriieve	a waler us	e largel o	I			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat				ach month	,				000	001	1100	000		
(44)m=	114.04	109.89	105.74	101.6	97.45	93.3	93.3	97.45	101.6	105.74	109.89	114.04		
	I									Fotal = Su	m(44) <sub>112</sub> =		1244.05	(44)
Energy	content of	hot water	used - cal	lculated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	) kWh/mon	th (see Ta	ables 1b, 1	c, 1d)		
(45)m=	169.11	147.91	152.63	133.07	127.68	110.18	102.1	117.16	118.56	138.17	150.82	163.78		_
lf instan	tanoous w	ator hoati	na ot point	t of uso (no	hot wata	r storago)	ontor 0 in	boxes (46		Fotal = Su	m(45) <sub>112</sub> =	-	1631.15	(45)
			<u> </u>	·						00.70	00.00	04.57		(46)
	storage		22.89	19.96	19.15	16.53	15.31	17.57	17.78	20.72	22.62	24.57	I	(46)
	-		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If com	munity h	eating a	ind no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Otherv	vise if no	stored	hot wate	er (this ir	ncludes i	nstantar	ieous co	ombi boil	ers) ente	er '0' in (	47)			
	storage					. /1 \ \ /1	(1-)						1	
				oss facto	or is kno	wn (kvvr	i/day):					55		(48)
	erature fa							(40) (40)				54		(49)
0.	•		•	e, kWh/ye cylinder l		or is not		(48) x (49)	) =		0.	84	I	(50)
,				rom Tabl								0		(51)
	munity h	-		on 4.3										
	e factor			Oh								0		(52)
	erature fa							(	(50)	-0)		0		(53)
•	/ lost fro (50) or (		-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
	. , .	, ,	,	for each	month			((56)m = (	55) ~ (41)-	m	0.	84		(55)
						05.4.4					05.4.4	25.00		(56)
(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	l	(56)

	ins 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= 25.98	3 23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98		(57)
Primary circu	uit loss (ar	nnual) fro	om Table	e 3							0		(58)
Primary circu	uit loss cal	culated	or each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(modified	by factor f	rom Tab	e H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)		1	
(59)m= 23.26	6 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	alculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat re	quired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 218.3	6 192.39	201.87	180.72	176.92	157.83	151.34	166.4	166.21	187.41	198.47	213.02		(62)
Solar DHW inpu	it calculated	using App	endix G or	· Appendix	H (negativ	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additior	nal lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix C	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
(64)m= 218.3	6 192.39	201.87	180.72	176.92	157.83	151.34	166.4	166.21	187.41	198.47	213.02		_
							Outp	out from w	ater heate	r (annual)₁	12	2210.94	(64)
Heat gains f	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 95.62	2 84.76	90.14	82.37	81.85	74.76	73.34	78.35	77.54	85.33	88.27	93.85		(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	ins (Table	e 5), Wat	ts										
Jan				1	1					-			
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 146.2	_	146.25	Apr 146.25	May 146.25	Jun 146.25	Jul 146.25	Aug 146.25	Sep 146.25	Oct 146.25	Nov 146.25	Dec 146.25		(66)
(66)m= 146.2 Lighting gair	5 146.25	146.25	146.25	146.25	146.25	146.25	146.25	146.25					(66)
	5 146.25 is (calcula	146.25	146.25	146.25	146.25	146.25	146.25	146.25					(66) (67)
Lighting gair	5 146.25 is (calcula 5 25.01	146.25 ted in Ap 20.34	146.25 opendix 15.4	146.25 L, equat 11.51	146.25 ion L9 oi 9.72	146.25 r L9a), a 10.5	146.25 Iso see 13.65	146.25 Table 5 18.32	146.25 23.26	146.25	146.25		
Lighting gair (67)m= 28.16	5 146.25 Is (calcula 3 25.01 gains (calc	146.25 ted in Ap 20.34 culated in	146.25 opendix 15.4 Append	146.25 L, equat 11.51 dix L, eq	146.25 ion L9 oi 9.72 uation L	146.25 r L9a), a 10.5 13 or L1	146.25 Iso see 13.65 3a), also	146.25 Table 5 18.32 see Ta	146.25 23.26 ble 5	146.25 27.15	146.25 28.94		
Lighting gair (67)m= 28.16 Appliances g	5 146.25 is (calcula 5 25.01 gains (calc 4 317.66	146.25 ted in Ap 20.34 culated in 309.44	146.25 opendix 15.4 Append 291.93	146.25 L, equat 11.51 dix L, eq 269.84	146.25 ion L9 of 9.72 uation L 249.08	146.25 r L9a), a 10.5 13 or L1 235.2	146.25 Iso see 13.65 3a), also 231.94	146.25 Table 5 18.32 see Ta 240.16	146.25 23.26 ble 5 257.67	146.25 27.15	146.25 28.94		(67)
Lighting gair (67)m= 28.16 Appliances g (68)m= 314.4	5 146.25 is (calcula 5 25.01 gains (calcula 4 317.66 ins (calcula	146.25 ted in Ap 20.34 culated in 309.44	146.25 opendix 15.4 Append 291.93	146.25 L, equat 11.51 dix L, eq 269.84	146.25 ion L9 of 9.72 uation L 249.08	146.25 r L9a), a 10.5 13 or L1 235.2	146.25 Iso see 13.65 3a), also 231.94	146.25 Table 5 18.32 see Ta 240.16	146.25 23.26 ble 5 257.67	146.25 27.15	146.25 28.94		(67)
Lighting gair (67)m= 28.10 Appliances g (68)m= 314.4 Cooking gair	5 146.25 is (calcula 5 25.01 jains (calc 4 317.66 ins (calcula 3 37.63	146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63	146.25 opendix 15.4 Append 291.93 opendix 37.63	146.25 L, equat 11.51 dix L, eq 269.84 L, equat	146.25 ion L9 of 9.72 uation L 249.08 tion L15	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a)	146.25 Iso see 13.65 3a), also 231.94 ), also se	146.25 Table 5 18.32 see Ta 240.16 ee Table	146.25 23.26 ble 5 257.67 25	146.25 27.15 279.76	146.25 28.94 300.52		(67) (68)
Lighting gair (67)m= 28.16 Appliances g (68)m= 314.4 Cooking gair (69)m= 37.63	5 146.25 is (calcula 5 25.01 jains (calc 4 317.66 ins (calcula 3 37.63	146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63	146.25 opendix 15.4 Append 291.93 opendix 37.63	146.25 L, equat 11.51 dix L, eq 269.84 L, equat	146.25 ion L9 of 9.72 uation L 249.08 tion L15	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a)	146.25 Iso see 13.65 3a), also 231.94 ), also se	146.25 Table 5 18.32 see Ta 240.16 ee Table	146.25 23.26 ble 5 257.67 25	146.25 27.15 279.76	146.25 28.94 300.52		(67) (68)
Lighting gain ( $67$ )m= 28.16 Appliances g ( $68$ )m= 314.4 Cooking gain ( $69$ )m= 37.63 Pumps and f ( $70$ )m= 3	5 146.25 146.25 15 (calcula 3 25.01 19 317.66 10 317.66 10 317.63 10 37.63 10	146.25 ted in Ap 20.34 sulated in 309.44 ated in Ap 37.63 (Table 5 3	146.25 ppendix 15.4 Append 291.93 opendix 37.63 5a) 3	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63	146.25 ion L9 of 9.72 uation L 249.08 tion L15 37.63	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63	146.25 Iso see 13.65 3a), also 231.94 ), also se 37.63	146.25 Table 5 18.32 see Ta 240.16 ee Table 37.63	146.25 23.26 ble 5 257.67 25 37.63	146.25 27.15 279.76 37.63	146.25 28.94 300.52 37.63		(67) (68) (69)
Lighting gair (67)m= 28.16 Appliances g (68)m= 314.4 Cooking gair (69)m= 37.63 Pumps and f	5       146.25         1s       (calcula         5       25.01         gains       (calcula         4       317.66         1s       (calcula         3       37.63         3       3         3       3         3       3         3       3         evaporatic       3	146.25 ted in Ap 20.34 sulated in 309.44 ated in Ap 37.63 (Table 5 3	146.25 ppendix 15.4 Append 291.93 opendix 37.63 5a) 3	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63	146.25 ion L9 of 9.72 uation L 249.08 tion L15 37.63	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63	146.25 Iso see 13.65 3a), also 231.94 ), also se 37.63	146.25 Table 5 18.32 see Ta 240.16 ee Table 37.63	146.25 23.26 ble 5 257.67 25 37.63	146.25 27.15 279.76 37.63	146.25 28.94 300.52 37.63		(67) (68) (69)
Lighting gair (67)m= 28.16 Appliances g (68)m= 314.4 Cooking gair (69)m= 37.65 Pumps and f (70)m= 3 Losses e.g. (71)m= -117	5 146.25 146.25 15 (calcula 5 25.01 19 317.66 10 317.66 10 317.63 13 37.63 13 37.63 13 37.63 14 317.66 14 317.66 15 317.66 16 317.63 17 46 17	146.25 ted in Ap 20.34 sulated in 309.44 ated in Ap 37.63 (Table 5 3 on (negat	146.25 ppendix 15.4 Append 291.93 opendix 37.63 5a) 3 tive valu	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 0le 5)	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3	146.25 Iso see <sup>-</sup> 13.65 3a), also 231.94 ), also se 37.63	146.25 Table 5 18.32 see Ta 240.16 ee Table 37.63	146.25 23.26 ble 5 257.67 5 37.63 3	146.25 27.15 279.76 37.63 3	146.25 28.94 300.52 37.63 3		(67) (68) (69) (70)
Lighting gair ( $67$ )m= 28.16 Appliances g ( $68$ )m= 314.4 Cooking gair ( $69$ )m= 37.63 Pumps and f ( $70$ )m= 3 Losses e.g. $6$	5 146.25 146.25 15 (calcula 3 25.01 19 ains (calcula 3 317.66 10 (calcula 3 37.63 10 ains gains 3 3 10 ains gains 117 10 g gains (1	146.25 ted in Ap 20.34 sulated in 309.44 ated in Ap 37.63 (Table 5 3 on (negat	146.25 ppendix 15.4 Append 291.93 opendix 37.63 5a) 3 tive valu	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 0le 5)	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3	146.25 Iso see <sup>-</sup> 13.65 3a), also 231.94 ), also se 37.63	146.25 Table 5 18.32 see Ta 240.16 ee Table 37.63	146.25 23.26 ble 5 257.67 5 37.63 3	146.25 27.15 279.76 37.63 3	146.25 28.94 300.52 37.63 3		(67) (68) (69) (70)
Lighting gain (67)m= 28.16 Appliances g (68)m= 314.4 Cooking gain (69)m= 37.63 Pumps and f (70)m= 3 Losses e.g. 6 (71)m= -117 Water heatin (72)m= 128.5	5       146.25         1s       (calcula         5       25.01         gains       (calcula         6       317.66         1s       (calcula         3       37.63         3       37.63         ans       gains         3       3         evaporation       -117         1g       gains       (126.13)	146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63 (Table 5 3 on (negat -117 Table 5) 121.16	146.25 ppendix 15.4 Append 291.93 ppendix 37.63 5a) 3 :ive valu -117	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab -117	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 ole 5) -117 103.83	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3 -117 98.58	146.25 Iso see - 13.65 3a), also 231.94 ), also se 37.63 3 -117 105.31	146.25 Table 5 18.32 • see Ta 240.16 • Table 37.63 3 -117 107.7	146.25 23.26 ble 5 257.67 5 37.63 3 -117	146.25 27.15 279.76 37.63 3 -117 122.6	146.25 28.94 300.52 37.63 3 -117 126.14		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> </ul>
Lighting gain (67)m= 28.16 Appliances g (68)m= 314.4 Cooking gain (69)m= 37.63 Pumps and f (70)m= 3 Losses e.g. g (71)m= -117 Water heatin	5       146.25         1s       (calcula         3       25.01         gains       (calcula         3       317.66         ns       (calcula         3       37.63         ans       gains         3       37.63         ans       gains         -117       g         ng       gains         126.13       126.13	146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63 (Table 5 3 on (negat -117 Table 5) 121.16	146.25 ppendix 15.4 Append 291.93 ppendix 37.63 5a) 3 :ive valu -117	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab -117	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 ole 5) -117 103.83	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3 -117 98.58	146.25 Iso see - 13.65 3a), also 231.94 ), also se 37.63 3 -117 105.31	146.25 Table 5 18.32 • see Ta 240.16 • Table 37.63 3 -117 107.7	146.25 23.26 ble 5 257.67 25 37.63 3 -117 114.7	146.25 27.15 279.76 37.63 3 -117 122.6	146.25 28.94 300.52 37.63 3 -117 126.14		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> </ul>
Lighting gain (67)m= 28.16 Appliances ( (68)m= 314.4 Cooking gain (69)m= 37.63 Pumps and f (70)m= 3 Losses e.g. ( (71)m= -117 Water heatin (72)m= 128.5 Total intern	5       146.25         1s       (calcula         5       25.01         gains       (calcula         6       317.66         1s       (calcula         3       37.63         3       37.63         3       37.63         3       3         evaporatic       -117         1g       gains       (Table 1)         3       126.13         al       gains =       6	146.25 ted in Ap 20.34 ulated in 309.44 ated in Ap 37.63 (Table 5 3 on (negat -117 Table 5) 121.16	146.25 ppendix 15.4 Append 291.93 opendix 37.63 5a) 3 :ive valu -117 114.4	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab -117 110.01	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 ole 5) -117 103.83 (66)	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3 -117 98.58 m + (67)m	146.25 Iso see - 13.65 3a), also 231.94 ), also se 37.63 3 -117 105.31 + (68)m +	146.25 Table 5 18.32 5 see Ta 240.16 240.16 37.63 3 -117 107.7 + (69)m +	146.25 23.26 ble 5 257.67 25 37.63 3 -117 114.7 (70)m + (7	146.25 27.15 279.76 37.63 3 -117 122.6 1)m + (72)	146.25 28.94 300.52 37.63 3 -117 126.14 m		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>
Lighting gain (67)m= 28.16 Appliances g (68)m= 314.4 Cooking gain (69)m= 37.63 Pumps and f (70)m= 3 Losses e.g. (71)m= -117 Water heatin (72)m= 128.5 Total intern (73)m= 540.9	5       146.25         1s       (calcula         25.01       (calcula         317.66       (calcula         37.63       (calcula         37.63       (calcula         3       37.63         ans       gains         3       37.63         ans       gains         3       126.13         al       gains         6       538.68         ns:       (calcula	146.25 ted in Ap 20.34 ulated in 309.44 ated in Ap 37.63 (Table 5 3 on (negat -117 Table 5) 121.16 : 520.82	146.25 ppendix 15.4 Append 291.93 opendix 37.63 5a) 3 :ive valu -117 114.4 491.61	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab -117 110.01	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 ole 5) -117 103.83 (66) 432.5	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3 -117 98.58 m + (67)m 414.16	146.25 Iso see - 13.65 3a), also 231.94 ), also se 37.63 3 -117 105.31 + (68)m + 420.78	146.25 Table 5 18.32 5 see Ta 240.16 240.16 37.63 3 -117 107.7 (69)m + 436.06	146.25 23.26 ble 5 257.67 25 37.63 3 -117 114.7 (70)m + (7 465.5	146.25 27.15 279.76 37.63 3 117 122.6 1)m + (72) 499.38	146.25 28.94 300.52 37.63 3 -117 126.14 m 525.49		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>
Lighting gain (67)m= 28.16 Appliances ( (68)m= 314.4 Cooking gain (69)m= 37.63 Pumps and f (70)m= 3 Losses e.g. ( (71)m= -117 Water heatin (72)m= 128.5 <b>Total intern</b> (73)m= 540.9 <b>6. Solar gain</b>	5       146.25         1s       (calcula         5       25.01         gains       (calcula         6       317.66         1s       (calcula         3       37.63         3       37.63         3       3         evaporation       -117         1g       gains       (Table 1)         3       126.13       126.13         al       gains =       6         538.68       ns:       e calculated	146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63 (Table 5 3 on (negat -117 Table 5) 121.16 520.82 using sola factor	146.25 ppendix 15.4 Append 291.93 opendix 37.63 5a) 3 :ive valu -117 114.4 491.61	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab -117 110.01 461.24 Table 6a	146.25 ion L9 of 9.72 uation L 249.08 tion L15 37.63 3 0le 5) -117 103.83 (66) 432.5 and associ	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3 -117 98.58 m + (67)m 414.16	146.25 Iso see 13.65 3a), also 231.94 ), also se 37.63 3 -117 105.31 + (68)m + 420.78 tions to co	146.25 Table 5 18.32 5 see Ta 240.16 240.16 37.63 3 -117 107.7 (69)m + 436.06	146.25         23.26         ble 5         257.67         5         37.63         3         -117         114.7         (70)m + (7)         465.5         he applicate	146.25 27.15 279.76 37.63 3 117 122.6 1)m + (72) 499.38	146.25 28.94 300.52 37.63 3 -117 126.14 m 525.49	Gains	<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>

North	0.9x	0.77	] x	15.74	×	10.63	) ×	0.63	x	0.7	=	51.15	(74)
North	0.9x	0.77	」 】 ×	15.74	x	20.32	]   x	0.63	x	0.7	=	97.75	
North	0.9x	0.77	」 】 x	15.74	x	34.53	x	0.63	x	0.7	=	166.1	(74)
North	0.9x	0.77	] x	15.74	x	55.46	x	0.63	x	0.7	=	266.8	(74)
North	0.9x	0.77	x	15.74	x	74.72	×	0.63	x	0.7	=	359.41	(74)
North	0.9x	0.77	x	15.74	x	79.99	x	0.63	x	0.7	=	384.76	(74)
North	0.9x	0.77	x	15.74	x	74.68	×	0.63	x	0.7	=	359.22	(74)
North	0.9x	0.77	x	15.74	x	59.25	×	0.63	x	0.7	=	285	(74)
North	0.9x	0.77	x	15.74	x	41.52	×	0.63	x	0.7	=	199.71	(74)
North	0.9x	0.77	x	15.74	x	24.19	×	0.63	x	0.7	=	116.36	(74)
North	0.9x	0.77	x	15.74	x	13.12	x	0.63	x	0.7	=	63.1	(74)
North	0.9x	0.77	x	15.74	×	8.86	×	0.63	x	0.7	=	42.64	(74)
East	0.9x	0.77	x	1.8	x	19.64	×	0.63	x	0.7	=	10.8	(76)
East	0.9x	0.77	x	1.8	x	38.42	x	0.63	x	0.7	=	21.14	(76)
East	0.9x	0.77	x	1.8	x	63.27	×	0.63	x	0.7	=	34.81	(76)
East	0.9x	0.77	x	1.8	×	92.28	×	0.63	x	0.7	=	50.76	(76)
East	0.9x	0.77	x	1.8	x	113.09	×	0.63	x	0.7	=	62.21	(76)
East	0.9x	0.77	x	1.8	x	115.77	×	0.63	x	0.7	=	63.69	(76)
East	0.9x	0.77	x	1.8	x	110.22	x	0.63	x	0.7	=	60.63	(76)
East	0.9x	0.77	x	1.8	x	94.68	x	0.63	x	0.7	=	52.08	(76)
East	0.9x	0.77	x	1.8	x	73.59	x	0.63	x	0.7	=	40.48	(76)
East	0.9x	0.77	x	1.8	x	45.59	x	0.63	x	0.7	=	25.08	(76)
East	0.9x	0.77	x	1.8	×	24.49	×	0.63	x	0.7	=	13.47	(76)
East	0.9x	0.77	x	1.8	×	16.15	x	0.63	x	0.7	=	8.88	(76)
South	0.9x	0.77	x	4.2	x	46.75	x	0.63	x	0.7	=	60.01	(78)
South	0.9x	0.77	x	4.2	x	76.57	×	0.63	x	0.7	=	98.28	(78)
South	0.9x	0.77	x	4.2	x	97.53	×	0.63	x	0.7	=	125.19	(78)
South	0.9x	0.77	x	4.2	x	110.23	×	0.63	x	0.7	=	141.49	(78)
South	0.9x	0.77	x	4.2	x	114.87	×	0.63	x	0.7	=	147.45	(78)
South	0.9x	0.77	×	4.2	x	110.55	×	0.63	x	0.7	=	141.9	(78)
South	0.9x	0.77	x	4.2	x	108.01	×	0.63	X	0.7	=	138.64	(78)
South	0.9x	0.77	×	4.2	x	104.89	×	0.63	x	0.7	=	134.64	(78)
South	0.9x	0.77	×	4.2	x	101.89	×	0.63	x	0.7	=	130.78	(78)
South	0.9x	0.77	x	4.2	x	82.59	X	0.63	x	0.7	=	106	(78)
South	0.9x	0.77	×	4.2	x	55.42	×	0.63	x	0.7	=	71.13	(78)
South	0.9x	0.77	x	4.2	x	40.4	×	0.63	x	0.7	=	51.85	(78)
West	0.9x	0.77	×	3.18	×	19.64	×	0.63	x	0.7	=	19.09	(80)
West	0.9x	0.77	×	3.18	×	38.42	×	0.63	x	0.7	=	37.34	(80)
West	0.9x	0.77	×	3.18	×	63.27	×	0.63	x	0.7	=	61.49	(80)
West	0.9x	0.77	×	3.18	×	92.28	×	0.63	x	0.7	=	89.68	(80)
West	0.9x	0.77	×	3.18	×	113.09	×	0.63	x	0.7	=	109.91	(80)

West 0.	9x 0.77	x	3.1	8	x	11	15.77	x	0.6	63	×	0.7	=	112.51	(80)
West 0.	9x 0.77	x	3.1	8	x	11	10.22	x	0.6	63	x	0.7	=	107.12	(80)
West 0.	9x 0.77	x	3.1	8	x	9	4.68	x	0.6	63	×	0.7	=	92.01	(80)
West 0.	9x 0.77	x	3.1	8	x	7	3.59	x	0.6	63	×	0.7	=	71.52	(80)
West 0.	9x 0.77	x	3.1	8	x	4	5.59	x	0.6	63	×	0.7	=	44.31	(80)
West 0.	9x 0.77	x	3.1	8	x	2	4.49	x	0.6	63	×	0.7	=	23.8	(80)
West 0.	9x 0.77	x	3.1	8	x	1	6.15	x	0.6	63	×	0.7	=	15.7	(80)
Solar gains	in watts, ca	alculated	for eacl	n month				(83)m	= Sum(	74)m .	(82)m	-		_	
(83)m= 141		387.59	548.74	678.98		02.85	665.61	563.	.73 44	2.49	291.75	171.5	119.08		(83)
Total gains	– internal a	nd solar	(84)m =	- (73)m	+ (8	83)m	, watts					-i	r	7	
<mark>(84)</mark> m= 682	.01 793.19	908.41	1040.35	1140.22	11	35.35	1079.77	984	.5 87	8.55	757.25	670.89	644.56		(84)
7. Mean ir	nternal temp	erature	(heating	season	)										
Temperat	ure during h	eating p	eriods ir	n the livi	ng	area f	from Tab	ole 9,	Th1 (°	°C)				21	(85)
Utilisation	factor for ga	ains for I	iving are	a, h1,m	ı (s	ее Та	ble 9a)							L	
Ja	ın Feb	Mar	Apr	May		Jun	Jul	Αι	g gr	Sep	Oct	Nov	Dec	]	
(86)m= 1	1	1	0.98	0.94		0.84	0.69	0.7	6 0	.94	0.99	1	1		(86)
Mean inte	rnal tempera	ature in l	living are	ea T1 (fo	ollo	w ste	ps 3 to 7	' in T	able 90					-	
(87)m= 19.		19.84	20.21	20.58	<b>—</b>	20.85	20.96	20.9	-	).71	20.24	19.77	19.41	]	(87)
Tomporat	ure during h		oriode ir	roct of	L dw	olling	from To			(°C)				1	
(88)m= 19.		19.83	19.84	19.84	T	9.85	19.85	19.8		9.85	19.84	19.84	19.84	1	(88)
					I					5.00	10.01	10.01	10.01		()
	factor for ga				r –	· · ·		r Ó			0.00			1	(89)
(89)m= 1	1	0.99	0.98	0.92		0.75	0.54	0.6	2 0	.89	0.99	1	1		(09)
	rnal tempera			of dwell	Ť	, i		r –			,			-	
(90)m= 17.	74 17.95	18.34	18.88	19.4	1	9.74	19.83	19.8	32 19	9.58	18.93	18.25	17.71		(90)
										fl	LA = Livi	ng area ÷ (4	4) =	0.2	(91)
Mean inte	rnal tempera	ature (fo	r the wh	ole dwe	llin	g) = fl	_A × T1	+ (1 ·	– fLA)	× T2			-	_	
(92)m= 18.	08 18.27	18.64	19.15	19.64	1	9.96	20.06	20.0	04 19	9.81	19.2	18.55	18.05		(92)
Apply adju	ustment to th	ne mean	internal	temper	atu	ire fro	m Table	4e, v	where	appro	priate		-	-	
(93)m= 18.	08 18.27	18.64	19.15	19.64	1	9.96	20.06	20.0	04 19	9.81	19.2	18.55	18.05		(93)
	neating requ														
	he mean inte ion factor fo		•		ned	at ste	ep 11 of	Tabl	e 9b, s	o that	t Ti,m=	(76)m an	d re-cal	culate	
		Mar	Apr	May	1	Jun	Jul	Αι		Sep	Oct	Nov	Dec	1	
	factor for ga			iviay		Jun	Jui		Jg I v	Seb [	001	NOV	Dec		
(94)m= 1		0.99	0.97	0.91		0.76	0.57	0.6	4 0	.89	0.98	1	1	1	(94)
	ns, hmGm ,	W = (94		4)m	I				I	I				1	
(95)m= 680	I	<u> </u>	1010.39		8	67.03	616.85	632.	.95 78	31.5	744.27	668.61	643.72	]	(95)
Monthly a	verage exte	rnal tem	perature	from T	abl	e 8				I				<b>_</b>	
(96)m= 4.3	3 4.9	6.5	8.9	11.7		14.6	16.6	16.	4 1	4.1	10.6	7.1	4.2	]	(96)
Heat loss	rate for mea	an intern	al tempe	erature,	Lm	1, W =	=[(39)m :	x [(93	3)m– (9	96)m [	]		·	-	
(97)m= 2612	2.49 2531.73	2293.51	1920.15	1484.37	9	95.51	641.99	675.	46 100	62.53	1607.6	2148.59	2607.06		(97)
· · · ·	ating require	ement fo	r each m	nonth, k	Wh	/mont	h = 0.02	24 x [	(97)m ·	- (95)	)m] x (4	11)m		-	
(98)m= 1437	7.14 1170.2	1036.65	655.02	332.44		0	0	0		0	642.32	1065.59	1460.72		

Total per year (kWh/year) = Sum(98) <sub>15912</sub>													7800.08	(98)
Space	e heatin	g require	ement in	ı kWh/m²	²/year							[	54.01	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	HP)					
	e heatii	-	t from c	econdar	v/cupplo	montary	ovetom					I	0	(201)
				nain syst		rnenary		(202) = 1 -	- (201) =				0	(201)
	-			main syst	. ,			(202) = 1 (204) = (20)		(203)] =			1	(202)
			•	ing syste				() (		(]			93.5	(204)
	-			ementar		a system	ז %						0	(208)
Linoit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	 kWh/yea	], ,
Space				alculate	, , , , , , , , , , , , , , , , , , ,		001	Aug	000	000		Dee	KWII/yee	u
	1437.14	1170.2	1036.65	655.02	332.44	0	0	0	0	642.32	1065.59	1460.72		
(211)m	n = {[(98	)m x (20	94)] } x 1	100 ÷ (20	)6)		-	-		-	-			(211)
	1537.04	1251.55	1108.71	700.56	355.55	0	0	0	0	686.97				-
								Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	8342.34	(211)
•		g fuel (s )1)] } x 1		ˈy), kWh/ ນອນ	month									
– 1[(90 (215)m=	· · · · ·	0	00 ÷ (20	0	0	0	0	0	0	0	0	0		
		<u> </u>	I	<u> </u>	I	<b>!</b>		Tota	l (kWh/yea	ar) =Sum(2	1 215) <sub>15,1012</sub>	=	0	(215)
Water	heating	9										I		J
Output		I IIII	I IIII	ulated a		457.00	454.04	400.4	400.04	407.44	400.47	040.00		
Efficier	218.36	192.39 ater hea	201.87	180.72	176.92	157.83	151.34	166.4	166.21	187.41	198.47	213.02	79.8	(216)
(217)m=		88.82	88.56	87.95	86.47	79.8	79.8	79.8	79.8	87.84	88.63	88.98	13.0	(217)
		ı heating,	kWh/m	nth										
. ,		<u>m x 100</u>			004.0	407 70	400.05	000 50	000.00	040.05	000.00	000 4		
(219)m=	245.55	216.61	227.94	205.48	204.6	197.78	189.65	208.52 Tota	208.28 I = Sum(21	213.35	223.92	239.4	2581.08	(219)
Annua	I totals										Wh/year	. l	kWh/year	(213)
			ed, main	system	1								8342.34	]
Water	heating	fuel use	d										2581.08	Ī
Electri	city for p	oumps, f	ans and	electric	keep-ho	t						•		-
centra	al heatir	ng pump	:									30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)
Total e	electricity	y for the	above, l	kWh/yea	ır			sum	of (230a).	(230g) =	:		75	(231)
Electri	city for l	ighting		Ē									497.35	] (232)
			for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=			l	11495.77	(338)
		•••		lual heat	, , ,	. ,	. ,	. ,						J. ,
										<b>F</b> '	las f	4	Emile -'	
							<b>ergy</b> /h/year			kg CO	<b>ion fac</b> 2/kWh	τοΓ	Emissions kg CO2/yea	r

Space heating (main system 1)	(211) x	0.216	=	1801.94	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	557.51	(264)
Space and water heating	(261) + (262) + (263) + (264) =	=		2359.46	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	258.13	(268)
Total CO2, kg/year	SI	um of (265)(271) =		2656.51	(272)

TER =

18.39 (273)



Be Lean SAP Sheets

Widdington

				User D	etails:						
Assessor Name: Software Name:	Matt Fitzp Stroma FS				Strom Softwa	are Vei				0003572 on: 1.0.5.41	
				roperty <i>i</i>	Address	: Plot 1					
Address :	Plot 1, Wid	dington, TE	BC								
1. Overall dwelling dim	ensions:				( 0)						
Ground floor					a(m²)		Av. Hei			Volume(m <sup>3</sup> )	
				1	19.31	(1a) x	2	2.5	(2a) =	298.27	(3a)
First floor				8	4.97	(1b) x	2.	.56	(2b) =	217.61	(3b)
Total floor area TFA = (	1a)+(1b)+(1c)+	(1d)+(1e)+	⊦(1n	) 20	04.28	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	515.88	(5)
2. Ventilation rate:											
	main heating		condar ating	У	other		total			m <sup>3</sup> per hour	
Number of chimneys		☐ + [	0	] + [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0		0	i + F	0	] = [	0	x2	20 =	0	(6b)
Number of intermittent f	ans						0	x ^	10 =	0	](7a)
Number of passive vent	S						0	x ^	10 =	0	](7b)
Number of flueless gas							0	x 4	40 =	0	] (7c)
,						L					](,
									Air ch	nanges per hou	ır
Infiltration due to chimn	eys, flues and f	ans = (6a)	+(6b)+(7	a)+(7b)+(	7c) =	Г	0	· [	÷ (5) =	0	(8)
If a pressurisation test has			, proceed	d to (17), d	otherwise of	continue fr	om (9) to (	(16)			-
Number of storeys in	the dwelling (n	s)								0	(9)
Additional infiltration	/							[(9)	-1]x0.1 =	0	(10)
Structural infiltration:							uction			0	(11)
if both types of wall are deducting areas of oper			maing to	ine great	er wall are	a (aller					
If suspended wooden	floor, enter 0.2	2 (unsealed	d) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no draught lobby, e	nter 0.05, else	enter 0								0	(13)
Percentage of window	vs and doors d	raught strip	pped							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	, q50, express	ed in cubic	: metre	s per ho	our per s	quare m	etre of e	nvelope	area	4.65000009536743	(17)
If based on air permeab	•									0.23	(18)
Air permeability value appl		ion test has b	been don	e or a deg	gree air pe	rmeability	is being us	sed			1
Number of sides shelter Shelter factor	ed				(20) = 1 -	[0 075 x (1	9)] =			2	(19)
Infiltration rate incorpora	ating shelter fa	ctor			(21) = (18)					0.85	(20)
Infiltration rate modified	-				() (10	,,,-				0.2	(21)
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
			Uun	oui	l ''ug					1	
Monthly average wind s (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	
(22)11- 3.1 3	4.4	+.3	5.0	5.0	3.7	4	4.5	4.5	4.7	J	

Wind F	actor (22	2a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjuste	ed infiltra	tion rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x (	(22a)m						
	0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23			
	ate effect echanical		-	rate for t	he appli	cable ca	se			•					
				andix N (2	(23a) – (23a	a) x Emv (c	quation (I	N5)) , other	wieg (23t	(232)		l		).5	(23a)
								n Table 4h)		) – (23a)		l		).5	(23b)
			-	-	-			HR) (24a		2h)m ⊥ ('	23h) v [*	 1 – (23 م)		0	(23c)
(24a)m=	· · · · ·			0	0		0		0	0	0	1 - (230)	÷ 100]		(24a)
		d mech	anical ve	entilation	without	heat rec	overv (N	MV) (24b	m = (2)	1 2b)m + (;	1 23b)				
(24b)m=		0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole ho	ouse ex	tract ven	tilation o	r positiv	e input v	/entilatio	on from o	outside						
,					•	•		-c) = (22b		.5 × (23b	)				
(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(24c)
,					•	•		on from lo 0.5 + [(22		0.5]					
(24d)m=	r í r	0	0	0	0	0	0	0	0	0	0	0			(24d)
Effec	ctive air c	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in box	(25)						
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(25)
3 He	at losses	and he	at loce r	aramat	or.					•	•				
ELEN		Gros	SS	Openin m	gs	Net Ar A ,r		U-valu W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²·k		A X kJ/K	
	IENT		SS	Openin	gs	Net Ar A ,r 2.21				A X U (W/ł 3.094	<)				
ELEN Doors	IENT	Gros	SS	Openin	gs	A ,n	n²	W/m2	К	(W/I	<) 				
ELEN Doors	<b>IENT</b> Type 1	Gros area	SS	Openin	gs	A ,r	n <sup>2</sup> x	W/m2	K = =	(W/I 3.094	<) 				(26)
ELEN Doors Doors Window	<b>Type 1</b> Type 2	Gros area	SS	Openin	gs	A ,r 2.21 1.89	n <sup>2</sup> x x x x	W/m2	K = = 0.04] =	(W/H 3.094 2.646	<) 				(26) (26)
ELEN Doors Doors Window Window	<b>IENT</b> Type 1 Type 2 ws Type	Gros area 1 2	SS	Openin	gs	A ,r 2.21 1.89 16.92	n <sup>2</sup> x x x x x1 x1	W/m2 1.4 1.4 /[1/(1.4)+	K = = = 0.04] = 0.04] =	(W/I 3.094 2.646 22.43	<)				(26) (26) (27)
ELEN Doors Doors Window Window	<b>Type 1</b> Type 2 ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6	n <sup>2</sup> x x x x1 x1 x1 x1	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+	K = = = = = = 0.04] = = 0.04] = =	(W/H 3.094 2.646 22.43 4.77	$\diamond$				(26) (26) (27) (27)
ELEN Doors Doors Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72	n <sup>2</sup> x x x x1 x1 x1 x1 x1 x1	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.094 2.646 22.43 4.77 0.95	$\diamond$				<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Doors Window Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72 9.9	n <sup>2</sup> × x × x <sup>1</sup> × 1 × 1 × 1 × 1 × 1 × 1	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12					<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type ghts	Gros area 1 2 3	SS (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16	n <sup>2</sup> x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 3.094 2.646 22.43 4.77 0.95 13.12 3.024		kJ/m²•ŀ		kJ/K	<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Window Window Window Window Rooflig Floor	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts	Gros area 1 2 3 4	21	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3	n <sup>2</sup> x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x <sup>2</sup>	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4 )+	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172		kJ/m²-k		kJ/K 8948.25	<ul> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(28)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type ghts Type1 Type2	Gros area 1 2 3 4	21 25	Openin m	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9	n <sup>2</sup> x x x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x x x x	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/(1.4 )+ (0.12) 0.19	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = =	(W/I 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64		kJ/m²-k 75 60		kJ/K 8948.25 8098.2	<ul> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(28)</li> <li>(29)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type yhts Type1 Type2 Type1	Gros area 1 2 3 4 170.1 82.8	21 21 21 21	Openin m 35.24	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85	n <sup>2</sup> x x x <sup>1</sup>	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ (0.12 0.19 0.17	K = = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = =	(W/I 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38		kJ/m²-k 75 60 9		kJ/K 8948.25 8098.2 745.65	(26) (26) (27) (27) (27) (27) (27) (27b) (28) (29) (29)
ELEN Doors Window Window Window Window Rooflig Floor Walls Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type1 Type2	Gros area 1 2 3 4 170 82.8 58.7	21 21 25 24	Openin m 35.24 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74	n <sup>2</sup> x x x <sup>1</sup>	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/( 1.4 )+ 0.12 0.19 0.17 0.11	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/I 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46		kJ/m²-k 75 60 9 9		kJ/K 8948.25 8098.2 745.65 528.66	<ul> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(29)</li> <li>(30)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig Floor Walls Noalls Roof Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 (170) 82.8 58.7 18.6	21 21 25 24 25	Openin m 35.24 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64	n <sup>2</sup> X X X X X X X X X X X X X X X X X X X	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = =	(W/I 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05		kJ/m²-k 75 60 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76	<ul> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(29)</li> <li>(29)</li> <li>(30)</li> <li>(30)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 1 21 21 21 21 21 21 25 1 21 21 21 21 21 21 21 21 21	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35	n <sup>2</sup> X X X X X X X X X X X X X X X X X X X	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/I 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30) (30)
ELEN Doors Doors Window Window Window Window Rooflig Floor Walls Roof Roof Roof Roof T Roof T Roof T Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 1 21 21 21 21 21 21 25 1 21 21 21 21 21 21 21 21 21	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x <sup>1</sup>	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/I 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (29) (29) (29) (30) (30) (30) (30)

Interna	al floor					84.97	,				Г	18	٦	1529.46	(32d)
Interna	al ceiling					84.97	,				Ī	9	Ē	764.73	(32e)
			ows, use e sides of in				ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	L ns given in	paragraph	 3.2		-
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				1	19.68	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	262	228.76	(34)
Therm	al mass	parame	ter (TMF		- TFA) in	n kJ/m²K			= (34)	÷ (4) =			1	28.4	(35)
	-		ere the de tailed calci		constructi	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f			-
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						2	6.11	(36)
			are not kn	own (36) =	= 0.05 x (3	1)									_
	abric he								(33) +	(36) =			14	45.79	(37)
Ventilation heat loss calculated monthly     (38)m = 0.33 × (25)m × (5)       Ian     Feb     Mar       Apr     May       Iun     Iun       Oct     Nov													I		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec															
(38)m=	85.46	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12			(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	231.25	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91			_
Heat lo	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	23	30.94	(39)
(40)m=	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13			
										Average =	Sum(40)1.	12 /12=	1	1.13	(40)
Numbe	er of day	's in moi	nth (Tab	le 1a)									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. Wa	ter heat	ing ener	rgy requi	irement:								kWh/ye	ear:		
Assum	ed occu	ipancy, I	N								2	01			(42)
				[1 - exp	(-0.0003	49 x (TF	- A -13.9	)2)] + 0.0	)013 x (	TFA -13.		01			(42)
	A £ 13.9														
								(25 x N) to achieve		se tarnet o		5.63			(43)
		-	person per			-	-		a water ac	io larger e	I				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Hot wate			day for ea		,			-		000	1101	000			
(44)m=	116.19	111.97	107.74	103.52	99.29	95.07	95.07	99.29	103.52	107.74	111.97	116.19			
									-		l m(44) <sub>112</sub> =	=	12	67.53	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	0Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)			_
(45)m=	172.31	150.7	155.51	135.58	130.09	112.26	104.02	119.37	120.79	140.77	153.67	166.87			
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> =	=	16	61.94	(45)
(46)m=	25.85	22.61	23.33	20.34	19.51	16.84	15.6	17.91	18.12	21.12	23.05	25.03			(46)
1 ( L	storage			-	-								l		
Storag	e volum	e (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180			(47)
If comr	munity h	eating a	ind no ta	ınk in dw	elling, e	nter 110	litres in	(47)							
Otherw	vise if no	o stored	hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)				

Water storage loss:

a) If m	nanufact	turer's de	eclared I	oss fact		1.	.32		(48)					
Tempe	erature f	actor fro	m Table	2b							0.	.54		(49)
		om water	-					(48) x (49	) =		0.	.71		(50)
Hot wa If com	ater stor munity h		factor fi ee secti	rom Tab	loss fact le 2 (kW							0		(51) (52)
		actor fro		2b								0		(53)
Energy	y lost fro	om water	<sup>-</sup> storage	e, kWh/y	ear			(47) x (51	) x (52) x (	53) =		0		(54)
Enter	(50) or	(54) in (5	55)	-							0.	.71		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)ı	m				
(56)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	(H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(57)
Primar	v circuit	loss (ar	nual) fro	om Table			_	0		(58)				
		•	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(mo	dified by	/ factor f	rom Tab	r	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 ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	217.67	191.67	200.87	179.47	175.45	156.15	149.38	164.73	164.69	186.13	197.56	212.23		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (	<u>S)</u>					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	217.67	191.67	200.87	179.47	175.45	156.15	149.38	164.73	164.69	186.13	197.56	212.23		
								Out	out from wa	ater heate	r (annual)₁	12	2196.01	(64)
-	ains fro	1		1	1	- -	× (45)m	i + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	-	
(65)m=	93.58	82.88	87.99	80.2	79.54	72.44	70.88	75.98	75.28	83.09	86.21	91.77		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a	):									
Metab	olic gair	<u>is (Table</u>	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-			
(67)m=	34	30.2	24.56	18.59	13.9	11.73	12.68	16.48	22.12	28.09	32.78	34.95		(67)
Applia	nces ga	ins (calc	ulated in	n Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	375.1	378.99	369.18	348.3	321.94	297.17	280.62	276.72	286.53	307.41	333.77	358.54		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	tion L15	or L15a)	), also se	e Table	5	-			
(69)m=	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04		(69)
Pumps	s and fa	ns gains	(Table	5a)					-		-			
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)

(r1)=-       1203	Losses	Losses e.g. evaporation (negative values) (Table 5)															
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(71)m=	-120.3	-120.3	-120.3	-120.3	-120.3	-	120.3	-120.3	-120	0.3 -120.3	-120	.3 -120.3	-120.	3		(71)
Total internal gains =         (66/m + (67/m + (67/m + (7/0m + (7/2)m + (	Water	heating	gains (T	able 5)		•	-					-		-			
Comme         Bools 00:06:0         683.13         549.39         513.86         480.63         496.44         484.32         516.3         557.4         587.96         (73)           Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.           Orientation:           Access Factor         Area         Flux         0         Table 6b         Table 6c         Gains         (W)           North         0.82         0.77         ×         16.92         ×         0.033         ×         0.63         ×         0.77         =         549.86         (74)           North         0.82         0.77         ×         16.92         ×         0.633         ×         0.7         =         105.06         (74)           North         0.92         0.77         ×         16.92         ×         0.633         ×         0.7         =         286.91         (74)           North         0.92         0.77         ×         16.92         ×         74.99         ×         0.633         ×         0.7         =         246.91         74.98         0.633         ×         0.7	(72)m=	125.78	123.34	118.27	111.38	106.91	1	00.61	95.26	102	.12 104.56	111.6	69 119.74	123.3	5		(72)
6. Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.           Orientation: Access Factor         Area         FLux         Gains           Table 6a         Gains           Morth         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.77         ×         105.06         (74)           North         0.9x         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         288.61         (74)           North         0.9x         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         288.61         (74)           North         0.9x         0.77         ×         16.92	Total i	nterna	l gains =					(66)m	ı + (67)m	1 + (68	3)m + (69)m +	(70)m +	- (71)m + (72	!)m			
<th< td=""><td>(73)m=</td><td>605.99</td><td>603.64</td><td>583.13</td><td>549.39</td><td>513.86</td><td>4</td><td>80.63</td><td>459.67</td><td>466</td><td>.44 484.32</td><td>518.</td><td>3 557.4</td><td>587.9</td><td>6</td><td></td><td>(73)</td></th<>	(73)m=	605.99	603.64	583.13	549.39	513.86	4	80.63	459.67	466	.44 484.32	518.	3 557.4	587.9	6		(73)
Orientation:         Access Factor Table 6d         Area m <sup>2</sup> Flux Table 6a         g Table 6b         FF Table 6c         Gains (W)           North         0.9x         0.77         x         16.92         x         10.63         x         0.63         x         0.77         =         64.98         (74)           North         0.9x         0.77         x         16.92         x         20.32         x         0.63         x         0.77         =         64.98         (74)           North         0.9x         0.77         x         16.92         x         55.46         x         0.63         x         0.77         =         128.68.1         (74)           North         0.9x         0.77         x         16.92         x         74.98         x         0.63         x         0.77         =         413.6         74)           North         0.9x         0.77         x         16.92         x         74.88         0.63         x         0.77         =         386.36         (74)           North         0.9x         0.77         x         16.92         x         1.12         0.63         x         0.77         =	6. Sol	ar gain	s:			-											
Table 6d         m <sup>2</sup> Table 6a         Table 6b         Table 6c         (W)           North         0.9x         0.77         x         16.92         x         0.63         x         0.77         =         54.98         (74)           North         0.9x         0.77         x         16.92         x         0.63         x         0.77         =         105.08         (74)           North         0.9x         0.77         x         16.92         x         34.53         x         0.63         x         0.77         =         178.56         (74)           North         0.9x         0.777         x         16.92         x         74.72         x         0.63         x         0.77         =         138.615         (74)           North         0.9x         0.777         x         16.92         x         74.88         x         0.63         x         0.77         =         138.615         (74)           North         0.9x         0.777         x         16.92         x         11.12         x         0.63         x         0.77         =         125.08         (74)           North         0.9x	Solar g	ains are	calculated u	using sola	r flux from	Table 6a	a and	lassocia	ted equa	tions	to convert to t	he appli	cable orienta	ition.			
North         0.9*         0.77         ×         16.92         ×         10.63         ×         0.77         =         64.98         (74)           North         0.9*         0.77         ×         16.92         ×         20.32         ×         0.63         ×         0.77         =         105.08         (74)           North         0.9*         0.77         ×         16.92         ×         55.46         ×         0.63         ×         0.77         =         286.81         74/1           North         0.9*         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         286.81         74/1           North         0.9*         0.77         ×         16.92         ×         78.99         ×         0.63         ×         0.77         =         386.15         74           North         0.9*         0.77         ×         16.92         ×         41.52         ×         0.63         ×         0.77         =         214.68         74           North         0.9*         0.77         ×         16.92         ×         13.12         ×         <	Orienta			actor													
North       0.9x       0.0.7       x       10.9z       x       10.9z       0.0.7       x       10.9z       x       0.0.8z       x       0.0.7       z       10.9z       0.77       x       11.9z       x       0.0.3z       x       0.77       z       11.9z       x       0.63       x       0.77       z       11.9z       x       0.63       x       0.77       z       11.9z       x       0.63       x       0.77       z       11.8z       x       74.7z       x       0.63       x       0.77       z       11.8z       x       74.7z       x       0.63       x       0.77       z       11.8z       x       74.7z       x       0.63       x       0.77       z       11.8z       x       74.8z       0.63       x       0.77       z       11.8z       x       74.8z       0.63       x       0.77       z       11.8z       x       0.63       x       0.77       z       11.8z       x       11.1z       x       0.63       x       0.77       z       11.8z       x       11.1z       x       0.63       x       0.77       z       11.8z       x       11.1z       x       0.63									e oa						F	(VV)	_
North       0.80       0.77       x       16.92       x       34.53       x       0.63       x       0.77       =       178.66       (74)         North       0.9x       0.77       x       16.92       x       55.46       x       0.63       x       0.77       =       286.81       (74)         North       0.9x       0.77       x       16.92       x       74.72       x       0.63       x       0.77       =       286.81       (74)         North       0.9x       0.77       x       16.92       x       79.99       x       0.63       x       0.77       =       386.35       (74)         North       0.9x       0.77       x       16.92       x       74.88       x       0.63       x       0.77       =       396.36       (74)         North       0.9x       0.77       x       16.92       x       24.19       x       0.63       x       0.77       =       125.08       (74)         North       0.9x       0.77       x       16.92       x       24.19       x       0.63       x       0.77       =       125.08       (74)			0.77	X	16	92	x	10	.63	X	0.63	×	0.7		= [	54.98	(74)
North         0.5x         0.77         x         16.92         x         55.46         x         0.63         x         0.77         =         266.81         (74)           North         0.9x         0.77         x         16.92         x         77.42         x         0.63         x         0.77         =         286.81         (74)           North         0.9x         0.77         x         16.92         x         77.999         x         0.63         x         0.77         =         413.6         (74)           North         0.9x         0.77         x         16.92         x         74.88         x         0.63         x         0.77         =         413.6         (74)           North         0.9x         0.77         x         16.92         x         24.19         x         0.63         x         0.77         =         214.68         (74)           North         0.9x         0.77         x         16.92         x         24.19         x         0.63         x         0.77         =         214.68         (74)           North         0.9x         0.77         x         16.92         x			0.77	X	16	92	x	20	.32	X	0.63	×	0.7		= [	105.08	(74)
North         0.5x         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         79.99         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         74.68         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         59.25         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         24.19         ×         0.63         ×         0.77         =         125.08         (74)           North         0.9x         0.77         ×         16.92         ×         24.19         ×         0.63         ×         0.77         =         125.08         (74)           North         0.9x         0.77         ×         3.6         ×		0.9x	0.77	×	16	92	x	34	.53	x	0.63	×	0.7		= [	178.56	(74)
North         0.9x         0.77         x         16.92         x         79.99         x         0.63         x         0.77         =         413.6         (74)           North         0.5x         0.77         x         16.92         x         74.68         x         0.63         x         0.77         =         396.15         (74)           North         0.5x         0.77         x         16.92         x         74.68         x         0.63         x         0.77         =         396.15         (74)           North         0.5x         0.77         x         16.92         x         41.52         x         0.63         x         0.77         =         214.68         (74)           North         0.5x         0.77         x         16.92         x         24.19         x         0.63         x         0.7         =         214.68         (74)           North         0.5x         0.77         x         16.92         x         8.86         x         0.63         x         0.7         =         214.68         (74)           North         0.5x         0.77         x         3.6         x <td< td=""><td></td><td></td><td>0.77</td><td>x</td><td>16</td><td>92</td><td>x</td><td>55</td><td>.46</td><td>x</td><td>0.63</td><td>×</td><td>0.7</td><td></td><td>- [</td><td>286.81</td><td>(74)</td></td<>			0.77	x	16	92	x	55	.46	x	0.63	×	0.7		- [	286.81	(74)
North         0.5x         0.77         ×         16.92         ×         74.68         ×         0.63         ×         0.77         =         386.15         (74)           North         0.5x         0.77         ×         16.92         ×         55.25         ×         0.63         ×         0.77         =         386.15         (74)           North         0.9x         0.77         ×         16.92         ×         41.52         ×         0.63         ×         0.77         =         214.68         (74)           North         0.9x         0.77         ×         16.92         ×         13.12         ×         0.63         ×         0.77         =         125.08         (74)           North         0.9x         0.77         ×         16.92         ×         18.42         ×         0.63         ×         0.77         =         67.83         (74)           Reat         0.9x         0.77         ×         3.6         ×         19.64         ×         0.63         ×         0.77         =         21.61         (76)           East         0.9x         0.77         ×         3.6         ×         2		0.9x	0.77	x	16	92	x	74	.72	x	0.63	×	0.7		- [	386.35	(74)
North       0.9x       0.77       x       16.92       x       59.25       x       0.63       x       0.77       =       306.36       (74)         North       0.9x       0.77       x       16.92       x       41.52       x       0.63       x       0.77       =       214.68       (74)         North       0.9x       0.77       x       16.92       x       41.52       x       0.63       x       0.77       =       214.68       (74)         North       0.9x       0.77       x       16.92       x       13.12       x       0.63       x       0.77       =       67.83       (74)         North       0.9x       0.77       x       16.92       x       8.86       x       0.63       x       0.77       =       45.84       (74)         East       0.9x       0.77       x       3.6       x       8.86       x       0.63       x       0.77       =       42.27       (76)         East       0.9x       0.77       x       3.6       x       113.09       x       0.63       x       0.77       =       121.43       (76)         Ea		0.9x	0.77	x	16	92	x	79	.99	x	0.63	×	0.7		= [	413.6	(74)
North       0.9x       0.77       x       16.92       x       41.52       x       0.63       x       0.77       =       214.68       (74)         North       0.9x       0.77       x       16.92       x       24.19       x       0.63       x       0.77       =       125.08       (74)         North       0.9x       0.77       x       16.92       x       13.12       x       0.63       x       0.77       =       67.83       (74)         North       0.9x       0.77       x       16.92       x       8.86       x       0.63       x       0.77       =       45.84       (74)         North       0.9x       0.77       x       3.6       x       8.86       x       0.63       x       0.77       =       45.84       (74)         East       0.9x       0.77       x       3.6       x       8.86       x       0.63       x       0.77       =       42.27       (76)         East       0.9x       0.77       x       3.6       x       113.09       x       0.63       x       0.77       =       121.26       (76)         East </td <td>North</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>16</td> <td>92</td> <td>x</td> <td>74</td> <td>.68</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td></td> <td>= [</td> <td>386.15</td> <td>(74)</td>	North	0.9x	0.77	x	16	92	x	74	.68	x	0.63	x	0.7		= [	386.15	(74)
North $0.9x$ $0.77$ $x$ $16.92$ $x$ $24.19$ $x$ $0.63$ $x$ $0.7$ $z$ $125.08$ $(74)$ North $0.9x$ $0.77$ $x$ $16.92$ $x$ $13.12$ $x$ $0.63$ $x$ $0.7$ $z$ $125.08$ $(74)$ North $0.9x$ $0.77$ $x$ $16.92$ $x$ $13.12$ $x$ $0.63$ $x$ $0.7$ $z$ $67.83$ $(74)$ North $0.9x$ $0.77$ $x$ $16.92$ $x$ $8.86$ $x$ $0.63$ $x$ $0.7$ $z$ $45.84$ $(74)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $45.84$ $(74)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $45.84$ $(74)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $42.27$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.228$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ <td>North</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>16</td> <td>92</td> <td>x</td> <td>59</td> <td>.25</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td></td> <td>= [</td> <td>306.36</td> <td>(74)</td>	North	0.9x	0.77	x	16	92	x	59	.25	x	0.63	x	0.7		= [	306.36	(74)
North0.9x0.77x16.92x13.12x0.63x0.77=67.83(74)North0.9x0.77x16.92x8.86x0.63x0.77=45.84(74)East0.9x0.77x3.6x19.64x0.63x0.77=21.61(76)East0.9x0.77x3.6x19.64x0.63x0.77=42.27(76)East0.9x0.77x3.6x63.27x0.63x0.77=69.61(76)East0.9x0.77x3.6x92.28x0.63x0.77=101.53(76)East0.9x0.77x3.6x113.09x0.63x0.77=124.43(76)East0.9x0.77x3.6x115.77x0.63x0.77=127.37(76)East0.9x0.77x3.6x110.22x0.63x0.77=121.26(76)East0.9x0.77x3.6x110.22x0.63x0.77=104.16(76)East0.9x0.77x3.6x110.22x0.63x0.77=104.16(76)East0.9x0.77x3.6x <td>North</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>16</td> <td>92</td> <td>x</td> <td>41</td> <td>.52</td> <td>x</td> <td>0.63</td> <td>×</td> <td>0.7</td> <td></td> <td>= [</td> <td>214.68</td> <td>(74)</td>	North	0.9x	0.77	x	16	92	x	41	.52	x	0.63	×	0.7		= [	214.68	(74)
North       0.9x       0.77       ×       16.92       ×       8.86       ×       0.63       ×       0.77       =       45.84       (74)         East       0.9x       0.77       ×       3.6       ×       19.64       ×       0.63       ×       0.77       =       21.61       (76)         East       0.9x       0.77       ×       3.6       ×       19.64       ×       0.63       ×       0.77       =       21.61       (76)         East       0.9x       0.77       ×       3.6       ×       38.42       ×       0.63       ×       0.77       =       42.27       (76)         East       0.9x       0.77       ×       3.6       ×       92.28       ×       0.63       ×       0.77       =       101.53       (76)         East       0.9x       0.77       ×       3.6       ×       113.09       ×       0.63       ×       0.77       =       127.37       (76)         East       0.9x       0.77       ×       3.6       ×       110.22       ×       0.63       ×       0.77       =       121.26       (76)         East	North	0.9x	0.77	x	16	92	x	24	.19	x	0.63	x	0.7		= [	125.08	(74)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $21.61$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $z$ $42.27$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $z$ $42.27$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $z$ $69.61$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $z$ $50.16$ $(76)$ E	North	0.9x	0.77	x	16	92	x	13	.12	x	0.63	x	0.7		= [	67.83	(74)
East       0.9x       0.77       x       3.6       x       38.42       x       0.63       x       0.77       =       42.27       (76)         East       0.9x       0.77       x       3.6       x       63.27       x       0.63       x       0.77       =       69.61       (76)         East       0.9x       0.77       x       3.6       x       92.28       x       0.63       x       0.77       =       69.61       (76)         East       0.9x       0.77       x       3.6       x       113.09       x       0.63       x       0.77       =       124.43       (76)         East       0.9x       0.77       x       3.6       x       115.77       x       0.63       x       0.77       =       124.43       (76)         East       0.9x       0.77       x       3.6       x       110.22       x       0.63       x       0.77       =       121.26       (76)         East       0.9x       0.77       x       3.6       x       110.23       x       0.63       x       0.77       =       80.96       (76)       East       0.9x	North	0.9x	0.77	x	16	92	x	8.8	86	x	0.63	x	0.7		= [	45.84	(74)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $z$ $69.61$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $122.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $z$ $122.6$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ $z$ Sou	East	0.9x	0.77	x	3.	6	x	19	.64	x	0.63	x	0.7		= [	21.61	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $z$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $z$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ $z$ S	East	0.9x	0.77	x	3.	6	x	38	.42	x	0.63	x	0.7	:	= [	42.27	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $127.37$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $127.37$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ <td< td=""><td>East</td><td>0.9x</td><td>0.77</td><td>X</td><td>3.</td><td>6</td><td>x</td><td>63</td><td>.27</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td></td><td>= [</td><td>69.61</td><td>(76)</td></td<>	East	0.9x	0.77	X	3.	6	x	63	.27	x	0.63	x	0.7		= [	69.61	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.03$ $x$ $0.63$ $x$ $0.7$ $=$ $124.43$ $(13)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $127.37$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $27.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ <t< td=""><td>East</td><td>0.9x</td><td>0.77</td><td>x</td><td>3.</td><td>6</td><td>x</td><td>92</td><td>.28</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td>:</td><td>= [</td><td>101.53</td><td>(76)</td></t<>	East	0.9x	0.77	x	3.	6	x	92	.28	x	0.63	x	0.7	:	= [	101.53	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $235.1$ $(78)$ <t< td=""><td>East</td><td>0.9x</td><td>0.77</td><td>x</td><td>3.</td><td>6</td><td>x</td><td>113</td><td>8.09</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td></td><td>= [</td><td>124.43</td><td>(76)</td></t<>	East	0.9x	0.77	x	3.	6	x	113	8.09	x	0.63	x	0.7		= [	124.43	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$	East	0.9x	0.77	x	3.	6	x	115	5.77	x	0.63	x	0.7		= [	127.37	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $295.1$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ <td>East</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>3.</td> <td>6</td> <td>x</td> <td>110</td> <td>).22</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td></td> <td>= [</td> <td>121.26</td> <td>(76)</td>	East	0.9x	0.77	x	3.	6	x	110	).22	x	0.63	x	0.7		= [	121.26	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$	East	0.9x	0.77	x	3.	6	x	94	.68	x	0.63	x	0.7		= [	104.16	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	73	.59	x	0.63	x	0.7		= [	80.96	(76)
East $0.9x$ $0.77$ x $3.6$ x $16.15$ x $0.63$ x $0.7$ = $17.77$ $(76)$ South $0.9x$ $0.77$ x $9.9$ x $46.75$ x $0.63$ x $0.7$ = $141.45$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $46.75$ x $0.63$ x $0.7$ = $141.45$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $76.57$ x $0.63$ x $0.7$ = $231.66$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $97.53$ x $0.63$ x $0.7$ = $295.1$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $110.23$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	45	.59	x	0.63	x	0.7	:	- [	50.16	(76)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $295.1$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	24	.49	x	0.63	x	0.7		= [	26.94	(76)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $295.1$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	16	.15	x	0.63	x	0.7		= [	17.77	(76)
South $0.9x$ $0.77$ x $9.9$ x $97.53$ x $0.63$ x $0.77$ = $295.1$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $110.23$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $347.55$ $(78)$	South	0.9x	0.77	x	9.	9	x	46	.75	x	0.63	x	0.7		= [	141.45	(78)
South $0.9x$ $0.77$ x $9.9$ x $110.23$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $347.55$ $(78)$	South	0.9x	0.77	x	9.	9	x	76	.57	x	0.63	×	0.7		= [	231.66	(78)
South $0.9x$ 0.77 x 9.9 x 114.87 x 0.63 x 0.7 = 347.55 (78)	South	0.9x	0.77	x	9.	9	x	97	.53	x	0.63	×	0.7		= [	295.1	(78)
	South	0.9x	0.77	x	9.	9	x	110	).23	x	0.63	×	0.7		= [	333.52	(78)
South 0.9x 0.77 x 9.9 x 110.55 x 0.63 x 0.7 = 334.47 (78)	South	0.9x	0.77	x	9.	9	x	114	.87	x	0.63	x	0.7		= [	347.55	(78)
	South	0.9x	0.77	x	9.	9	x	110	).55	x	0.63	×	0.7		= [	334.47	(78)

	-																
South	0.9x	0.77		x	9.9		x	10	08.01	x		0.63	x	0.7	=	326.8	(78)
South	0.9x	0.77		x	9.9		x	1(	04.89	x		0.63	×	0.7	=	317.37	(78)
South	0.9x	0.77		x	9.9		x	1(	01.89	x		0.63	x	0.7	=	308.26	(78)
South	0.9x	0.77		x	9.9		x	8	2.59	×		0.63	×	0.7	=	249.87	(78)
South	0.9x	0.77		x	9.9		x	5	5.42	x		0.63	x	0.7	=	167.67	(78)
South	0.9x	0.77		x	9.9		x	4	40.4	x		0.63	x	0.7	=	122.23	(78)
West	0.9x	0.77		x	0.72		x	1	9.64	x		0.63	x	0.7	=	4.32	(80)
West	0.9x	0.77		x	0.72		x	3	8.42	x		0.63	x	0.7	=	8.45	(80)
West	0.9x	0.77		x	0.72		x	6	3.27	x		0.63	×	0.7	=	13.92	(80)
West	0.9x	0.77		x	0.72		x	9	2.28	x		0.63	×	0.7	=	20.31	(80)
West	0.9x	0.77		x	0.72		x	1.	13.09	x		0.63	x	0.7	=	24.89	(80)
West	0.9x	0.77		x	0.72		x	1	15.77	x		0.63	x	0.7	=	25.47	(80)
West	0.9x	0.77		x	0.72		x	1.	10.22	×		0.63	×	0.7	=	24.25	(80)
West	0.9x	0.77		x	0.72		x	9	4.68	x		0.63	x	0.7	=	20.83	(80)
West	0.9x	0.77		x	0.72		x	7	3.59	x		0.63	×	0.7	=	16.19	(80)
West	0.9x	0.77		x	0.72		x	4	5.59	x		0.63	×	0.7	=	10.03	(80)
West	0.9x	0.77		x	0.72		x	2	4.49	×		0.63	×	0.7	=	5.39	(80)
West	0.9x	0.77		x	0.72		x	1	6.15	×		0.63	×	0.7	=	3.55	(80)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	ŕ	15.3	×		0.63	×	0.7	=	13.11	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	2	8.48	x		0.63	×	0.7	=	24.41	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	5	0.24	x		0.63	×	0.7	=	43.07	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	8	9.03	×		0.63	۔ ا × آ	0.7	=	76.33	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	12	29.88	x		0.63	×	0.7	=	111.35	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	14	43.74	x		0.63	- ×	0.7	=	123.22	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	1:	32.31	x		0.63	-   ×	0.7	=	113.43	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	9	8.56	x		0.63	×	0.7	= =	84.5	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	6	2.62	x		0.63	-   ×	0.7	=	53.69	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	3	4.05	×		0.63	ا × آ	0.7	= =	29.19	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	1	8.64	×		0.63	- x	0.7	=	15.98	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	1	2.94	x		0.63	-   ×	0.7	=	11.1	(82)
	L							L		1							
Solar ga	ains in	watts, ca	alculat	ted	for each	mont	h			(83)m	า = Sเ	ım(74)m	.(82)m				
(83)m=	235.48	411.88	600.2	26	818.49	994.56	5 1(	024.14	971.89	833	.22	673.79	464.33	283.82	200.49	]	(83)
Total ga	ains – i	nternal a	nd so	lar	(84)m =	(73)m	1+(	83)m	, watts	-				-			
(84)m=	841.47	1015.52	1183.	38	1367.88	1508.4	3 1	504.77	1431.56	1299	9.66	1158.11	982.63	841.22	788.44		(84)
7. Mea	an inter	nal temp	eratu	re (	heating s	seaso	n)										
Tempe	erature	during h	eating	g pe	eriods in	the liv	ving	area f	rom Tab	ole 9	, Th1	(°C)				21	(85)
Utilisat	tion fac	ctor for ga	ains fo	or li	ving area	a, h1,r	m (s	ее Та	ble 9a)								
Г	Jan	Feb	Ма	ır	Apr	Мау	/	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	]	
(86)m=	0.99	0.99	0.97	'	0.94	0.87		0.75	0.62	0.6	68	0.86	0.96	0.99	0.99		(86)
Mean	interna	l tempera	ature	in li	ving area	a T1 (	follo	ow ste	ps 3 to 7	7 in T	able	9c)				-	
(87)m=	18.73	18.96	19.3	-	19.87	20.37	-	20.74	20.9	20.	-	20.55	19.91	19.21	18.67	]	(87)
Ľ		II			I					I	1			_I		1	

Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	n2 (°C)					
(88)m=	19.97	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	0.99	0.98	0.97	0.93	0.84	0.68	0.5	0.57	0.81	0.95	0.99	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	16.91	17.25	17.81	18.56	19.26	19.74	19.91	19.88	19.52	18.62	17.62	16.83		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.11	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	A) × T2			•		-
(92)m=	17.11	17.44	17.99	18.71	19.39	19.85	20.02	19.99	, 19.64	18.77	17.8	17.04		(92)
Apply	adjustn	nent to t	he mear	internal	tempera	ature fro	m Table	4e, whe	re appro	opriate				
(93)m=	16.96	17.29	17.84	18.56	19.24	19.7	19.87	19.84	19.49	18.62	17.65	16.89		(93)
8. Sp	ace hea	ting requ	uirement											
						ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	Jan	Feb	or gains Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Jun	Jui	Aug	Seb		INOV	Dec		
(94)m=	0.98	0.97	0.95	0.9	0.81	0.66	0.49	0.55	0.78	0.93	0.98	0.99		(94)
Usefu	l gains,	hmGm	, W = (94	1)m x (84	4)m									
(95)m=	828.84	988.82	1126.01	1233.78	1218.06	988.87	702.89	717.32	906.27	912.88	820.63	778.59		(95)
Month	nly aver	age exte	rnal tem	perature	e 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 =	- /	x [(93)m	– (96)m	]				
(97)m=	2928.17	2860.98	2617.98	2229.88	1740.81	1177.37	755.91	794.68	1243.64	1851.39	2435.63	2929.93		(97)
-							í –	24 x [(97)		· · ·	· · · · · ·			
(98)m=	1561.91	1258.09	1110.03	717.19	388.93	0	0	0	0	698.25	1162.8	1600.59		٦
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	8497.78	(98)
Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								41.6	(99)
9a. En	ergy rec	luiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
-	e heatir	-										,		-
			at from se			mentary							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) × [1 – (	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.6	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c			)								
	1561.91	1258.09	1110.03	717.19	388.93	0	0	0	0	698.25	1162.8	1600.59		
(211)m	n = {[(98	)m x (20	4)] } x 1	00 ÷ (20	)6)									(211)
	1723.96	1388.62	1225.19	791.6	429.28	0	0	0	0	770.69	1283.44	1766.66		
			<u> </u>	<u> </u>		<u> </u>		Tota	l (kWh/yea	ar) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>	=	9379.45	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							I		_
= {[(98	)m x (20	)1)]}x <sup>1</sup>	00 ÷ (20	8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	-	0	(215)

#### Water heating

							ergy /b/vear			Emiss	<b>ion fac</b> 2/kWh	tor	Emissions	r
12a. (	CO2 em	issions -	– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHF	)					
Total d	elivered	l energy	for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=				12706.7	(338)
Electric	city for li	ighting											600.52	(232)
Total e	lectricity	y for the	above, l	(Wh/yea	r			sum	of (230a).	(230g) =			169.73	(231)
boiler	with a f	an-assis	sted flue									45		(230e)
centra	al heatir	ng pump	:									30		(230c)
mech	anical v	entilatio	n - balan	iced, ext	ract or p	ositive ir	nput fron	n outside	Ð			94.73		(230a)
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t								
Water	heating	fuel use	d										2557.01	
Space	heating	fuel use	ed, main	system	1								9379.45	
Annua	I totals									k	Wh/year	•	kWh/year	-
								Tota	l = Sum(2	19a) <sub>112</sub> =			2557.01	(219)
	= (64)	<u>m x 100</u> 215.3			201.71	195.44	186.96	206.17	206.12	211.23	222.3	237.92		
		heating,	kWh/m	onth										
(217)m=		89.02	88.78	88.23	86.98	79.9	79.9	79.9	79.9	88.12	88.87	89.2		(217)
Efficier	-	ater hea											79.9	(216)
Output	from w 217.67	ater hea 191.67	ter (calc 200.87	ulated a	bove) 175.45	156.15	149.38	164.73	164.69	186.13	197.56	212.23		
Auto	from	otor hee	tor locia	ulated	houro)									

	kWh/year	kg CO2/kWh		kg CO2/ye	ar
Space heating (main system 1)	(211) x	0.216	=	2025.96	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	552.31	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2578.27	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	88.09	(267)
Electricity for lighting	(232) x	0.519	=	311.67	(268)
Total CO2, kg/year	sur	n of (265)(271) =		2978.03	(272)
Dwelling CO2 Emission Rate	(27	2) ÷ (4) =		14.58	(273)
El rating (section 14)				84	(274)

				User D	etails:									
Assessor Name: Software Name:	Matt Fitzp Stroma FS				Strom Softwa	are Ver				0003572 on: 1.0.5.41				
				operty /	Address	: Plot 2								
Address :	Plot 2, Wid	dington, TB	3C											
1. Overall dwelling dim	iensions:			_										
One word file an				<b></b>	a(m²)		Av. Hei		1	Volume(m <sup>3</sup> )	1			
Ground floor				1'	19.31	(1a) x	2	2.5	(2a) =	298.27	(3a)			
First floor				8	4.97	(1b) x	2.	.56	(2b) =	217.61	(3b)			
Total floor area TFA = (	1a)+(1b)+(1c)+	(1d)+(1e)+	(1n	) 20	04.28	(4)								
Dwelling volume       (3a)+(3b)+(3c)+(3d)+(3e)+(3n) =         2. Ventilation rate:														
2. Ventilation rate: main secondary other total m <sup>3</sup>														
2. Ventilation rate: main secondary other total m <sup>3</sup> per														
Number of chimneys	0	(6a)												
Number of open flues	0		0	i + Г	0	-   -	0	x 2	20 =	0	(6b)			
Number of intermittent f	ans						0	x 1	0 =	0	(7a)			
Number of passive vent	S						0	x 1	0 =	0	](7b)			
Number of flueless gas	fires						0	x 4	40 =	0	](7c)			
0						L					]``´			
									Air ch	nanges per hou	ır			
Infiltration due to chimn	eys, flues and t	ans = (6a)+	-(6b)+(7	a)+(7b)+(	7c) =	Γ	0	·	÷ (5) =	0	(8)			
If a pressurisation test has			proceed	l to (17), c	otherwise o	continue fr	om (9) to (	(16)			-			
Number of storeys in	the dwelling (n	s)								0	(9)			
Additional infiltration				0.05 (				[(9)-	1]x0.1 =	0	(10)			
Structural infiltration:							ruction			0	(11)			
if both types of wall are deducting areas of oper			nung to	ine great	ei wali ale	a (allel								
If suspended wooden	floor, enter 0.2	2 (unsealed	l) or 0.	1 (seale	ed), else	enter 0				0	(12)			
lf no draught lobby, e	nter 0.05, else	enter 0								0	(13)			
Percentage of window	ws and doors d	raught strip	ped							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	nvelope	area	4.65000009536743	(17)			
If based on air permeab										0.23	(18)			
Air permeability value appl		ion test has be	een don	e or a deg	gree air pe	rmeability	is being us	sed		r	1			
Number of sides shelter Shelter factor	rea				(20) = 1 -	[0.075 x (1	9)] =			2	(19)			
Infiltration rate incorpora	ating shelter fa	rtor			(21) = (18)		-/]			0.85	(20)			
Infiltration rate modified	-				. , (.0	,				0.2	(21)			
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]				
Monthly average wind s	·	· · · ·	2011	0.01	1,109					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				
			5.5	0.0	U.,	, T				J				

Wind F	actor (22	2a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjuste	ed infiltra	tion rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m						
	0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23			
	ate effect echanical		-	rate for t	he appli	cable ca	se						_		
				andix N (2	(23a) – (23a	a) x Emv (c	auation (I	N5)) , other	wieg (23t	(232)		l		.5	(23a)
								n Table 4h)		) – (23a)		ļ		.5	(23b)
			-	-	-			HR) (24a		2h)m + ('	23h) v [ <sup>,</sup>	1 _ (23c)		0	(23c)
(24a)m=	· · · · ·			0	0		0		0		0	1 - (230)	÷ 100]		(24a)
		d mech	i anical ve	entilation	u without	heat rec	coverv (N	MV) (24b	m = (2)	1 2b)m + (2	23b)				
(24b)m=		0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole ho	ouse ex	tract ver	tilation o	r positiv	e input v	ventilatio	on from o	outside			<u> </u>			
,					•	•		c) = (22b		.5 × (23b	)				
(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(24c)
,					•	•		on from l 0.5 + [(2:		0.5]					
(24d)m=	r í r	0	0	0	0	0	0	0	0	0	0	0			(24d)
Effec	ctive air c	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in box	(25)						
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(25)
3 He	at losses	and he	at loce r	poromot	or.			•			•	•			
ELEN		Gros	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<b>&lt;</b> )	k-value kJ/m²·ł		A X kJ/K	
	IENT		SS	Openin	gs	Net Ar A ,r 2.21				A X U (W/ł 3.094	<)				
ELEN Doors	IENT	Gros	SS	Openin	gs	A ,n	n²	W/m2	К	(W/ł	<) 				
ELEN Doors	<b>IENT</b> Type 1	Gros area	SS	Openin	gs	A ,r	n <sup>2</sup> x	W/m2	K = =	(W/ł 3.094	<) 				(26)
ELEN Doors Doors Window	<b>Type 1</b> Type 2	Gros area	SS	Openin	gs	A ,r 2.21 1.89	n <sup>2</sup> x x 2 x	W/m2	K = = 0.04] =	(W/ł 3.094 2.646	<) 				(26) (26)
ELEN Doors Doors Window Window	<b>IENT</b> Type 1 Type 2 ws Type	Gros area 1 2	SS	Openin	gs	A ,r 2.21 1.89 16.92	n <sup>2</sup> x x x x x1 x1	W/m2 1.4 1.4 /[1/(1.4)+	K = = = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43	<)				(26) (26) (27)
ELEN Doors Doors Window Window	<b>Type 1</b> Type 2 ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6	n <sup>2</sup> x x x x x1 x1 x1 x1	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	K = = = = = = 0.04] = = 0.04] = =	(W/H 3.094 2.646 22.43 4.77	$\diamond$				(26) (26) (27) (27)
ELEN Doors Doors Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72	n <sup>2</sup> x x x x1 x1 x1 x1 x1 x1	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/H 3.094 2.646 22.43 4.77 0.95	$\diamond$				(26) (26) (27) (27) (27)
ELEN Doors Doors Window Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72 9.9	n <sup>2</sup> x x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12					<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type ghts	Gros area 1 2 3	SS (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024		kJ/m²+ł		kJ/K	<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Window Window Window Window Rooflig Floor	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts	Gros area 1 2 3 4	21	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> 1 x 7 x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4 )+	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172		kJ/m²+k 75		kJ/K 8948.25	<ul> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(28)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type ghts Type1 Type2	Gros area 1 2 3 4	21 25	Openin m	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x <sup>2</sup> x <sup>3</sup>	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/(1.4 )+ (0.12) 0.19	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64		kJ/m²+k 75 60		kJ/K 8948.25 8098.2	(26) (26) (27) (27) (27) (27) (27) (27b) (28) (29)
ELEN Doors Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type yhts Type1 Type2 Type1	Gros area 1 2 3 4 170.1 82.8	21 21 21 21	Openin m 35.24	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ (0.12 0.19 0.17	K = = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38		kJ/m²-ŀ 75 60 9		kJ/K 8948.25 8098.2 745.65	(26) (26) (27) (27) (27) (27) (27b) (28) (29) (29)
ELEN Doors Window Window Window Window Rooflig Floor Walls Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type1	Gros area 1 2 3 4 170 82.8 58.7	21 21 25 24	Openin m 35.24 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74	n <sup>2</sup> x x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup></sup>	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/( 1.4 )+ 0.12 0.19 0.17 0.11	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46		kJ/m²-k 75 60 9 9		kJ/K 8948.25 8098.2 745.65 528.66	(26) (27) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Noalls Roof Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 (170) 82.8 58.7 18.6	21 21 25 24 25	Openin m 35.24 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64	n <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05		kJ/m²-ŀ 75 60 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 21 55 4 1	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35	n <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30) (30)
ELEN Doors Doors Window Window Window Window Rooflig Floor Walls Roof Roof Roof Roof T Roof T Roof T Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 21 55 4 1	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x <sup>1</sup>	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (29) (29) (30) (30) (30)

Interna	al floor					84.97	7				Г	18	٦	1529.46	(32d)
Interna	al ceiling					84.97	7				Ī	9	Ē	764.73	(32e)
			ows, use e sides of in				ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	L ns given in	paragraph	 3.2		-
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	) + (32) =				1	19.68	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	262	228.76	(34)
Therm	al mass	parame	ter (TMF	• = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			1	28.4	(35)
	-		ere the de tailed calci		constructi	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f			-
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						2	6.11	(36)
			are not kn	own (36) =	= 0.05 x (3	1)									_
	abric he								(33) +	(36) =			14	15.79	(37)
Ventila	tion hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × (	25)m x (5)		I		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	85.46	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12			(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	231.25	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91			_
Heat lo	oss para	meter (H	HLP), W/	′m²K			-			Average = = (39)m ÷	Sum(39)1. (4)	<sub>12</sub> /12=	23	30.94	(39)
(40)m=	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13			
									/	Average =	Sum(40)1.	12 /12=	1	.13	(40)
Numbe	er of day	rs 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	ear:		
A			NI .										l		(10)
		ipancy, l 9. N = 1		[1 - exp	(-0.0003	349 x (TF	- A -13.9	)2)] + 0.(	)013 x (	TFA -13.		01			(42)
	A £ 13.9				(	- (		, ,]			- /				
								(25 x N)				5.63			(43)
		-	not water person per			-	-	to achieve	a water us	se target o	Γ				
							I	Aug	Son	Oct	Nov	Dee			
Hot wate	Jan er usage ii	Feb n litres per	Mar day for ea	Apr ach month	May Vd.m = fa	Jun ctor from T	Jul Table 1c x	Aug (43)	Sep		INOV	Dec			
(44)m=	116.19	, 111.97	107.74	103.52	99.29	95.07	95.07	99.29	103.52	107.74	111.97	116.19			
(++)11-	110.15	111.57	107.74	100.02	55.25	55.07	55.07	55.25			m(44) <sub>112</sub> =		12	67.53	(44)
Energy of	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )					12	01.00	
(45)m=	172.31	150.7	155.51	135.58	130.09	112.26	104.02	119.37	120.79	140.77	153.67	166.87			
										L Total = Su	m(45) <sub>112</sub> =	=	16	61.94	(45)
lf instan	taneous w	ater heatii	ng at point	of use (no	hot water	<sup>.</sup> storage),	enter 0 in	boxes (46			( - )				
(46)m=	25.85	22.61	23.33	20.34	19.51	16.84	15.6	17.91	18.12	21.12	23.05	25.03			(46)
	storage						•								
0		```		0 1			•	within sa	ame ves	sel		180			(47)
	•	-	ind no ta		-			. ,	,	(0) -	47)				
Otherv	vise if no	o stored	not wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)				

Water storage loss:

a) If m	nanufact	turer's de	eclared l	oss fact	or is kno	wn (kWł	n/day):				1.	.32		(48)
Tempe	erature f	actor fro	m Table	2b							0.	.54		(49)
			-	e, kWh/y				(48) x (49	) =		0.	.71		(50)
Hot wa If com	ater stor munity h		factor fi	rom Tab	loss fact le 2 (kW							0		(51) (52)
		actor fro		2b								0		(53)
Energy	y lost fro	om water	storage	e, kWh/y	ear			(47) x (51	) x (52) x (	53) =		0		(54)
		(54) in (8	-								0.	.71		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(57)
Primar	v circuit	loss (ar	nual) fr	, om Table	- <u>-</u> 3							0		(58)
		•	,			59)m = (	(58) ÷ 36	65 × (41)	m		L	-		
	-						ter heatii			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	Iculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	heat req	uired 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=	217.67	191.67	200.87	179.47	175.45	156.15	149.38	164.73	164.69	186.13	197.56	212.23	. , . ,	(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	217.67	191.67	200.87	179.47	175.45	156.15	149.38	164.73	164.69	186.13	197.56	212.23		
								Out	out from wa	ater heate	r (annual)₁	12	2196.01	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m	]	
(65)m=	93.58	82.88	87.99	80.2	79.54	72.44	70.88	75.98	75.28	83.09	86.21	91.77		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a	):									
Metab	olic gair	s (Table	e 5), Wat	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37		(66)
Lightin	ig gains	(calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	34	30.2	24.56	18.59	13.9	11.73	12.68	16.48	22.12	28.09	32.78	34.95		(67)
Applia	nces ga	ins (calc	ulated in	n Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	375.1	378.99	369.18	348.3	321.94	297.17	280.62	276.72	286.53	307.41	333.77	358.54		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	tion L15	or L15a)	), also se	e Table	5				
(69)m=	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04		(69)
Pumps	s and fa	ns gains	(Table :	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)

(r1)=-       1203	Losses	Losses e.g. evaporation (negative values) (Table 5)															
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(71)m=	-120.3	-120.3	-120.3	-120.3	-120.3	-	120.3	-120.3	-120	0.3 -120.3	-120	.3 -120.3	-120.	3		(71)
Total internal gains =         (66/m + (67/m + (67/m + (7/0m + (7/2)m + (	Water	heating	gains (T	able 5)		•	-					-		-			
Comme         Bools 00:06:0         683.13         549.39         513.86         480.63         496.44         484.32         516.3         557.4         587.96         (73)           Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.           Orientation:           Access Factor         Area         Flux         0         Table 6b         Table 6c         Gains         (W)           North         0.82         0.77         ×         16.92         ×         0.033         ×         0.63         ×         0.77         =         549.86         (74)           North         0.82         0.77         ×         16.92         ×         0.633         ×         0.7         =         105.06         (74)           North         0.92         0.77         ×         16.92         ×         0.633         ×         0.7         =         286.91         (74)           North         0.92         0.77         ×         16.92         ×         74.99         ×         0.633         ×         0.7         =         246.91         74         96.92         0.77         = </td <td>(72)m=</td> <td>125.78</td> <td>123.34</td> <td>118.27</td> <td>111.38</td> <td>106.91</td> <td>1</td> <td>00.61</td> <td>95.26</td> <td>102</td> <td>.12 104.56</td> <td>111.6</td> <td>69 119.74</td> <td>123.3</td> <td>5</td> <td></td> <td>(72)</td>	(72)m=	125.78	123.34	118.27	111.38	106.91	1	00.61	95.26	102	.12 104.56	111.6	69 119.74	123.3	5		(72)
6. Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.           Orientation: Access Factor         Area         FLux         Gains           Table 6a         Gains           Morth         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.77         ×         105.06         (74)           North         0.9x         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         288.61         (74)           North         0.9x         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         288.61         (74)           North         0.9x         0.77         ×         16.92	Total i	nterna	l gains =					(66)m	ı + (67)m	1 + (68	3)m + (69)m +	(70)m +	- (71)m + (72	!)m			
<th< td=""><td>(73)m=</td><td>605.99</td><td>603.64</td><td>583.13</td><td>549.39</td><td>513.86</td><td>4</td><td>80.63</td><td>459.67</td><td>466</td><td>.44 484.32</td><td>518.</td><td>3 557.4</td><td>587.9</td><td>6</td><td></td><td>(73)</td></th<>	(73)m=	605.99	603.64	583.13	549.39	513.86	4	80.63	459.67	466	.44 484.32	518.	3 557.4	587.9	6		(73)
Orientation:         Access Factor Table 6d         Area m <sup>2</sup> Flux Table 6a         g Table 6b         FF Table 6c         Gains (W)           North         0.9x         0.77         x         16.92         x         10.63         x         0.63         x         0.77         =         64.98         (74)           North         0.9x         0.77         x         16.92         x         20.32         x         0.63         x         0.77         =         64.98         (74)           North         0.9x         0.77         x         16.92         x         55.46         x         0.63         x         0.77         =         128.68.1         (74)           North         0.9x         0.77         x         16.92         x         74.98         x         0.63         x         0.77         =         413.6         74)           North         0.9x         0.77         x         16.92         x         74.88         0.63         x         0.77         =         386.36         (74)           North         0.9x         0.77         x         16.92         x         1.12         0.63         x         0.77         =	6. Sol	ar gain	s:			-											
Table 6d         m <sup>2</sup> Table 6a         Table 6b         Table 6c         (W)           North         0.9x         0.77         x         16.92         x         0.63         x         0.77         =         54.98         (74)           North         0.9x         0.77         x         16.92         x         0.63         x         0.77         =         105.08         (74)           North         0.9x         0.77         x         16.92         x         34.53         x         0.63         x         0.77         =         178.56         (74)           North         0.9x         0.777         x         16.92         x         74.72         x         0.63         x         0.77         =         138.615         (74)           North         0.9x         0.777         x         16.92         x         74.88         x         0.63         x         0.77         =         138.615         (74)           North         0.9x         0.777         x         16.92         x         11.12         x         0.63         x         0.77         =         125.08         (74)           North         0.9x	Solar g	ains are	calculated u	using sola	r flux from	Table 6a	a and	lassocia	ted equa	tions	to convert to t	he appli	cable orienta	ition.			
North         0.9*         0.77         ×         16.92         ×         10.63         ×         0.77         =         64.98         (74)           North         0.9*         0.77         ×         16.92         ×         20.32         ×         0.63         ×         0.77         =         105.08         (74)           North         0.9*         0.77         ×         16.92         ×         55.46         ×         0.63         ×         0.77         =         286.81         74/1           North         0.9*         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         286.81         74/1           North         0.9*         0.77         ×         16.92         ×         78.99         ×         0.63         ×         0.77         =         386.15         74           North         0.9*         0.77         ×         16.92         ×         41.52         ×         0.63         ×         0.77         =         214.68         74           North         0.9*         0.77         ×         16.92         ×         13.12         ×         <	Orienta			actor													
North       0.9x       0.0.7       x       10.9z       x       10.9z       0.0.7       x       10.9z       x       0.0.8z       x       0.0.7       z       10.9z       0.77       x       11.9z       x       0.0.3z       x       0.77       z       11.9z       x       0.63       x       0.77       z       11.9z       x       0.63       x       0.77       z       11.9z       x       0.63       x       0.77       z       11.8z       x       74.7z       x       0.63       x       0.77       z       11.8z       x       74.7z       x       0.63       x       0.77       z       11.8z       x       74.7z       x       0.63       x       0.77       z       11.8z       x       74.8z       0.63       x       0.77       z       11.8z       x       74.8z       0.63       x       0.77       z       11.8z       x       0.63       x       0.77       z       11.8z       x       11.1z       x       0.63       x       0.77       z       11.8z       x       11.1z       x       0.63       x       0.77       z       11.8z       x       11.1z       x       0.63									e oa						F	(VV)	_
North       0.80       0.77       x       16.92       x       34.53       x       0.63       x       0.77       =       178.66       (74)         North       0.9x       0.77       x       16.92       x       55.46       x       0.63       x       0.77       =       286.81       (74)         North       0.9x       0.77       x       16.92       x       74.72       x       0.63       x       0.77       =       286.81       (74)         North       0.9x       0.77       x       16.92       x       79.99       x       0.63       x       0.77       =       386.35       (74)         North       0.9x       0.77       x       16.92       x       74.88       x       0.63       x       0.77       =       396.36       (74)         North       0.9x       0.77       x       16.92       x       24.19       x       0.63       x       0.77       =       125.08       (74)         North       0.9x       0.77       x       16.92       x       24.19       x       0.63       x       0.77       =       125.08       (74)			0.77	X	16	92	x	10	.63	X	0.63	×	0.7		= [	54.98	(74)
North         0.5x         0.77         x         16.92         x         55.46         x         0.63         x         0.77         =         266.81         (74)           North         0.9x         0.77         x         16.92         x         77.42         x         0.63         x         0.77         =         286.81         (74)           North         0.9x         0.77         x         16.92         x         77.999         x         0.63         x         0.77         =         413.6         (74)           North         0.9x         0.77         x         16.92         x         74.88         x         0.63         x         0.77         =         413.6         (74)           North         0.9x         0.77         x         16.92         x         24.19         x         0.63         x         0.77         =         214.68         (74)           North         0.9x         0.77         x         16.92         x         24.19         x         0.63         x         0.77         =         214.68         (74)           North         0.9x         0.77         x         16.92         x			0.77	X	16	92	x	20	.32	X	0.63	×	0.7		= [	105.08	(74)
North         0.5x         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         79.99         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         74.68         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         59.25         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         24.19         ×         0.63         ×         0.77         =         125.08         (74)           North         0.9x         0.77         ×         16.92         ×         24.19         ×         0.63         ×         0.77         =         125.08         (74)           North         0.9x         0.77         ×         3.6         ×		0.9x	0.77	×	16	92	x	34	.53	x	0.63	×	0.7		= [	178.56	(74)
North         0.9x         0.77         x         16.92         x         79.99         x         0.63         x         0.77         =         413.6         (74)           North         0.5x         0.77         x         16.92         x         74.68         x         0.63         x         0.77         =         396.15         (74)           North         0.5x         0.77         x         16.92         x         74.68         x         0.63         x         0.77         =         396.15         (74)           North         0.5x         0.77         x         16.92         x         41.52         x         0.63         x         0.77         =         214.68         (74)           North         0.5x         0.77         x         16.92         x         24.19         x         0.63         x         0.7         =         214.68         (74)           North         0.5x         0.77         x         16.92         x         8.86         x         0.63         x         0.7         =         214.68         (74)           North         0.5x         0.77         x         3.6         x <td< td=""><td></td><td></td><td>0.77</td><td>x</td><td>16</td><td>92</td><td>x</td><td>55</td><td>.46</td><td>x</td><td>0.63</td><td>×</td><td>0.7</td><td></td><td>- [</td><td>286.81</td><td>(74)</td></td<>			0.77	x	16	92	x	55	.46	x	0.63	×	0.7		- [	286.81	(74)
North         0.5x         0.77         ×         16.92         ×         74.68         ×         0.63         ×         0.77         =         386.15         (74)           North         0.5x         0.77         ×         16.92         ×         55.25         ×         0.63         ×         0.77         =         386.15         (74)           North         0.9x         0.77         ×         16.92         ×         41.52         ×         0.63         ×         0.77         =         214.68         (74)           North         0.9x         0.77         ×         16.92         ×         13.12         ×         0.63         ×         0.77         =         125.08         (74)           North         0.9x         0.77         ×         16.92         ×         18.42         ×         0.63         ×         0.77         =         67.83         (74)           Reat         0.9x         0.77         ×         3.6         ×         19.64         ×         0.63         ×         0.77         =         21.61         (76)           East         0.9x         0.77         ×         3.6         ×         2		0.9x	0.77	x	16	92	x	74	.72	x	0.63	×	0.7		- [	386.35	(74)
North       0.9x       0.77       x       16.92       x       59.25       x       0.63       x       0.77       =       306.36       (74)         North       0.9x       0.77       x       16.92       x       41.52       x       0.63       x       0.77       =       214.68       (74)         North       0.9x       0.77       x       16.92       x       41.52       x       0.63       x       0.77       =       214.68       (74)         North       0.9x       0.77       x       16.92       x       13.12       x       0.63       x       0.77       =       67.83       (74)         North       0.9x       0.77       x       16.92       x       8.86       x       0.63       x       0.77       =       45.84       (74)         East       0.9x       0.77       x       3.6       x       8.86       x       0.63       x       0.77       =       42.27       (76)         East       0.9x       0.77       x       3.6       x       113.09       x       0.63       x       0.77       =       121.43       (76)         Ea		0.9x	0.77	x	16	92	x	79	.99	x	0.63	×	0.7		= [	413.6	(74)
North       0.9x       0.77       x       16.92       x       41.52       x       0.63       x       0.77       =       214.68       (74)         North       0.9x       0.77       x       16.92       x       24.19       x       0.63       x       0.77       =       125.08       (74)         North       0.9x       0.77       x       16.92       x       13.12       x       0.63       x       0.77       =       67.83       (74)         North       0.9x       0.77       x       16.92       x       8.86       x       0.63       x       0.77       =       45.84       (74)         North       0.9x       0.77       x       3.6       x       8.86       x       0.63       x       0.77       =       45.84       (74)         East       0.9x       0.77       x       3.6       x       8.86       x       0.63       x       0.77       =       42.27       (76)         East       0.9x       0.77       x       3.6       x       113.09       x       0.63       x       0.77       =       121.26       (76)         East </td <td>North</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>16</td> <td>92</td> <td>x</td> <td>74</td> <td>.68</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td></td> <td>= [</td> <td>386.15</td> <td>(74)</td>	North	0.9x	0.77	x	16	92	x	74	.68	x	0.63	x	0.7		= [	386.15	(74)
North $0.9x$ $0.77$ $x$ $16.92$ $x$ $24.19$ $x$ $0.63$ $x$ $0.7$ $z$ $125.08$ $(74)$ North $0.9x$ $0.77$ $x$ $16.92$ $x$ $13.12$ $x$ $0.63$ $x$ $0.7$ $z$ $125.08$ $(74)$ North $0.9x$ $0.77$ $x$ $16.92$ $x$ $13.12$ $x$ $0.63$ $x$ $0.7$ $z$ $67.83$ $(74)$ North $0.9x$ $0.77$ $x$ $16.92$ $x$ $8.86$ $x$ $0.63$ $x$ $0.7$ $z$ $45.84$ $(74)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $45.84$ $(74)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $45.84$ $(74)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $42.27$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.228$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ <td>North</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>16</td> <td>92</td> <td>x</td> <td>59</td> <td>.25</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td></td> <td>= [</td> <td>306.36</td> <td>(74)</td>	North	0.9x	0.77	x	16	92	x	59	.25	x	0.63	x	0.7		= [	306.36	(74)
North0.9x0.77x16.92x13.12x0.63x0.77=67.83(74)North0.9x0.77x16.92x8.86x0.63x0.77=45.84(74)East0.9x0.77x3.6x19.64x0.63x0.77=21.61(76)East0.9x0.77x3.6x19.64x0.63x0.77=42.27(76)East0.9x0.77x3.6x63.27x0.63x0.77=69.61(76)East0.9x0.77x3.6x92.28x0.63x0.77=101.53(76)East0.9x0.77x3.6x113.09x0.63x0.77=124.43(76)East0.9x0.77x3.6x115.77x0.63x0.77=127.37(76)East0.9x0.77x3.6x110.22x0.63x0.77=121.26(76)East0.9x0.77x3.6x110.22x0.63x0.77=104.16(76)East0.9x0.77x3.6x110.22x0.63x0.77=104.16(76)East0.9x0.77x3.6x <td>North</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>16</td> <td>92</td> <td>x</td> <td>41</td> <td>.52</td> <td>x</td> <td>0.63</td> <td>×</td> <td>0.7</td> <td></td> <td>= [</td> <td>214.68</td> <td>(74)</td>	North	0.9x	0.77	x	16	92	x	41	.52	x	0.63	×	0.7		= [	214.68	(74)
North       0.9x       0.77       ×       16.92       ×       8.86       ×       0.63       ×       0.77       =       45.84       (74)         East       0.9x       0.77       ×       3.6       ×       19.64       ×       0.63       ×       0.77       =       21.61       (76)         East       0.9x       0.77       ×       3.6       ×       19.64       ×       0.63       ×       0.77       =       21.61       (76)         East       0.9x       0.77       ×       3.6       ×       38.42       ×       0.63       ×       0.77       =       42.27       (76)         East       0.9x       0.77       ×       3.6       ×       92.28       ×       0.63       ×       0.77       =       101.53       (76)         East       0.9x       0.77       ×       3.6       ×       113.09       ×       0.63       ×       0.77       =       127.37       (76)         East       0.9x       0.77       ×       3.6       ×       110.22       ×       0.63       ×       0.77       =       121.26       (76)         East	North	0.9x	0.77	x	16	92	x	24	.19	x	0.63	x	0.7		= [	125.08	(74)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $21.61$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $z$ $42.27$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $z$ $42.27$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $z$ $69.61$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $z$ $50.16$ $(76)$ E	North	0.9x	0.77	x	16	92	x	13	.12	x	0.63	x	0.7		= [	67.83	(74)
East       0.9x       0.77       x       3.6       x       38.42       x       0.63       x       0.77       =       42.27       (76)         East       0.9x       0.77       x       3.6       x       63.27       x       0.63       x       0.77       =       69.61       (76)         East       0.9x       0.77       x       3.6       x       92.28       x       0.63       x       0.77       =       69.61       (76)         East       0.9x       0.77       x       3.6       x       113.09       x       0.63       x       0.77       =       124.43       (76)         East       0.9x       0.77       x       3.6       x       115.77       x       0.63       x       0.77       =       124.43       (76)         East       0.9x       0.77       x       3.6       x       110.22       x       0.63       x       0.77       =       121.26       (76)         East       0.9x       0.77       x       3.6       x       110.23       x       0.63       x       0.77       =       80.96       (76)       East       0.9x	North	0.9x	0.77	x	16	92	x	8.8	86	x	0.63	x	0.7		= [	45.84	(74)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $z$ $69.61$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $122.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $z$ $122.6$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ $z$ Sou	East	0.9x	0.77	x	3.	6	x	19	.64	x	0.63	x	0.7		= [	21.61	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $z$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $z$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ $z$ S	East	0.9x	0.77	x	3.	6	x	38	.42	x	0.63	x	0.7	:	= [	42.27	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $127.37$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $127.37$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ <td< td=""><td>East</td><td>0.9x</td><td>0.77</td><td>x</td><td>3.</td><td>6</td><td>x</td><td>63</td><td>.27</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td></td><td>= [</td><td>69.61</td><td>(76)</td></td<>	East	0.9x	0.77	x	3.	6	x	63	.27	x	0.63	x	0.7		= [	69.61	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.03$ $x$ $0.63$ $x$ $0.7$ $=$ $124.43$ $(13)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $127.37$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $27.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ <t< td=""><td>East</td><td>0.9x</td><td>0.77</td><td>x</td><td>3.</td><td>6</td><td>x</td><td>92</td><td>.28</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td>:</td><td>= [</td><td>101.53</td><td>(76)</td></t<>	East	0.9x	0.77	x	3.	6	x	92	.28	x	0.63	x	0.7	:	= [	101.53	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $235.1$ $(78)$ <t< td=""><td>East</td><td>0.9x</td><td>0.77</td><td>x</td><td>3.</td><td>6</td><td>x</td><td>113</td><td>8.09</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td></td><td>= [</td><td>124.43</td><td>(76)</td></t<>	East	0.9x	0.77	x	3.	6	x	113	8.09	x	0.63	x	0.7		= [	124.43	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$	East	0.9x	0.77	x	3.	6	x	115	5.77	x	0.63	x	0.7		= [	127.37	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $295.1$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ <td>East</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>3.</td> <td>6</td> <td>x</td> <td>110</td> <td>).22</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td></td> <td>= [</td> <td>121.26</td> <td>(76)</td>	East	0.9x	0.77	x	3.	6	x	110	).22	x	0.63	x	0.7		= [	121.26	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$	East	0.9x	0.77	x	3.	6	x	94	.68	x	0.63	x	0.7		= [	104.16	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	73	.59	x	0.63	x	0.7		= [	80.96	(76)
East $0.9x$ $0.77$ x $3.6$ x $16.15$ x $0.63$ x $0.7$ = $17.77$ $(76)$ South $0.9x$ $0.77$ x $9.9$ x $46.75$ x $0.63$ x $0.7$ = $141.45$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $46.75$ x $0.63$ x $0.7$ = $141.45$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $76.57$ x $0.63$ x $0.7$ = $231.66$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $97.53$ x $0.63$ x $0.7$ = $295.1$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $110.23$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	45	.59	x	0.63	x	0.7	:	- [	50.16	(76)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $295.1$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	24	.49	x	0.63	x	0.7		= [	26.94	(76)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $295.1$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	16	.15	x	0.63	x	0.7		= [	17.77	(76)
South $0.9x$ $0.77$ x $9.9$ x $97.53$ x $0.63$ x $0.77$ = $295.1$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $110.23$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $347.55$ $(78)$	South	0.9x	0.77	x	9.	9	x	46	.75	x	0.63	x	0.7		= [	141.45	(78)
South $0.9x$ $0.77$ x $9.9$ x $110.23$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $347.55$ $(78)$	South	0.9x	0.77	x	9.	9	x	76	.57	x	0.63	×	0.7		= [	231.66	(78)
South $0.9x$ 0.77 x 9.9 x 114.87 x 0.63 x 0.7 = 347.55 (78)	South	0.9x	0.77	x	9.	9	x	97	.53	x	0.63	×	0.7		= [	295.1	(78)
	South	0.9x	0.77	x	9.	9	x	110	).23	x	0.63	×	0.7		= [	333.52	(78)
South 0.9x 0.77 x 9.9 x 110.55 x 0.63 x 0.7 = 334.47 (78)	South	0.9x	0.77	x	9.	9	x	114	.87	x	0.63	x	0.7		= [	347.55	(78)
	South	0.9x	0.77	x	9.	9	x	110	).55	x	0.63	×	0.7		= [	334.47	(78)

	-																
South	0.9x	0.77		x	9.9		x	10	08.01	x		0.63	x	0.7	=	326.8	(78)
South	0.9x	0.77		x	9.9		x	1(	04.89	x		0.63	×	0.7	=	317.37	(78)
South	0.9x	0.77		x	9.9		x	1(	01.89	x		0.63	x	0.7	=	308.26	(78)
South	0.9x	0.77		x	9.9		x	8	2.59	×		0.63	×	0.7	=	249.87	(78)
South	0.9x	0.77		x	9.9		x	5	5.42	x		0.63	x	0.7	=	167.67	(78)
South	0.9x	0.77		x	9.9		x	4	40.4	x		0.63	x	0.7	=	122.23	(78)
West	0.9x	0.77		x	0.72		x	1	9.64	x		0.63	x	0.7	=	4.32	(80)
West	0.9x	0.77		x	0.72		x	3	8.42	x		0.63	x	0.7	=	8.45	(80)
West	0.9x	0.77		x	0.72		x	6	3.27	x		0.63	×	0.7	=	13.92	(80)
West	0.9x	0.77		x	0.72		x	9	2.28	x		0.63	×	0.7	=	20.31	(80)
West	0.9x	0.77		x	0.72		x	1.	13.09	x		0.63	x	0.7	=	24.89	(80)
West	0.9x	0.77		x	0.72		x	1	15.77	x		0.63	x	0.7	=	25.47	(80)
West	0.9x	0.77		x	0.72		x	1.	10.22	×		0.63	×	0.7	=	24.25	(80)
West	0.9x	0.77		x	0.72		x	9	4.68	x		0.63	x	0.7	=	20.83	(80)
West	0.9x	0.77		x	0.72		x	7	3.59	x		0.63	×	0.7	=	16.19	(80)
West	0.9x	0.77		x	0.72		x	4	5.59	x		0.63	×	0.7	=	10.03	(80)
West	0.9x	0.77		x	0.72		x	2	4.49	×		0.63	×	0.7	=	5.39	(80)
West	0.9x	0.77		x	0.72		x	1	6.15	×		0.63	×	0.7	=	3.55	(80)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	ŕ	15.3	×		0.63	×	0.7	=	13.11	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	2	8.48	×		0.63	×	0.7	=	24.41	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	5	0.24	×		0.63	×	0.7	=	43.07	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	8	9.03	×		0.63	۔ ا × آ	0.7	=	76.33	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	12	29.88	x		0.63	×	0.7	=	111.35	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	14	43.74	x		0.63	- ×	0.7	=	123.22	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	1:	32.31	x		0.63	-   ×	0.7	=	113.43	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	9	8.56	x		0.63	×	0.7	= =	84.5	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	6	2.62	x		0.63	-   ×	0.7	=	53.69	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	3	4.05	×		0.63	ا × آ	0.7	= =	29.19	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	1	8.64	×		0.63	- x	0.7	=	15.98	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	1	2.94	x		0.63	-   ×	0.7	=	11.1	(82)
	L							L		1							
Solar ga	ains in	watts, ca	alculat	ted	for each	mont	h			(83)m	า = Sเ	ım(74)m	.(82)m				
(83)m=	235.48	411.88	600.2	26	818.49	994.56	5 1(	024.14	971.89	833	.22	673.79	464.33	283.82	200.49	]	(83)
Total ga	ains – i	nternal a	nd so	lar	(84)m =	(73)m	1+(	83)m	, watts	-				-			
(84)m=	841.47	1015.52	1183.	38	1367.88	1508.4	3 1	504.77	1431.56	1299	9.66	1158.11	982.63	841.22	788.44		(84)
7. Mea	an inter	nal temp	eratu	re (	heating s	seaso	n)										
Tempe	erature	during h	eating	g pe	eriods in	the liv	ving	area f	rom Tab	ole 9	, Th1	(°C)				21	(85)
Utilisat	tion fac	ctor for ga	ains fo	or li	ving area	a, h1,r	m (s	ее Та	ble 9a)								
Г	Jan	Feb	Ма	ır	Apr	Мау	/	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	]	
(86)m=	0.99	0.99	0.97	'	0.94	0.87		0.75	0.62	0.6	68	0.86	0.96	0.99	0.99		(86)
Mean	interna	l tempera	ature	in li	ving area	a T1 (	follo	ow ste	ps 3 to 7	7 in T	able	9c)				-	
(87)m=	18.73	18.96	19.3	-	19.87	20.37	-	20.74	20.9	20.	-	20.55	19.91	19.21	18.67	]	(87)
Ľ		II			I					I	1			_I		1	

Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	n2 (°C)					
(88)m=	19.97	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	0.99	0.98	0.97	0.93	0.84	0.68	0.5	0.57	0.81	0.95	0.99	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	16.91	17.25	17.81	18.56	19.26	19.74	19.91	19.88	19.52	18.62	17.62	16.83		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.11	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	llina) = fl	LA × T1	+ (1 – fL	A) × T2			•		-
(92)m=	17.11	17.44	17.99	18.71	19.39	19.85	20.02	19.99	, 19.64	18.77	17.8	17.04		(92)
Apply	adjustn	nent to t	he mear	internal	tempera	ature fro	m Table	4e, whe	re appro	opriate				
(93)m=	16.96	17.29	17.84	18.56	19.24	19.7	19.87	19.84	19.49	18.62	17.65	16.89		(93)
8. Sp	ace hea	ting requ	uirement											
						ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	Jan	Feb	or gains Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Jun	Jui	Aug	Seb		INOV	Dec		
(94)m=	0.98	0.97	0.95	0.9	0.81	0.66	0.49	0.55	0.78	0.93	0.98	0.99		(94)
Usefu	l gains,	hmGm	, W = (94	1)m x (84	4)m									
(95)m=	828.84	988.82	1126.01	1233.78	1218.06	988.87	702.89	717.32	906.27	912.88	820.63	778.59		(95)
Month	nly aver	age exte	rnal tem	perature	e 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 =	- /	x [(93)m	– (96)m	]				
(97)m=	2928.17	2860.98	2617.98	2229.88	1740.81	1177.37	755.91	794.68	1243.64	1851.39	2435.63	2929.93		(97)
-							í –	24 x [(97)		· · ·	· · · · · ·			
(98)m=	1561.91	1258.09	1110.03	717.19	388.93	0	0	0	0	698.25	1162.8	1600.59		٦
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	8497.78	(98)
Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								41.6	(99)
9a. En	ergy rec	luiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
-	e heatir	-										,		-
			at from se			mentary							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) × [1 – (	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.6	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c			)								
	1561.91	1258.09	1110.03	717.19	388.93	0	0	0	0	698.25	1162.8	1600.59		
(211)m	n = {[(98	)m x (20	4)] } x 1	00 ÷ (20	)6)									(211)
	1723.96	1388.62	1225.19	791.6	429.28	0	0	0	0	770.69	1283.44	1766.66		
				<u> </u>		<u> </u>		Tota	l (kWh/yea	ar) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>	=	9379.45	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							I		_
= {[(98	)m x (20	)1)]}x <sup>1</sup>	00 ÷ (20	8)				. <u> </u>						
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	-	0	(215)

#### Water heating

							ergy /b/vear			Emiss	<b>ion fac</b> 2/kWh	tor	Emissions	r
12a. (	CO2 em	issions -	– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHF	)					
Total d	elivered	l energy	for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=				12706.7	(338)
Electric	city for li	ighting											600.52	(232)
Total e	lectricity	y for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			169.73	(231)
boiler	with a f	an-assis	sted flue									45		(230e)
centra	al heatir	ng pump	:									30		(230c)
mech	anical v	entilatio	n - balan	iced, ext	ract or p	ositive ir	nput fron	n outside	Ð			94.73		(230a)
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t								
Water	heating	fuel use	d										2557.01	
Space	heating		9379.45											
Annua	•	kWh/year	-											
								Tota	l = Sum(2	19a) <sub>112</sub> =			2557.01	(219)
	= (64)	<u>m x 100</u> 215.3			201.71	195.44	186.96	206.17	206.12	211.23	222.3	237.92		
		heating,	kWh/m	onth										
(217)m=		89.02	88.78	88.23	86.98	79.9	79.9	79.9	79.9	88.12	88.87	89.2		(217)
Efficier	-	ater hea											79.9	(216)
Output	from w 217.67	ater hea 191.67	ter (calc 200.87	ulated a	bove) 175.45	156.15	149.38	164.73	164.69	186.13	197.56	212.23		
Auto	from	otor hee	tor locia	ulated	houro)									

	kWh/year	kg CO2/kWh		kg CO2/ye	ar
Space heating (main system 1)	(211) x	0.216	=	2025.96	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	552.31	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2578.27	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	88.09	(267)
Electricity for lighting	(232) x	0.519	=	311.67	(268)
Total CO2, kg/year	sur	n of (265)(271) =		2978.03	(272)
Dwelling CO2 Emission Rate	(27	2) ÷ (4) =		14.58	(273)
El rating (section 14)				84	(274)

					User D	etails:								
Assessor Name: Software Name:		tt Fitzpat oma FSA				Strom Softwa	are Vei				0003572 on: 1.0.5.41			
					roperty	Address	: Plot 3							
Address :		t 3, Widdi	ngton,	твс										
1. Overall dwelling dir	nension	S:				( ))			• • • • • •					
Ground floor					<b></b>	a(m²)			ight(m)		Volume(m <sup>3</sup> )			
					1	19.31	(1a) x	2	2.5	(2a) =	298.27	(3a)		
First floor					8	84.97	(1b) x	2	.56	(2b) =	217.61	(3b)		
Total floor area TFA =	(1a)+(1t	o)+(1c)+(′	1d)+(1e	e)+(1r	I) 2	04.28	(4)							
Dwelling volume							(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	515.88	(5)		
2. Ventilation rate: main secondary other total m <sup>3</sup> per hour														
main secondary other total m <sup>3</sup> per hour heating heating														
Number of chimneys	Ĺ			-	] + [	0	] = [	0	x 4	40 =	0	(6a)		
Number of open flues	Ē	0	i + F	0		0	] = [	0	x2	20 =	0	(6b)		
Number of intermittent	L fans							0	x ^	10 =	0	(7a)		
Number of passive ven	ts							0	x ^	10 =	0	(7b)		
Number of flueless gas	fires							0	x 4	40 =	0	(7c)		
Ũ							L					]`´		
										Air ch	nanges per hou	r		
Infiltration due to chimr	neys, flu	es and fa	ns = <mark>(6</mark>	a)+(6b)+(7	a)+(7b)+(	7c) =	Г	0	·	÷ (5) =	0	(8)		
If a pressurisation test has				ed, procee	d to (17), o	otherwise of	continue fr	rom (9) to (	(16)					
Number of storeys in	the dwo	elling (ns)	)								0	(9)		
Additional infiltration	0.05 (		4	(	0.05 (***				[(9)	-1]x0.1 =	0	(10)		
Structural infiltration: if both types of wall are								uction			0	(11)		
deducting areas of ope				ponung ic	line great		a (allel							
If suspended wooder	n floor, e	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)		
If no draught lobby, e	enter 0.0	)5, else e	nter 0								0	(13)		
Percentage of windo	ws and	doors dra	aught st	ripped							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	nvelope	area	4.65000009536743	(17)		
If based on air permea											0.23	(18)		
Air permeability value app		ressurisation	n test has	s been dor	e or a deg	gree air pe	rmeability	is being us	sed			lue		
Number of sides shelte Shelter factor	rea					(20) = 1 -	[0.075 x (1	[9]] =			2 0.85	(19) (20)		
Infiltration rate incorpor	ating sh	elter fact	or			(21) = (18		/-			0.00	(21)		
Infiltration rate modified	-			ł		х <i>у</i> х -					0.2	]()		
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]			
Monthly average wind			-			1	1 - 24		L		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			
				I		I	I		I		J			

Wind F	actor (22	2a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjuste	ed infiltra	tion rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m						
	0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23			
	ate effect echanical		-	rate for t	he appli	cable ca	se						_		
				andix N (2	(23a) – (23a	a) x Emv (c	auation (I	N5)) , other	wiee (23t	(232)		l		.5	(23a)
								n Table 4h)		) – (23a)		l		.5	(23b)
			-	-	-			HR) (24a		2h)m + ('	23h) v [ <sup>,</sup>	1 _ (23c)		0	(23c)
(24a)m=	· · · · ·			0	0		0		0		0	1 - (230)	÷ 100]		(24a)
		d mech	i anical ve	entilation	u without	heat rec	coverv (N	MV) (24b	m = (2)	1 2b)m + (2	23b)				
(24b)m=		0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole ho	ouse ex	tract ver	tilation o	r positiv	e input v	ventilatio	on from o	outside			<u> </u>			
,					•	•		c) = (22b		.5 × (23b	)				
(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(24c)
,					•	•		on from l 0.5 + [(2:		0.5]					
(24d)m=	r í r	0	0	0	0	0	0	0	0	0	0	0			(24d)
Effec	ctive air c	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in box	(25)						
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(25)
3 He	at losses	and he	at loce r	poromot	or.			•			•	•	l		
ELEN		Gros	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<b>&lt;</b> )	k-value kJ/m²·ł		A X kJ/K	
	IENT		SS	Openin	gs	Net Ar A ,r 2.21				A X U (W/ł 3.094	<)				
ELEN Doors	IENT	Gros	SS	Openin	gs	A ,n	n²	W/m2	К	(W/ł	<) 				
ELEN Doors	<b>IENT</b> Type 1	Gros area	SS	Openin	gs	A ,r	n <sup>2</sup> x	W/m2	K = =	(W/ł 3.094	<) 				(26)
ELEN Doors Doors Window	<b>Type 1</b> Type 2	Gros area	SS	Openin	gs	A ,r 2.21 1.89	n <sup>2</sup> x x 2 x	W/m2	K = = 0.04] =	(W/ł 3.094 2.646	<) 				(26) (26)
ELEN Doors Doors Window Window	<b>IENT</b> Type 1 Type 2 ws Type	Gros area 1 2	SS	Openin	gs	A ,r 2.21 1.89 16.92	n <sup>2</sup> x x x x x1 x1	W/m2 1.4 1.4 /[1/(1.4)+	K = = = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43	<)				(26) (26) (27)
ELEN Doors Doors Window Window	<b>Type 1</b> Type 2 ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6	n <sup>2</sup> x x x x x1 x1 x1 x1	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	K = = = = = = 0.04] = = 0.04] = =	(W/H 3.094 2.646 22.43 4.77	$\diamond$				(26) (26) (27) (27)
ELEN Doors Doors Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72	n <sup>2</sup> x x x x1 x1 x1 x1 x1 x1	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43 4.77 0.95	$\diamond$				(26) (26) (27) (27) (27)
ELEN Doors Doors Window Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72 9.9	n <sup>2</sup> x x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12					<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type ghts	Gros area 1 2 3	SS (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024		kJ/m²+ł		kJ/K	<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Window Window Window Window Rooflig Floor	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts	Gros area 1 2 3 4	21	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> 1 x 7 x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4 )+	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172		kJ/m²+k 75		kJ/K 8948.25	<ul> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(28)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type ghts Type1 Type2	Gros area 1 2 3 4	21 25	Openin m	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x <sup>2</sup> x <sup>3</sup>	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/(1.4 )+ (0.12) 0.19	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64		kJ/m²+k 75 60		kJ/K 8948.25 8098.2	(26) (26) (27) (27) (27) (27) (27) (27b) (28) (29)
ELEN Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type yhts Type1 Type2 Type1	Gros area 1 2 3 4 170.1 82.8	21 21 21 21	Openin m 35.24	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ (0.12 0.19 0.17	K = = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38		kJ/m²-ŀ 75 60 9		kJ/K 8948.25 8098.2 745.65	(26) (26) (27) (27) (27) (27) (27b) (28) (29) (29)
ELEN Doors Window Window Window Window Rooflig Floor Walls Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type1	Gros area 1 2 3 4 170 82.8 58.7	21 21 25 24	Openin m 35.24 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74	n <sup>2</sup> x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/( 1.4 )+ 0.12 0.19 0.17 0.11	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46		kJ/m²-k 75 60 9 9		kJ/K 8948.25 8098.2 745.65 528.66	(26) (27) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Noalls Roof Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 (170) 82.8 58.7 18.6	21 21 25 24 25	Openin m 35.24 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64	n <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05		kJ/m²-ŀ 75 60 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 21 55 4 1	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35	n <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30) (30)
ELEN Doors Doors Window Window Window Window Rooflig Floor Walls Roof Roof Roof Roof T Roof T Roof T Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 21 55 4 1	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x <sup>1</sup>	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (29) (29) (30) (30) (30) (30)

Interna	al floor					84.97	7				Г	18	٦	1529.46	(32d)
Interna	al ceiling					84.97	7				Ī	9	Ē	764.73	(32e)
			ows, use e sides of in				ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	L Is given in	paragraph	 3.2		-
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	) + (32) =				1	19.68	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	262	228.76	(34)
Therm	al mass	parame	ter (TMF	• = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			1	28.4	(35)
	-		ere the de tailed calci		constructi	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f			-
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						2	6.11	(36)
			are not kn	own (36) =	= 0.05 x (3	1)									_
	abric he								(33) +	(36) =			14	15.79	(37)
Ventila	tion hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × (	25)m x (5)		I		
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (38)m=         85.46         85.12         85.															
(38)m=	85.46	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12			(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	231.25	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91			
Heat lo	oss para	meter (H	HLP), W/	′m²K			-			Average = = (39)m ÷	Sum(39)1. (4)	<sub>12</sub> /12=	23	30.94	(39)
(40)m=	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13			
									/	Average =	Sum(40)1.	12 /12=	1	.13	(40)
Numbe	er of day	rs 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	ear:		
A			NI .										l		(10)
		ipancy, l 9. N = 1		[1 - exp	(-0.0003	349 x (TF	- A -13.9	)2)] + 0.(	)013 x (	TFA -13.		01			(42)
	A £ 13.9				(	- (		, ,]			- /				
								(25 x N)				5.63			(43)
		-	not water person per			-	-	to achieve	a water us	se target o	Γ				
							I	Aug	Son	Oct	Nov	Dee			
Hot wate	Jan er usage ii	Feb n litres per	Mar day for ea	Apr ach month	May Vd.m = fa	Jun ctor from T	Jul Table 1c x	Aug (43)	Sep		INOV	Dec			
(44)m=	116.19	, 111.97	107.74	103.52	99.29	95.07	95.07	99.29	103.52	107.74	111.97	116.19			
(++)11-	110.15	111.57	107.74	100.02	55.25	55.07	55.07	55.25			m(44) <sub>112</sub> =		12	67.53	(44)
Energy of	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )					12	01.00	
(45)m=	172.31	150.7	155.51	135.58	130.09	112.26	104.02	119.37	120.79	140.77	153.67	166.87			
										L Total = Su	m(45) <sub>112</sub> =	=	16	61.94	(45)
lf instan	taneous w	ater heatii	ng at point	of use (no	hot water	<sup>.</sup> storage),	enter 0 in	boxes (46			( - )				
(46)m=	25.85	22.61	23.33	20.34	19.51	16.84	15.6	17.91	18.12	21.12	23.05	25.03			(46)
	storage						•								
0		```		0 1			•	within sa	ame ves	sel		180			(47)
	•	-	ind no ta		-			. ,	,	(0) -	47)				
Otherv	vise if no	o stored	not wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)				

Water storage loss:

a) If m	nanufact	turer's de	eclared l	oss fact	or is kno	wn (kWł	n/day):				1.	.32		(48)
Tempe	erature f	actor fro	m Table	2b							0.	.54		(49)
			-	e, kWh/y				(48) x (49	) =		0.	.71		(50)
Hot wa If com	ater stor munity h		factor fi	rom Tab	loss fact le 2 (kW							0		(51) (52)
		actor fro		2b								0		(53)
Energy	y lost fro	om water	storage	e, kWh/y	ear			(47) x (51	) x (52) x (	53) =		0		(54)
		(54) in (8	-								0.	.71		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(57)
Primar	v circuit	loss (ar	nual) fr	, om Table	- <u>-</u> 3							0		(58)
		•	,			59)m = (	(58) ÷ 36	65 × (41)	m		L	-		
	-						ter heatii			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	Iculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	heat req	uired 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=	217.67	191.67	200.87	179.47	175.45	156.15	149.38	164.73	164.69	186.13	197.56	212.23	. , . ,	(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	217.67	191.67	200.87	179.47	175.45	156.15	149.38	164.73	164.69	186.13	197.56	212.23		
								Out	out from wa	ater heate	r (annual)₁	12	2196.01	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m	]	
(65)m=	93.58	82.88	87.99	80.2	79.54	72.44	70.88	75.98	75.28	83.09	86.21	91.77		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a	):									
Metab	olic gair	s (Table	e 5), Wat	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37		(66)
Lightin	ig gains	(calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	34	30.2	24.56	18.59	13.9	11.73	12.68	16.48	22.12	28.09	32.78	34.95		(67)
Applia	nces ga	ins (calc	ulated in	n Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	375.1	378.99	369.18	348.3	321.94	297.17	280.62	276.72	286.53	307.41	333.77	358.54		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	tion L15	or L15a)	), also se	e Table	5				
(69)m=	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04	38.04		(69)
Pumps	s and fa	ns gains	(Table :	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)

(r1)=-       1203	Losses	Losses e.g. evaporation (negative values) (Table 5)															
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(71)m=	-120.3	-120.3	-120.3	-120.3	-120.3	-	120.3	-120.3	-120	0.3 -120.3	-120	.3 -120.3	-120.	3		(71)
Total internal gains =         (66/m + (67/m + (67/m + (7/0m + (7/2)m + (	Water	heating	gains (T	able 5)		•	-					-		-			
Comme         Bools 00:06:0         683.13         549.39         513.86         480.63         496.44         484.32         516.3         557.4         587.96         (73)           Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.           Orientation:           Access Factor         Area         Flux         0         Table 6b         Table 6c         Gains         (W)           North         0.82         0.77         ×         16.92         ×         0.033         ×         0.63         ×         0.77         =         549.86         (74)           North         0.82         0.77         ×         16.92         ×         0.633         ×         0.7         =         105.06         (74)           North         0.92         0.77         ×         16.92         ×         0.633         ×         0.7         =         286.91         (74)           North         0.92         0.77         ×         16.92         ×         74.99         ×         0.633         ×         0.7         =         246.91         74.98         0.633         ×         0.7	(72)m=	125.78	123.34	118.27	111.38	106.91	1	00.61	95.26	102	.12 104.56	111.6	69 119.74	123.3	5		(72)
6. Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.           Orientation: Access Factor         Area         FLux         Gains           Table 6a         Gains           Morth         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.63         ×         0.77         ×         105.06         (74)           North         0.9x         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         288.61         (74)           North         0.9x         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         288.61         (74)           North         0.9x         0.77         ×         16.92	Total i	nterna	l gains =					(66)m	ı + (67)m	1 + (68	3)m + (69)m +	(70)m +	- (71)m + (72	!)m			
<th< td=""><td>(73)m=</td><td>605.99</td><td>603.64</td><td>583.13</td><td>549.39</td><td>513.86</td><td>4</td><td>80.63</td><td>459.67</td><td>466</td><td>.44 484.32</td><td>518.</td><td>3 557.4</td><td>587.9</td><td>6</td><td></td><td>(73)</td></th<>	(73)m=	605.99	603.64	583.13	549.39	513.86	4	80.63	459.67	466	.44 484.32	518.	3 557.4	587.9	6		(73)
Orientation:         Access Factor Table 6d         Area m <sup>2</sup> Flux Table 6a         g Table 6b         FF Table 6c         Gains (W)           North         0.9x         0.77         x         16.92         x         10.63         x         0.63         x         0.77         =         64.98         (74)           North         0.9x         0.77         x         16.92         x         20.32         x         0.63         x         0.77         =         64.98         (74)           North         0.9x         0.77         x         16.92         x         55.46         x         0.63         x         0.77         =         128.68.1         (74)           North         0.9x         0.77         x         16.92         x         74.98         x         0.63         x         0.77         =         413.6         74)           North         0.9x         0.77         x         16.92         x         74.88         0.63         x         0.77         =         386.36         (74)           North         0.9x         0.77         x         16.92         x         1.12         0.63         x         0.77         =	6. Sol	ar gain	s:			-											
Table 6d         m <sup>2</sup> Table 6a         Table 6b         Table 6c         (W)           North         0.9x         0.77         x         16.92         x         0.63         x         0.77         =         54.98         (74)           North         0.9x         0.77         x         16.92         x         0.63         x         0.77         =         105.08         (74)           North         0.9x         0.77         x         16.92         x         34.53         x         0.63         x         0.77         =         178.56         (74)           North         0.9x         0.777         x         16.92         x         74.72         x         0.63         x         0.77         =         138.615         (74)           North         0.9x         0.777         x         16.92         x         74.88         x         0.63         x         0.77         =         138.615         (74)           North         0.9x         0.777         x         16.92         x         11.12         x         0.63         x         0.77         =         125.08         (74)           North         0.9x	Solar g	ains are	calculated u	using sola	r flux from	Table 6a	a and	lassocia	ted equa	tions	to convert to t	he appli	cable orienta	ition.			
North         0.9*         0.77         ×         16.92         ×         10.63         ×         0.77         =         64.98         (74)           North         0.9*         0.77         ×         16.92         ×         20.32         ×         0.63         ×         0.77         =         105.08         (74)           North         0.9*         0.77         ×         16.92         ×         55.46         ×         0.63         ×         0.77         =         286.81         74/1           North         0.9*         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         286.81         74/1           North         0.9*         0.77         ×         16.92         ×         78.99         ×         0.63         ×         0.77         =         386.15         74           North         0.9*         0.77         ×         16.92         ×         41.52         ×         0.63         ×         0.77         =         214.68         74           North         0.9*         0.77         ×         16.92         ×         13.12         ×         <	Orienta			actor													
North       0.9x       0.0.7       x       10.9z       x       10.9z       0.0.7       x       10.9z       x       0.0.8z       x       0.0.7       z       10.9z       0.77       x       11.9z       x       0.0.3z       x       0.77       z       11.9z       x       0.63       x       0.77       z       11.9z       x       0.63       x       0.77       z       11.9z       x       0.63       x       0.77       z       11.8z       x       74.7z       x       0.63       x       0.77       z       11.8z       x       74.7z       x       0.63       x       0.77       z       11.8z       x       74.7z       x       0.63       x       0.77       z       11.8z       x       74.8z       0.63       x       0.77       z       11.8z       x       74.8z       0.63       x       0.77       z       11.8z       x       0.63       x       0.77       z       11.8z       x       11.1z       x       0.63       x       0.77       z       11.8z       x       11.1z       x       0.63       x       0.77       z       11.8z       x       11.1z       x       0.63									e oa						F	(VV)	_
North       0.80       0.77       x       16.92       x       34.53       x       0.63       x       0.77       =       178.66       (74)         North       0.9x       0.77       x       16.92       x       55.46       x       0.63       x       0.77       =       286.81       (74)         North       0.9x       0.77       x       16.92       x       74.72       x       0.63       x       0.77       =       286.81       (74)         North       0.9x       0.77       x       16.92       x       79.99       x       0.63       x       0.77       =       386.35       (74)         North       0.9x       0.77       x       16.92       x       74.88       x       0.63       x       0.77       =       396.36       (74)         North       0.9x       0.77       x       16.92       x       24.19       x       0.63       x       0.77       =       125.08       (74)         North       0.9x       0.77       x       16.92       x       24.19       x       0.63       x       0.77       =       125.08       (74)			0.77	X	16	92	x	10	.63	X	0.63	×	0.7		= [	54.98	(74)
North         0.5x         0.77         x         16.92         x         55.46         x         0.63         x         0.77         =         266.81         (74)           North         0.9x         0.77         x         16.92         x         77.42         x         0.63         x         0.77         =         286.81         (74)           North         0.9x         0.77         x         16.92         x         77.999         x         0.63         x         0.77         =         413.6         (74)           North         0.9x         0.77         x         16.92         x         74.88         x         0.63         x         0.77         =         413.6         (74)           North         0.9x         0.77         x         16.92         x         24.19         x         0.63         x         0.77         =         214.68         (74)           North         0.9x         0.77         x         16.92         x         24.19         x         0.63         x         0.77         =         214.68         (74)           North         0.9x         0.77         x         16.92         x			0.77	X	16	92	x	20	.32	X	0.63	×	0.7		= [	105.08	(74)
North         0.5x         0.77         ×         16.92         ×         74.72         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         79.99         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         74.68         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         59.25         ×         0.63         ×         0.77         =         386.35         (74)           North         0.9x         0.77         ×         16.92         ×         24.19         ×         0.63         ×         0.77         =         125.08         (74)           North         0.9x         0.77         ×         16.92         ×         24.19         ×         0.63         ×         0.77         =         125.08         (74)           North         0.9x         0.77         ×         3.6         ×		0.9x	0.77	×	16	92	x	34	.53	x	0.63	×	0.7		= [	178.56	(74)
North         0.9x         0.77         x         16.92         x         79.99         x         0.63         x         0.77         =         413.6         (74)           North         0.5x         0.77         x         16.92         x         74.68         x         0.63         x         0.77         =         396.15         (74)           North         0.5x         0.77         x         16.92         x         74.68         x         0.63         x         0.77         =         396.15         (74)           North         0.5x         0.77         x         16.92         x         41.52         x         0.63         x         0.77         =         214.68         (74)           North         0.5x         0.77         x         16.92         x         24.19         x         0.63         x         0.7         =         214.68         (74)           North         0.5x         0.77         x         16.92         x         8.86         x         0.63         x         0.7         =         214.68         (74)           North         0.5x         0.77         x         3.6         x <td< td=""><td></td><td></td><td>0.77</td><td>x</td><td>16</td><td>92</td><td>x</td><td>55</td><td>.46</td><td>x</td><td>0.63</td><td>×</td><td>0.7</td><td></td><td>- [</td><td>286.81</td><td>(74)</td></td<>			0.77	x	16	92	x	55	.46	x	0.63	×	0.7		- [	286.81	(74)
North         0.5x         0.77         ×         16.92         ×         74.68         ×         0.63         ×         0.77         =         386.15         (74)           North         0.5x         0.77         ×         16.92         ×         55.25         ×         0.63         ×         0.77         =         386.15         (74)           North         0.9x         0.77         ×         16.92         ×         41.52         ×         0.63         ×         0.77         =         214.68         (74)           North         0.9x         0.77         ×         16.92         ×         13.12         ×         0.63         ×         0.77         =         125.08         (74)           North         0.9x         0.77         ×         16.92         ×         18.42         ×         0.63         ×         0.77         =         67.83         (74)           East         0.9x         0.77         ×         3.6         ×         19.64         ×         0.63         ×         0.77         =         21.61         (76)           East         0.9x         0.77         ×         3.6         ×         2		0.9x	0.77	x	16	92	x	74	.72	x	0.63	×	0.7		- [	386.35	(74)
North       0.9x       0.77       x       16.92       x       59.25       x       0.63       x       0.77       =       306.36       (74)         North       0.9x       0.77       x       16.92       x       41.52       x       0.63       x       0.77       =       214.68       (74)         North       0.9x       0.77       x       16.92       x       41.52       x       0.63       x       0.77       =       214.68       (74)         North       0.9x       0.77       x       16.92       x       13.12       x       0.63       x       0.77       =       67.83       (74)         North       0.9x       0.77       x       16.92       x       8.86       x       0.63       x       0.77       =       45.84       (74)         East       0.9x       0.77       x       3.6       x       8.86       x       0.63       x       0.77       =       42.27       (76)         East       0.9x       0.77       x       3.6       x       113.09       x       0.63       x       0.77       =       121.43       (76)         Ea		0.9x	0.77	x	16	92	x	79	.99	x	0.63	×	0.7		= [	413.6	(74)
North       0.9x       0.77       x       16.92       x       41.52       x       0.63       x       0.77       =       214.68       (74)         North       0.9x       0.77       x       16.92       x       24.19       x       0.63       x       0.77       =       125.08       (74)         North       0.9x       0.77       x       16.92       x       13.12       x       0.63       x       0.77       =       67.83       (74)         North       0.9x       0.77       x       16.92       x       8.86       x       0.63       x       0.77       =       45.84       (74)         North       0.9x       0.77       x       3.6       x       8.86       x       0.63       x       0.77       =       45.84       (74)         East       0.9x       0.77       x       3.6       x       8.86       x       0.63       x       0.77       =       42.27       (76)         East       0.9x       0.77       x       3.6       x       113.09       x       0.63       x       0.77       =       121.26       (76)         East </td <td>North</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>16</td> <td>92</td> <td>x</td> <td>74</td> <td>.68</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td></td> <td>= [</td> <td>386.15</td> <td>(74)</td>	North	0.9x	0.77	x	16	92	x	74	.68	x	0.63	x	0.7		= [	386.15	(74)
North $0.9x$ $0.77$ $x$ $16.92$ $x$ $24.19$ $x$ $0.63$ $x$ $0.7$ $z$ $125.08$ $(74)$ North $0.9x$ $0.77$ $x$ $16.92$ $x$ $13.12$ $x$ $0.63$ $x$ $0.7$ $z$ $125.08$ $(74)$ North $0.9x$ $0.77$ $x$ $16.92$ $x$ $13.12$ $x$ $0.63$ $x$ $0.7$ $z$ $67.83$ $(74)$ North $0.9x$ $0.77$ $x$ $16.92$ $x$ $8.86$ $x$ $0.63$ $x$ $0.7$ $z$ $45.84$ $(74)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $45.84$ $(74)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $45.84$ $(74)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $42.27$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.228$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ <td>North</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>16</td> <td>92</td> <td>x</td> <td>59</td> <td>.25</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td></td> <td>= [</td> <td>306.36</td> <td>(74)</td>	North	0.9x	0.77	x	16	92	x	59	.25	x	0.63	x	0.7		= [	306.36	(74)
North0.9x0.77x16.92x13.12x0.63x0.77=67.83(74)North0.9x0.77x16.92x8.86x0.63x0.77=45.84(74)East0.9x0.77x3.6x19.64x0.63x0.77=21.61(76)East0.9x0.77x3.6x19.64x0.63x0.77=42.27(76)East0.9x0.77x3.6x63.27x0.63x0.77=69.61(76)East0.9x0.77x3.6x92.28x0.63x0.77=101.53(76)East0.9x0.77x3.6x113.09x0.63x0.77=124.43(76)East0.9x0.77x3.6x115.77x0.63x0.77=127.37(76)East0.9x0.77x3.6x110.22x0.63x0.77=121.26(76)East0.9x0.77x3.6x110.22x0.63x0.77=104.16(76)East0.9x0.77x3.6x110.22x0.63x0.77=104.16(76)East0.9x0.77x3.6x <td>North</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>16</td> <td>92</td> <td>x</td> <td>41</td> <td>.52</td> <td>x</td> <td>0.63</td> <td>×</td> <td>0.7</td> <td></td> <td>= [</td> <td>214.68</td> <td>(74)</td>	North	0.9x	0.77	x	16	92	x	41	.52	x	0.63	×	0.7		= [	214.68	(74)
North       0.9x       0.77       ×       16.92       ×       8.86       ×       0.63       ×       0.77       =       45.84       (74)         East       0.9x       0.77       ×       3.6       ×       19.64       ×       0.63       ×       0.77       =       21.61       (76)         East       0.9x       0.77       ×       3.6       ×       19.64       ×       0.63       ×       0.77       =       21.61       (76)         East       0.9x       0.77       ×       3.6       ×       38.42       ×       0.63       ×       0.77       =       42.27       (76)         East       0.9x       0.77       ×       3.6       ×       92.28       ×       0.63       ×       0.77       =       101.53       (76)         East       0.9x       0.77       ×       3.6       ×       113.09       ×       0.63       ×       0.77       =       127.37       (76)         East       0.9x       0.77       ×       3.6       ×       110.22       ×       0.63       ×       0.77       =       121.26       (76)         East	North	0.9x	0.77	x	16	92	x	24	.19	x	0.63	x	0.7		= [	125.08	(74)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $z$ $21.61$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $z$ $42.27$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $z$ $42.27$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $z$ $69.61$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $z$ $50.16$ $(76)$ E	North	0.9x	0.77	x	16	92	x	13	.12	x	0.63	x	0.7		= [	67.83	(74)
East       0.9x       0.77       x       3.6       x       38.42       x       0.63       x       0.77       =       42.27       (76)         East       0.9x       0.77       x       3.6       x       63.27       x       0.63       x       0.77       =       69.61       (76)         East       0.9x       0.77       x       3.6       x       92.28       x       0.63       x       0.77       =       69.61       (76)         East       0.9x       0.77       x       3.6       x       113.09       x       0.63       x       0.77       =       124.43       (76)         East       0.9x       0.77       x       3.6       x       115.77       x       0.63       x       0.77       =       124.43       (76)         East       0.9x       0.77       x       3.6       x       110.22       x       0.63       x       0.77       =       121.26       (76)         East       0.9x       0.77       x       3.6       x       110.23       x       0.63       x       0.77       =       80.96       (76)       East       0.9x	North	0.9x	0.77	x	16	92	x	8.8	86	x	0.63	x	0.7		= [	45.84	(74)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $z$ $69.61$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $122.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $z$ $122.6$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $z$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ South <td< td=""><td>East</td><td>0.9x</td><td>0.77</td><td>x</td><td>3.</td><td>6</td><td>x</td><td>19</td><td>.64</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td></td><td>= [</td><td>21.61</td><td>(76)</td></td<>	East	0.9x	0.77	x	3.	6	x	19	.64	x	0.63	x	0.7		= [	21.61	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $z$ $101.53$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $z$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $z$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $z$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $z$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ $z$ S	East	0.9x	0.77	x	3.	6	x	38	.42	x	0.63	x	0.7	:	= [	42.27	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $113.09$ $x$ $0.63$ $x$ $0.7$ $=$ $124.43$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $127.37$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $127.37$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ <td< td=""><td>East</td><td>0.9x</td><td>0.77</td><td>x</td><td>3.</td><td>6</td><td>x</td><td>63</td><td>.27</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td></td><td>= [</td><td>69.61</td><td>(76)</td></td<>	East	0.9x	0.77	x	3.	6	x	63	.27	x	0.63	x	0.7		= [	69.61	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.03$ $x$ $0.63$ $x$ $0.7$ $=$ $124.43$ $(13)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $115.77$ $x$ $0.63$ $x$ $0.7$ $=$ $127.37$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $27.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ <t< td=""><td>East</td><td>0.9x</td><td>0.77</td><td>x</td><td>3.</td><td>6</td><td>x</td><td>92</td><td>.28</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td>:</td><td>= [</td><td>101.53</td><td>(76)</td></t<>	East	0.9x	0.77	x	3.	6	x	92	.28	x	0.63	x	0.7	:	= [	101.53	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $=$ $121.26$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $235.1$ $(78)$ <t< td=""><td>East</td><td>0.9x</td><td>0.77</td><td>x</td><td>3.</td><td>6</td><td>x</td><td>113</td><td>8.09</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td></td><td>= [</td><td>124.43</td><td>(76)</td></t<>	East	0.9x	0.77	x	3.	6	x	113	8.09	x	0.63	x	0.7		= [	124.43	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $=$ $104.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$	East	0.9x	0.77	x	3.	6	x	115	5.77	x	0.63	x	0.7		= [	127.37	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $73.59$ $x$ $0.63$ $x$ $0.7$ $=$ $80.96$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $295.1$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ <td>East</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>3.</td> <td>6</td> <td>x</td> <td>110</td> <td>).22</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td></td> <td>= [</td> <td>121.26</td> <td>(76)</td>	East	0.9x	0.77	x	3.	6	x	110	).22	x	0.63	x	0.7		= [	121.26	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $=$ $50.16$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$	East	0.9x	0.77	x	3.	6	x	94	.68	x	0.63	x	0.7		= [	104.16	(76)
East $0.9x$ $0.77$ $x$ $3.6$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $=$ $26.94$ $(76)$ East $0.9x$ $0.77$ $x$ $3.6$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $=$ $17.77$ $(76)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	73	.59	x	0.63	x	0.7		= [	80.96	(76)
East $0.9x$ $0.77$ x $3.6$ x $16.15$ x $0.63$ x $0.7$ = $17.77$ $(76)$ South $0.9x$ $0.77$ x $9.9$ x $46.75$ x $0.63$ x $0.7$ = $141.45$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $46.75$ x $0.63$ x $0.7$ = $141.45$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $76.57$ x $0.63$ x $0.7$ = $231.66$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $97.53$ x $0.63$ x $0.7$ = $295.1$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $110.23$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	45	.59	x	0.63	x	0.7	:	- [	50.16	(76)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $141.45$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $295.1$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	24	.49	x	0.63	x	0.7		= [	26.94	(76)
South $0.9x$ $0.77$ $x$ $9.9$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $231.66$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $295.1$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $333.52$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$ South $0.9x$ $0.77$ $x$ $9.9$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $347.55$ $(78)$	East	0.9x	0.77	x	3.	6	x	16	.15	x	0.63	x	0.7		= [	17.77	(76)
South $0.9x$ $0.77$ x $9.9$ x $97.53$ x $0.63$ x $0.77$ = $295.1$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $110.23$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $347.55$ $(78)$	South	0.9x	0.77	x	9.	9	x	46	.75	x	0.63	x	0.7		= [	141.45	(78)
South $0.9x$ $0.77$ x $9.9$ x $110.23$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $333.52$ $(78)$ South $0.9x$ $0.77$ x $9.9$ x $114.87$ x $0.63$ x $0.7$ = $347.55$ $(78)$	South	0.9x	0.77	x	9.	9	x	76	.57	x	0.63	×	0.7		= [	231.66	(78)
South $0.9x$ 0.77 x 9.9 x 114.87 x 0.63 x 0.7 = 347.55 (78)	South	0.9x	0.77	x	9.	9	x	97	.53	x	0.63	×	0.7		= [	295.1	(78)
	South	0.9x	0.77	x	9.	9	x	110	).23	x	0.63	×	0.7		= [	333.52	(78)
South 0.9x 0.77 x 9.9 x 110.55 x 0.63 x 0.7 = 334.47 (78)	South	0.9x	0.77	x	9.	9	x	114	.87	x	0.63	x	0.7		= [	347.55	(78)
	South	0.9x	0.77	x	9.	9	x	110	).55	x	0.63	×	0.7		= [	334.47	(78)

	-																
South	0.9x	0.77		x	9.9		x	10	08.01	x		0.63	x	0.7	=	326.8	(78)
South	0.9x	0.77		x	9.9		x	1(	04.89	x		0.63	×	0.7	=	317.37	(78)
South	0.9x	0.77		x	9.9		x	1(	01.89	x		0.63	x	0.7	=	308.26	(78)
South	0.9x	0.77		x	9.9		x	8	2.59	×		0.63	×	0.7	=	249.87	(78)
South	0.9x	0.77		x	9.9		x	5	5.42	x		0.63	x	0.7	=	167.67	(78)
South	0.9x	0.77		x	9.9		x	4	40.4	x		0.63	x	0.7	=	122.23	(78)
West	0.9x	0.77		x	0.72		x	1	9.64	x		0.63	x	0.7	=	4.32	(80)
West	0.9x	0.77		x	0.72		x	3	8.42	x		0.63	x	0.7	=	8.45	(80)
West	0.9x	0.77		x	0.72		x	6	3.27	x		0.63	×	0.7	=	13.92	(80)
West	0.9x	0.77		x	0.72		x	9	2.28	x		0.63	×	0.7	=	20.31	(80)
West	0.9x	0.77		x	0.72		x	1.	13.09	x		0.63	x	0.7	=	24.89	(80)
West	0.9x	0.77		x	0.72		x	1	15.77	x		0.63	x	0.7	=	25.47	(80)
West	0.9x	0.77		x	0.72		x	1.	10.22	×		0.63	×	0.7	=	24.25	(80)
West	0.9x	0.77		x	0.72		x	9	4.68	x		0.63	x	0.7	=	20.83	(80)
West	0.9x	0.77		x	0.72		x	7	3.59	x		0.63	×	0.7	=	16.19	(80)
West	0.9x	0.77		x	0.72		x	4	5.59	x		0.63	×	0.7	=	10.03	(80)
West	0.9x	0.77		x	0.72		x	2	4.49	×		0.63	×	0.7	=	5.39	(80)
West	0.9x	0.77		x	0.72		x	1	6.15	×		0.63	×	0.7	=	3.55	(80)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	ŕ	15.3	×		0.63	×	0.7	=	13.11	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	2	8.48	×		0.63	×	0.7	=	24.41	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	5	0.24	×		0.63	×	0.7	=	43.07	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	8	9.03	×		0.63	۔ ا × آ	0.7	=	76.33	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	12	29.88	x		0.63	×	0.7	=	111.35	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	14	43.74	x		0.63	- ×	0.7	=	123.22	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	1:	32.31	x		0.63	-   ×	0.7	=	113.43	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	9	8.56	x		0.63	×	0.7	= =	84.5	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	6	2.62	x		0.63	- ×	0.7	=	53.69	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	3	4.05	×		0.63	ا × آ	0.7	= =	29.19	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	1	8.64	×		0.63	- ×	0.7	=	15.98	(82)
Roofligh	ts <u>0.9</u> x	1		x	2.16		x	1	2.94	x		0.63	-   x	0.7	=	11.1	(82)
	L							L		1							
Solar ga	ains in	watts, ca	alculat	ted	for each	mont	h			(83)m	า = Sเ	ım(74)m	.(82)m				
(83)m=	235.48	411.88	600.2	26	818.49	994.56	5 1(	024.14	971.89	833	.22	673.79	464.33	283.82	200.49	]	(83)
Total ga	ains – i	nternal a	nd so	lar	(84)m =	(73)m	1+(	83)m	, watts	-				-			
(84)m=	841.47	1015.52	1183.	38	1367.88	1508.4	3 1	504.77	1431.56	1299	9.66	1158.11	982.63	841.22	788.44		(84)
7. Mea	an inter	nal temp	eratu	re (	heating s	seaso	n)										
Tempe	erature	during h	eating	g pe	eriods in	the liv	ving	area f	rom Tab	ole 9	, Th1	(°C)				21	(85)
Utilisat	tion fac	ctor for ga	ains fo	or li	ving area	a, h1,r	m (s	ее Та	ble 9a)								
Г	Jan	Feb	Ма	ır	Apr	Мау	/	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	]	
(86)m=	0.99	0.99	0.97	'	0.94	0.87		0.75	0.62	0.6	68	0.86	0.96	0.99	0.99		(86)
Mean	interna	l tempera	ature	in li	ving area	a T1 (	follo	ow ste	ps 3 to 7	7 in T	able	9c)				-	
(87)m=	18.73	18.96	19.3	-	19.87	20.37	-	20.74	20.9	20.	-	20.55	19.91	19.21	18.67	]	(87)
Ľ		II			I					I	1			_I		1	

Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	n2 (°C)					
(88)m=	19.97	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	0.99	0.98	0.97	0.93	0.84	0.68	0.5	0.57	0.81	0.95	0.99	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	16.91	17.25	17.81	18.56	19.26	19.74	19.91	19.88	19.52	18.62	17.62	16.83		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.11	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	llina) = fl	LA × T1	+ (1 – fL	A) × T2			•		-
(92)m=	17.11	17.44	17.99	18.71	19.39	19.85	20.02	19.99	, 19.64	18.77	17.8	17.04		(92)
Apply	adjustn	nent to t	he mear	internal	tempera	ature fro	m Table	4e, whe	re appro	opriate				
(93)m=	16.96	17.29	17.84	18.56	19.24	19.7	19.87	19.84	19.49	18.62	17.65	16.89		(93)
8. Sp	ace hea	ting requ	uirement											
						ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	Jan	Feb	or gains Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Jun	Jui	Aug	Seb		INOV	Dec		
(94)m=	0.98	0.97	0.95	0.9	0.81	0.66	0.49	0.55	0.78	0.93	0.98	0.99		(94)
Usefu	l gains,	hmGm	, W = (94	1)m x (84	4)m									
(95)m=	828.84	988.82	1126.01	1233.78	1218.06	988.87	702.89	717.32	906.27	912.88	820.63	778.59		(95)
Month	nly aver	age exte	rnal tem	perature	e 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 =	- /	x [(93)m	– (96)m	]				
(97)m=	2928.17	2860.98	2617.98	2229.88	1740.81	1177.37	755.91	794.68	1243.64	1851.39	2435.63	2929.93		(97)
-							í –	24 x [(97)		· · ·	· · · · · ·			
(98)m=	1561.91	1258.09	1110.03	717.19	388.93	0	0	0	0	698.25	1162.8	1600.59		٦
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	8497.78	(98)
Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								41.6	(99)
9a. En	ergy rec	luiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
-	e heatir	-										,		-
			at from se			mentary							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) × [1 – (	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.6	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c			)								
	1561.91	1258.09	1110.03	717.19	388.93	0	0	0	0	698.25	1162.8	1600.59		
(211)m	n = {[(98	)m x (20	4)] } x 1	00 ÷ (20	)6)									(211)
	1723.96	1388.62	1225.19	791.6	429.28	0	0	0	0	770.69	1283.44	1766.66		
				<u> </u>		<u> </u>		Tota	l (kWh/yea	ar) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>	=	9379.45	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							I		_
= {[(98	)m x (20	)1)]}x <sup>1</sup>	00 ÷ (20	8)				. <u> </u>						
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	-	0	(215)

#### Water heating

							ergy /b/vear			Emiss	<b>ion fac</b> 2/kWh	tor	Emissions	r
12a. (	CO2 em	issions -	– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHF	)					
Total d	elivered	l energy	for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=				12706.7	(338)
Electric	city for li	ighting											600.52	(232)
Total e	lectricity	y for the	above, l	(Wh/yea	r			sum	of (230a).	(230g) =			169.73	(231)
boiler	with a f	an-assis	sted flue									45		(230e)
centra	al heatir	ng pump	:									30		(230c)
mech	anical v	entilatio	n - balan	iced, ext	ract or p	ositive ir	nput fron	n outside	Ð			94.73		(230a)
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t								
Water	heating	fuel use	d										2557.01	
Space	heating		9379.45											
Annua	•	kWh/year	-											
								Tota	l = Sum(2	19a) <sub>112</sub> =			2557.01	(219)
	= (64)	<u>m x 100</u> 215.3			201.71	195.44	186.96	206.17	206.12	211.23	222.3	237.92		
		heating,	kWh/m	onth										. ,
(217)m=		89.02	88.78	88.23	86.98	79.9	79.9	79.9	79.9	88.12	88.87	89.2		(217)
Efficier	-	ater hea											79.9	(216)
Output	from w 217.67	ater hea 191.67	ter (calc 200.87	ulated a	bove) 175.45	156.15	149.38	164.73	164.69	186.13	197.56	212.23		
Auto	from	otor hee	tor locia	ulated	houro)									

	kWh/year	kg CO2/kWh		kg CO2/ye	ar
Space heating (main system 1)	(211) x	0.216	=	2025.96	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	552.31	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2578.27	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	88.09	(267)
Electricity for lighting	(232) x	0.519	=	311.67	(268)
Total CO2, kg/year	sur	n of (265)(271) =		2978.03	(272)
Dwelling CO2 Emission Rate	(27	2) ÷ (4) =		14.58	(273)
El rating (section 14)				84	(274)

			User D	etails:						
Assessor Name: Software Name:	Matt Fitzpatric Stroma FSAP			Stroma Softwa					0003572 on: 1.0.5.41	
			roperty A	Address:	Plot 4					
Address :	Plot 4, Widdingt	on, TBC								
1. Overall dwelling dimen	sions:									
Ground floor			Area 14	. ,	(1a) x	<b>Av. He</b> i	ight(m) 2.5	(2a) =	Volume(m <sup>3</sup> ) 361.07	(3a)
Total floor area TFA = (1a)	+(1b)+(1c)+(1d)-	+(1e)+(1r	n) <u>1</u> 4	14.43	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	361.07	(5)
2. Ventilation rate:				_						
Number of chimneys	0	secondar heating	+	0 0	] = [	total 0		40 =	m <sup>3</sup> per hour	(6a)
Number of open flues	0	• 0	+	0		0	X 2	20 =	0	(6b)
Number of intermittent fan	6					0	x ^	10 =	0	(7a)
Number of passive vents						0	x ′	10 =	0	(7b)
Number of flueless gas fire	es					0	× 4	40 =	0	(7c)
								Air ch	anges per hou	ur
Infiltration due to chimneys					continue fro	0 om (9) to (		÷ (5) =	0	(8)
Number of storeys in the Additional infiltration	e dwelling (ns)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	sent, use the value c s); if equal user 0.35	orresponding to	o the greate	er wall area	a (after	uction			0	](11)
If suspended wooden flo			.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	-								0	(13)
Percentage of windows Window infiltration	and doors draug	nt stripped		0.25 - [0.2	$\mathbf{v}(14) \div 1$	001 -			0	(14)
Infiltration rate				(8) + (10) ·			⊦ (15) –		0	(15)
Air permeability value, q	50 expressed in	cubic metre				<i>·</i> · · ·		area	0 4.6500000953674	(16)
If based on air permeability	•		•	•	•		nvelope	uicu	0.23	(18)
Air permeability value applies						is being us	sed		0.23	
Number of sides sheltered									2	(19)
Shelter factor				(20) = 1 - [	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporatin	g shelter factor			(21) = (18)	x (20) =				0.2	(21)
Infiltration rate modified for	monthly wind sp	beed							1	
Jan Feb M	lar Apr N	1ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7								1	
(22)m= 5.1 5 4	.9 4.4 4.	.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22)$	m ÷ 4									
(22a)m= 1.27 1.25 1.	23 1.1 1.0	08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltr	ation rat	e (allow	ing for sł	nelter an	d wind s	peed) =	: (21a) x	(22a)m					
	0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23	]	
		c <i>tive air</i> al ventila	-	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (	N5)) , othe	rwise (23b	o) = (23a)			0.5	(23b)
				iency in %						, , ,			0:0	(23c)
a) If	balance	d mech	anical ve	entilation	with he	at recove	erv (MV	HR) (24a	a)m = (2	2b)m + (	23b) × [*	1 – (23c)	-	(100)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If	balance	d mech	anical ve	entilation	without	heat rec	covery (I	и VIV) (24t	)m = (2	1 2b)m + (i	23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If	whole h	ouse ex	tract ver	ntilation of	or positiv	ve input v	ventilatio	on from o	outside		•			
i	f (22b)n	n < 0.5 >	< (23b), 1	then (24	c) = (23k	); other\	vise (24	c) = (22	b) m + 0	.5 × (23b	) 	i	,	
(24c)m=		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	J	(24c)
,				ole hous m = (221		•				0.5]			_	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24d)
Effec	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	ld) in bo	x (25)					
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
3. He	at losse	s and he	eat loss	paramet	er:									
ELEN	IENT	Gros area		Openin rr		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
Doors	Type 1					2.55	x	1.4	=	3.57				(26)
Doors	Type 2					2.1	x	1.4	=	2.94	=			(26)
Window	ws Type	e 1				15.74	⊥ x1	/[1/( 1.4 )+	0.04] =	20.87	=			(27)
Window	ws Type	e 2				1.8		/[1/( 1.4 )+	0.04] =	2.39	=			(27)
Window	ws Type	e 3				3.18		/[1/( 1.4 )+	0.04] =	4.22	=			(27)
Window	ws Type	94				4.2		/[1/( 1.4 )+	0.04] =	5.57	=			(27)
Floor						144.4	3 X	0.12	=	17.331	 6	75	108	32.25 (28)
Walls		172.	48	29.5	7	142.9	1 ×	0.19	=	27.15	i F	60	85	74.6 (29)
Roof		144.	43	0		144.4	3 X	0.11	=	15.89	i F	9	129	99.87 (30)
Total a	rea of e	elements	s, m²			461.3	4							(31)
Interna	l wall **					248.9	9				ſ	9	224	40.91 (32c)
				effective wi nternal wal			ated using	g formula 1	1/[(1/U-valı	ue)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30	) + (32) =				99.92	(33)
Heat c	apacity	Cm = S	(A x k )						((28).	(30) + (32	2) + (32a).	(32e) =	22947.6	3 (34)
Therma	al mass	parame	eter (TMI	- = Cm -	- TFA) ir	n kJ/m²K			= (34)	) ÷ (4) =			158.88	(35)
	-		ere the de tailed calc		construct	ion are noi	t known pi	recisely the	e indicative	e values of	TMP in T	able 1f		—
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix I	<						20.7	(36)
	of therma abric he		are not kr	10wn (36) =	= 0.05 x (3	1)			(33) +	+ (36) =			120.62	(37)

Ventila	tion hea	t loss ca	alculated	dmonthl	у				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	59.81	59.58	59.58	59.58	59.58	59.58	59.58	59.58	59.58	59.58	59.58	59.58		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	180.43	180.2	180.2	180.2	180.2	180.2	180.2	180.2	180.2	180.2	180.2	180.2		
										-	Sum(39)1.	12 /12=	180.22	(39)
	oss para	、 、	i ,,	1				1	· ,	= (39)m ÷	· · ·			
(40)m=	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25		
Numbe	er of day	rs in mor	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12 /12=	1.25	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
				-	-	-	-	-		-				
4. Wa	ter heat	ing ener	rgy requ	irement:								kWh/ye	ear:	
A			NI .											(10)
	ied occu A > 13.9			(1 - exp	(-0.0003	849 x (TF	- A -13.9	)2)] + 0.(	)013 x ( <sup>-</sup>	TFA -13.		93		(42)
	A £ 13.9				(	- (		, ,,			- /			
								(25 x N) to achieve		se target o		3.67		(43)
		-		r day (all w		-	-	io acilieve	a water us	se largel o	I			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate				ach month	,			Ŭ Ŭ	Ocp	000	1100	Dee		
(44)m=	114.04	109.89	105.74	101.6	97.45	93.3	93.3	97.45	101.6	105.74	109.89	114.04		
									-	Total = Su	m(44) <sub>112</sub> =		1244.05	(44)
Energy of	content of	hot water	used - ca	lculated m	onthly $= 4$ .	190 x Vd,n	n x nm x D	OTm / 3600	) kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)		_
(45)m=	169.11	147.91	152.63	133.07	127.68	110.18	102.1	117.16	118.56	138.17	150.82	163.78		
										Total = Su	m(45) <sub>112</sub> =	-	1631.15	(45)
								boxes (46)						
	25.37 storage	22.19	22.89	19.96	19.15	16.53	15.31	17.57	17.78	20.72	22.62	24.57		(46)
	-		includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If com	munity h	eating a	ind no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Otherv	vise if no	stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage													
				oss facto	or is kno	wn (kWł	n/day):				1.	32		(48)
	erature fa										0.	54		(49)
			•	e, kWh/ye		ar ia nat	known	(48) x (49)	=		0.	71		(50)
				cylinder l rom Tabl								0		(51)
	nunity h	-										0		(01)
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
•••			-	e, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter	(50) or (	54) in (5	55)								0.	71		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)ı	m				
(56)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(56)

	ains 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= 22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(57)
Primary circ	uit loss (ar	nnual) fro	om Table	e 3	-	-	-		-		0		(58)
Primary circ	uit loss cal	lculated f	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	ter heatii	ng and a	cylinde	r thermo	stat)		1	
(59)m= 23.2	6 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 re	equired for	water he	eating ca	alculated	d for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 214.4	7 188.88	197.99	176.96	173.04	154.07	147.46	162.52	162.45	183.52	194.71	209.14		(62)
Solar DHW inp	ut calculated	using App	endix G or	r Appendix	KH (negativ	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or V	NWHRS	applies	, see Ap	pendix C	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
(64)m= 214.4	7 188.88	197.99	176.96	173.04	154.07	147.46	162.52	162.45	183.52	194.71	209.14		-
							Outp	out from w	ater heate	r (annual)₁	12	2165.21	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
<mark>(65)</mark> m= 92.5	2 81.96	87.04	79.36	78.74	71.75	70.23	75.24	74.54	82.23	85.26	90.74		(65)
include (5	7)m in cale	culation of	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	vater is fr	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a	):									
Metabolic g	ains (Table	e 5). Wat	ts										
		, e),a.	10	_				_	_	_	_		
Jai		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 146.2	n Feb			May 146.25	Jun 146.25	Jul 146.25	Aug 146.25	Sep 146.25	Oct 146.25	Nov 146.25	Dec 146.25		(66)
	n Feb 25 146.25	Mar 146.25	Apr 146.25	146.25	146.25	146.25	146.25	146.25					(66)
(66)m= 146.2	n Feb 25 146.25 ns (calcula	Mar 146.25	Apr 146.25	146.25	146.25	146.25	146.25	146.25					(66) (67)
(66)m= 146.2 Lighting gai	Feb           25         146.25           ns (calcula           6         25.01	Mar 146.25 ted in Ap 20.34	Apr 146.25 opendix 15.4	146.25 L, equat 11.51	146.25 ion L9 oi 9.72	146.25 r L9a), a 10.5	146.25 Iso see 13.65	146.25 Table 5 18.32	146.25 23.26	146.25	146.25		
(66)m= 146.2 Lighting gai (67)m= 28.1	n Feb 25 146.25 ns (calcula 6 25.01 gains (calc	Mar 146.25 ted in Ap 20.34 culated in	Apr 146.25 ppendix 15.4 Append	146.25 L, equat 11.51 dix L, eq	146.25 ion L9 or 9.72 uation L	146.25 r L9a), a 10.5 13 or L1	146.25 Iso see 13.65 3a), also	146.25 Table 5 18.32 see Ta	146.25 23.26 ble 5	146.25 27.15	146.25 28.94		
(66)m= 146.2 Lighting gain (67)m= 28.1 Appliances	Feb           25         146.25           ns (calcula           6         25.01           gains (calcula           4         317.66	Mar 146.25 ted in Ap 20.34 culated in 309.44	Apr 146.25 opendix 15.4 Append 291.93	146.25 L, equat 11.51 dix L, eq 269.84	146.25 ion L9 of 9.72 uation L 249.08	146.25 r L9a), a 10.5 13 or L1 235.2	146.25 Iso see 13.65 3a), also 231.94	146.25 Table 5 18.32 see Ta 240.16	146.25 23.26 ble 5 257.67	146.25 27.15	146.25 28.94		(67)
(66)m= 146.2 Lighting gain (67)m= 28.1 Appliances (68)m= 314.	Feb           25         146.25           ns (calcula           6         25.01           gains (calcula           4         317.66           ns (calcula	Mar 146.25 ted in Ap 20.34 culated in 309.44	Apr 146.25 opendix 15.4 Append 291.93	146.25 L, equat 11.51 dix L, eq 269.84	146.25 ion L9 of 9.72 uation L 249.08	146.25 r L9a), a 10.5 13 or L1 235.2	146.25 Iso see 13.65 3a), also 231.94	146.25 Table 5 18.32 see Ta 240.16	146.25 23.26 ble 5 257.67	146.25 27.15	146.25 28.94		(67)
(66)m= 146.2 Lighting gai (67)m= 28.1 Appliances (68)m= 314. Cooking gai	Feb           25         146.25           146.25         146.25           ns (calcula         25.01           gains (calcula         317.66           ns (calcula         37.63	Mar 146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63	Apr 146.25 ppendix 15.4 Append 291.93 opendix 37.63	146.25 L, equat 11.51 dix L, eq 269.84 L, equat	146.25 ion L9 of 9.72 uation L 249.08 tion L15	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a)	146.25 Iso see 13.65 3a), also 231.94 ), also se	146.25 Table 5 18.32 see Ta 240.16 ee Table	146.25 23.26 ble 5 257.67 25	146.25 27.15 279.76	146.25 28.94 300.52		(67) (68)
(66)m= 146.2 Lighting gai (67)m= 28.1 Appliances (68)m= 314. Cooking gai (69)m= 37.6	Feb           25         146.25           146.25         146.25           ns (calcula         25.01           gains (calcula         317.66           ns (calcula         37.63	Mar 146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63	Apr 146.25 ppendix 15.4 Append 291.93 opendix 37.63	146.25 L, equat 11.51 dix L, eq 269.84 L, equat	146.25 ion L9 of 9.72 uation L 249.08 tion L15	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a)	146.25 Iso see 13.65 3a), also 231.94 ), also se	146.25 Table 5 18.32 see Ta 240.16 ee Table	146.25 23.26 ble 5 257.67 25	146.25 27.15 279.76	146.25 28.94 300.52		(67) (68)
(66)m = 146.2 Lighting gain (67)m = 28.1 Appliances (68)m = 314. Cooking gain (69)m = 37.6 Pumps and	Feb           25         146.25           146.25         146.25           ns (calcula         25.01           gains (calcula         317.66           ns (calcula         37.63           fans gains         3           3         37.63           fans gains         3	Mar 146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63 (Table 5 3	Apr 146.25 opendix 15.4 Append 291.93 opendix 37.63 5a) 3	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63	146.25 Iso see 13.65 3a), also 231.94 ), also se 37.63	146.25 Table 5 18.32 see Ta 240.16 ee Table 37.63	146.25 23.26 ble 5 257.67 25 37.63	146.25 27.15 279.76 37.63	146.25 28.94 300.52 37.63		(67) (68) (69)
$\begin{array}{c c} (66)m= & 146.2 \\ Lighting gair \\ (67)m= & 28.1 \\ Appliances \\ (68)m= & 314. \\ Cooking gair \\ (69)m= & 37.6 \\ Pumps and \\ (70)m= & 3 \end{array}$	Feb           146.25           146.25           146.25           146.25           1317.66           ns (calcula           3           37.63           fans gains           3           3           3           3           3           3	Mar 146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63 (Table 5 3	Apr 146.25 opendix 15.4 Append 291.93 opendix 37.63 5a) 3	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63	146.25 Iso see 13.65 3a), also 231.94 ), also se 37.63	146.25 Table 5 18.32 see Ta 240.16 ee Table 37.63	146.25 23.26 ble 5 257.67 25 37.63	146.25 27.15 279.76 37.63	146.25 28.94 300.52 37.63		(67) (68) (69)
(66)m= 146.2 Lighting gain (67)m= 28.1 Appliances (68)m= 314. Cooking gain (69)m= 37.6 Pumps and (70)m= 3 Losses e.g.	Feb           146.25           146.25           146.25           ns (calcula           6         25.01           gains (calcula           3         317.66           ns (calcula           3         37.63           fans gains           3         3           evaporation           7         -117	Mar 146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63 (Table 5 3 on (negat	Apr 146.25 ppendix 15.4 Append 291.93 opendix 37.63 5a) 3 tive valu	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 ole 5)	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3	146.25 Iso see <sup>-</sup> 13.65 3a), also 231.94 ), also se 37.63	146.25 Table 5 18.32 see Ta 240.16 37.63 3	146.25 23.26 ble 5 257.67 5 37.63 3	146.25 27.15 279.76 37.63 3	146.25 28.94 300.52 37.63 3		(67) (68) (69) (70)
$\begin{array}{c} (66)m= \ \hline 146.2 \\ Lighting gain \\ (67)m= \ \hline 28.1 \\ Appliances \\ (68)m= \ \hline 314. \\ Cooking gain \\ (69)m= \ \hline 37.6 \\ Pumps and \\ (70)m= \ \hline 3 \\ Losses e.g. \\ (71)m= \ \hline -112 \\ \end{array}$	Feb           146.25           146.25           ns (calcula           6         25.01           gains (calcula           4         317.66           ns (calcula           3         37.63           fans gains         3           evaporatic           7         -117           ng gains (1	Mar 146.25 ted in Ap 20.34 culated in 309.44 ated in Ap 37.63 (Table 5 3 on (negat	Apr 146.25 ppendix 15.4 Append 291.93 opendix 37.63 5a) 3 tive valu	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 ole 5)	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3	146.25 Iso see <sup>-</sup> 13.65 3a), also 231.94 ), also se 37.63	146.25 Table 5 18.32 see Ta 240.16 37.63 3	146.25 23.26 ble 5 257.67 5 37.63 3	146.25 27.15 279.76 37.63 3	146.25 28.94 300.52 37.63 3		(67) (68) (69) (70)
(66)m= 146.2 Lighting gai (67)m= 28.1 Appliances (68)m= 314. Cooking gai (69)m= 37.6 Pumps and (70)m= 3 Losses e.g. (71)m= $-117$ Water heating	Feb           146.25           146.25           146.25           146.25           1317.66           ns (calcula           317.63           fans (calcula           37.63           fans gains           3           -117           ng gains (1           121.96	Mar 146.25 ted in Ap 20.34 culated in Ap 309.44 ated in Ap 37.63 (Table 5 3 on (negation -117 Fable 5) 116.98	Apr 146.25 opendix 15.4 Append 291.93 opendix 37.63 5a) 3 tive valu -117	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 ole 5) -117 99.65	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3 -117 94.4	146.25 Iso see - 13.65 3a), also 231.94 ), also se 37.63 3 -117 101.13	146.25 Table 5 18.32 5 see Ta 240.16 37.63 3 -117 103.52	146.25 23.26 ble 5 257.67 5 37.63 3 -117	146.25 27.15 279.76 37.63 3 -117 118.42	146.25 28.94 300.52 37.63 3 -117 121.97		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> </ul>
(66)m =       146.2         Lighting gain       (67)m =       28.1         Appliances       (68)m =       314.         Cooking gain       (69)m =       37.6         Pumps and       (70)m =       3         Losses e.g.       (71)m =       -112         Water heatin       (72)m =       124.2	Feb           146.25           146.25           146.25           146.25           137.66           137.66           137.63           fans (calcula           37.63           fans gains           3           14           17.66           15           16           17           16           17           17           19           121.96           12           12	Mar 146.25 ted in Ap 20.34 culated in Ap 309.44 ated in Ap 37.63 (Table 5 3 on (negation -117 Fable 5) 116.98	Apr 146.25 opendix 15.4 Append 291.93 opendix 37.63 5a) 3 tive valu -117	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 ole 5) -117 99.65	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3 -117 94.4	146.25 Iso see - 13.65 3a), also 231.94 ), also se 37.63 3 -117 101.13	146.25 Table 5 18.32 5 see Ta 240.16 37.63 3 -117 103.52	146.25 23.26 ble 5 257.67 25 37.63 3 -117 110.52	146.25 27.15 279.76 37.63 3 -117 118.42	146.25 28.94 300.52 37.63 3 -117 121.97		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> </ul>
(66)m =       146.2         Lighting gain       (67)m =       28.1         Appliances       (68)m =       314.         Cooking gain       (69)m =       37.6         Pumps and       (70)m =       3         Losses e.g.       (71)m =       -112         Water heatin       (72)m =       124.2         Total interm       124.2	Feb           146.25           146.25           146.25           146.25           1317.66           ns (calcula           3           37.63           fans gains           3           37.63           fans gains           3           37.63           fans gains           3           121.96           al gains =           '9           534.5	Mar 146.25 ted in Ap 20.34 culated in Ap 309.44 ated in Ap 37.63 (Table 5 3 on (negation -117 Table 5) 116.98	Apr 146.25 opendix 15.4 Append 291.93 opendix 37.63 5a) 3 tive valu -117 110.22	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab -117 105.83	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 ole 5) -117 99.65 (66)	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3 -117 94.4 m + (67)m	146.25 Iso see - 13.65 3a), also 231.94 ), also se 37.63 3 -117 101.13 + (68)m +	146.25 Table 5 18.32 • see Ta 240.16 • Table 37.63 3 -117 103.52 + (69)m +	146.25 23.26 ble 5 257.67 25 37.63 3 -117 110.52 (70)m + (7	146.25 27.15 279.76 37.63 3 -117 118.42 1)m + (72)	146.25 28.94 300.52 37.63 3 -117 121.97		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>
(66)m= 146.2 Lighting gain (67)m= 28.1 Appliances (68)m= 314. Cooking gain (69)m= 37.6 Pumps and (70)m= 3 Losses e.g. (71)m= -112 Water heatin (72)m= 124.2 Total interr (73)m= 536.2	Feb           146.25           146.25           146.25           146.25           146.25           1317.66           1317.66           1317.63           fans (calcula           37.63           fans gains           3           4           317.66           13           37.63           fans gains           3           121.96           121.96           121.96           13           134.5           ins:	Mar 146.25 ted in Ap 20.34 culated in Ap 309.44 ated in Ap 37.63 (Table 5 3 on (negat -117 Table 5) 116.98 516.64	Apr 146.25 opendix 15.4 Append 291.93 opendix 37.63 5a) 3 tive valu -117 110.22 487.43	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab -117 105.83 457.06	146.25 ion L9 or 9.72 uation L 249.08 tion L15 37.63 3 0le 5) -117 99.65 (66) 428.33	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3 -117 94.4 m + (67)m 409.98	146.25 Iso see - 13.65 3a), also 231.94 ), also se 37.63 3 -117 101.13 + (68)m + 416.6	146.25 Table 5 18.32 See Ta 240.16 ee Table 37.63 3 -117 103.52 + (69)m + 431.88	146.25 23.26 ble 5 257.67 25 37.63 3 -117 110.52 (70)m + (7 461.33	146.25 27.15 279.76 37.63 3 -117 118.42 1)m + (72) 495.21	146.25 28.94 300.52 37.63 3 -117 121.97 m 521.31		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>
(66)m=       146.2         Lighting gain       (67)m=       28.1         Appliances       (68)m=       314.         Cooking gain       (69)m=       37.6         Pumps and       (70)m=       3         Losses e.g.       (71)m=       -112         Water heatin       (72)m=       124.2         Total interr       (73)m=       536.2         6. Solar gain       500ar gain	Feb           146.25           146.25           146.25           146.25           146.25           146.25           1317.66           ns (calcula           3           37.63           fans gains           3           37.63           fans gains           3           25           121.96           al gains =           '9           534.5           ins:           re calculated	Mar           146.25           ted in Ap           20.34           culated in Ap           309.44           ated in Ap           37.63           (Table 5)           116.98           516.64           using sola           actor	Apr 146.25 opendix 15.4 Append 291.93 opendix 37.63 5a) 3 tive valu -117 110.22 487.43	146.25 L, equat 11.51 dix L, eq 269.84 L, equat 37.63 3 es) (Tab -117 105.83 457.06 Table 6a	146.25 ion L9 of 9.72 uation L 249.08 tion L15 37.63 3 0le 5) -117 99.65 (66) 428.33 and associ	146.25 r L9a), a 10.5 13 or L1 235.2 or L15a) 37.63 3 -117 94.4 m + (67)m 409.98	146.25 Iso see 13.65 3a), also 231.94 ), also se 37.63 3 -117 101.13 + (68)m + 416.6 tions to co	146.25 Table 5 18.32 See Ta 240.16 ee Table 37.63 3 -117 103.52 + (69)m + 431.88	146.25 23.26 ble 5 257.67 5 37.63 3 -117 110.52 (70)m + (7 461.33 he applicat	146.25 27.15 279.76 37.63 3 -117 118.42 1)m + (72) 495.21	146.25 28.94 300.52 37.63 3 -117 121.97 m 521.31	Gains	<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>

North         0.00         0.000	N I a set la	г		1			[	1 1		1				٦
North         0.4x         0.77         x         15.74         x         0.4x         0.65         x         0.77         z         15.74         x         55.46         x         0.65         x         0.77         z         15.74         x         55.46         x         0.63         x         0.77         z         15.74         x         7472         x         0.63         x         0.77         z         05.74         x         7472         x         0.63         x         0.77         z         05.74         x         746.85         x         0.63         x         0.77         z         05.74         x         746.85         x         0.63         x         0.77         z         0.57         x         15.74         x         14.52         x         0.63         x         0.77         z         15.74         x         14.52         x         0.63         x         0.77         z         15.74         x         13.12         x         0.63         x         0.77         z         15.74         x         13.12         x         0.63         x         0.77         z         13.8         13.12         x         0.63         x <td>North</td> <td>0.9x</td> <td>0.77</td> <td>×</td> <td>15.74</td> <td>X</td> <td>10.63</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>51.15</td> <td>(74)</td>	North	0.9x	0.77	×	15.74	X	10.63	X	0.63	X	0.7	=	51.15	(74)
North         0.0 </td <td></td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>15.74</td> <td>x</td> <td>20.32</td> <td>X</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>97.75</td> <td>(74)</td>		0.9x	0.77	x	15.74	x	20.32	X	0.63	x	0.7	=	97.75	(74)
North         0.0         0.077         ×         15.74         ×         0.772         ×         0.637         ×         0.677         ×         0.560.1         (74)           North         0.3x         0.77         ×         15.74         ×         74.983         ×         0.633         ×         0.77         =         356.42         (74)           North         0.3x         0.77         ×         15.74         ×         56.25         0.633         ×         0.77         =         356.42         (74)           North         0.3x         0.77         ×         15.74         ×         56.25         0.633         ×         0.77         =         16.36         (74)           North         0.3x         0.77         ×         15.74         ×         13.12         ×         0.633         ×         0.77         =         63.14         (74)           North         0.3x         0.77         ×         1.8         ×         18.42         ×         0.633         ×         0.77         =         63.14         (74)           North         0.3x         0.77         ×         1.8         ×         0.63         ×		0.9x	0.77	x	15.74	x	34.53	X	0.63	x	0.7	=	166.1	(74)
North         0.0         0.077         ×         15.74         ×         74.99         ×         0.063         ×         0.07         =         384.76         (74)           North         0.3x         0.77         ×         15.74         ×         74.68         ×         0.63         ×         0.77         =         384.76         (74)           North         0.3x         0.77         ×         15.74         ×         99.92         ×         0.63         ×         0.77         =         199.071         (74)           North         0.3x         0.77         ×         15.74         ×         41.92         ×         0.63         ×         0.77         =         116.36         (74)           North         0.3x         0.77         ×         15.74         ×         8.86         ×         0.63         ×         0.77         =         142.64         (74)           East         0.3x         0.77         ×         1.8         ×         0.63         ×         0.77         =         121.14         (76)           East         0.3x         0.77         ×         1.8         ×         122.24         0.63	North	0.9x	0.77	x	15.74	x	55.46	x	0.63	x	0.7	=	266.8	(74)
North         0.8         0.07         ×         10.74         ×         10.748         ×         0.033         ×         0.07         =         359.22         (74)           North         0.9         0.77         ×         15.74         ×         56.25         ×         0.63         ×         0.77         =         199.71         (74)           North         0.9         0.77         ×         15.74         ×         24.19         ×         0.63         ×         0.77         =         199.71         (74)           North         0.9         0.77         ×         15.74         ×         28.45         0.63         ×         0.77         =         116.36         (74)           North         0.9         0.77         ×         15.74         ×         8.86         0.63         ×         0.77         =         42.64         (74)           East         0.9         0.77         ×         1.8         ×         36.22         ×         0.63         ×         0.77         =         34.81         (76)           East         0.9         0.77         ×         1.8         ×         110.22         ×         0.	North	0.9x	0.77	x	15.74	x	74.72	x	0.63	x	0.7	=	359.41	(74)
North         0.82         0.77         ×         15.74         ×         0.925         ×         0.63         ×         0.77         =         2285         (74)           North         0.92         0.77         ×         15.74         ×         24.19         ×         0.633         ×         0.77         =         198.71         (74)           North         0.92         0.77         ×         15.74         ×         24.19         ×         0.633         ×         0.77         =         116.36         (74)           North         0.92         0.77         ×         15.74         ×         8.86         0.633         ×         0.77         =         63.1         (74)           North         0.92         0.77         ×         1.8         ×         10.643         ×         0.633         ×         0.77         =         10.8         (76)           East         0.92         0.77         ×         1.8         ×         113.09         ×         0.633         ×         0.77         =         63.69         (76)           East         0.92         0.77         ×         1.8         ×         113.09         <	North	0.9x	0.77	x	15.74	x	79.99	x	0.63	x	0.7	=	384.76	(74)
North         0.8         0.77         ×         15.74         ×         41.52         ×         0.63         ×         0.77         =         1199.71         (74)           North         0.9         0.77         ×         15.74         ×         24.19         ×         0.633         ×         0.77         =         116.36         (74)           North         0.9         0.77         ×         15.74         ×         24.19         ×         0.633         ×         0.77         =         63.1         (74)           North         0.9         0.77         ×         11.8         ×         13.64         ×         0.633         ×         0.77         =         21.14         (76)           East         0.9         0.77         ×         1.8         ×         63.27         ×         0.633         ×         0.77         =         34.81         (76)           East         0.9         0.77         ×         1.8         ×         113.09         ×         0.633         ×         0.77         =         63.69         (76)           East         0.9         0.77         ×         1.8         ×         115.7 <td>North</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>15.74</td> <td>x</td> <td>74.68</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>359.22</td> <td>(74)</td>	North	0.9x	0.77	x	15.74	x	74.68	x	0.63	x	0.7	=	359.22	(74)
North         0.8         0.77         x         1574         x         24.9         x         0.63         x         0.77         x         116.30         (74)           North         0.9x         0.77         x         1574         x         13.12         x         0.63         x         0.77         =         63.1         (74)           North         0.9x         0.77         x         15.74         x         8.86         x         0.63         x         0.77         =         42.84         (74)           East         0.9x         0.77         x         1.8         x         38.42         x         0.63         x         0.77         =         21.14         (76)           East         0.9x         0.77         x         1.8         x         36.327         x         0.63         x         0.77         =         34.81         (76)           East         0.9x         0.77         x         1.8         x         113.09         x         0.63         x         0.77         =         62.21         (76)           East         0.9x         0.77         x         1.8         x         173.59	North	0.9x	0.77	x	15.74	x	59.25	x	0.63	x	0.7	=	285	(74)
North         0.8         0.77         x         15.74         x         13.12         x         0.63         x         0.77         =         63.1         (14)           East         0.9         0.77         x         115.74         x         8.86         x         0.63         x         0.77         =         42.64         (74)           East         0.9         0.77         x         1.8         x         13.64         x         0.63         x         0.77         =         42.64         (74)           East         0.9         0.77         x         1.8         x         63.27         x         0.63         x         0.77         =         21.14         (76)           East         0.9         0.77         x         1.8         x         113.09         x         0.63         x         0.77         =         62.21         (76)           East         0.9         0.77         x         1.8         x         110.22         x         0.63         x         0.77         =         62.20         (76)           East         0.9         0.77         x         1.8         x         74.59 <t< td=""><td>North</td><td>0.9x</td><td>0.77</td><td>x</td><td>15.74</td><td>x</td><td>41.52</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td>=</td><td>199.71</td><td>(74)</td></t<>	North	0.9x	0.77	x	15.74	x	41.52	x	0.63	x	0.7	=	199.71	(74)
North         0.91         0.01         1.001         0.001         0.01 <th0.01< th="">         0.01         0.01         &lt;</th0.01<>	North	0.9x	0.77	x	15.74	x	24.19	x	0.63	x	0.7	=	116.36	(74)
East         0.0.7         x         1.8.4         x         19.64         x         0.03         x         0.7         i.8         x         19.64         x         0.03         x         0.7         =         10.8         (%)           East         0.9x         0.77         x         1.8         x         663.27         x         0.63         x         0.7         =         34.81         (%)           East         0.9x         0.77         x         1.8         x         92.28         x         0.63         x         0.7         =         50.76         (%)           East         0.9x         0.77         x         1.8         x         115.77         x         0.63         x         0.7         =         663.69         (%)           East         0.9x         0.77         x         1.8         x         110.22         x         0.63         x         0.7         =         663.69         (%)           East         0.9x         0.77         x         1.8         x         145.59         x         0.63         x         0.7         =         52.08         (%)           East         0.9x<	North	0.9x	0.77	x	15.74	x	13.12	x	0.63	x	0.7	=	63.1	(74)
East       0.8x       0.77       x       1.8       x       38.42       x       0.63       x       0.77       =       1.14       (76)         East       0.9x       0.77       x       1.8       x       63.27       x       0.63       x       0.77       =       34.41       (76)         East       0.9x       0.77       x       1.8       x       92.28       x       0.63       x       0.77       =       62.21       (76)         East       0.9x       0.77       x       1.8       x       115.77       x       0.63       x       0.77       =       62.21       (76)         East       0.9x       0.77       x       1.8       x       110.22       x       0.63       x       0.77       =       63.69       (76)         East       0.9x       0.77       x       1.8       x       110.22       x       0.63       x       0.77       =       63.26.9       (76)         East       0.9x       0.77       x       1.8       x       45.59       x       0.63       x       0.77       =       63.26.9       (76)       50.63       x	North	0.9x	0.77	x	15.74	x	8.86	x	0.63	x	0.7	=	42.64	(74)
East $0.0x$ $0.77$ x $1.8$ x $63.27$ x $0.63$ x $0.77$ = $3.4.81$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $92.28$ x $0.63$ x $0.77$ = $62.21$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $113.09$ x $0.63$ x $0.77$ = $62.21$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $115.77$ x $0.63$ x $0.77$ = $63.69$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $110.22$ x $0.63$ x $0.77$ = $62.208$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $94.68$ x $0.63$ x $0.77$ = $42.048$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $73.59$ x $0.63$ x $0.77$ = $25.08$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $24.49$ x $0.63$ x $0.7$ = $25.08$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $24.49$ x $0.63$ x $0.7$ = $25.08$ $(76)$ East $0.9x$ $0.77$ x $4.2$ x $76.57$ $x$ $0.63$ x $0.7$ = $8.88$ $(76)$ South $0.9x$ $0.77$ x $4.2$ x $116.57$	East	0.9x	0.77	x	1.8	x	19.64	x	0.63	x	0.7	=	10.8	(76)
East       0.9       0.77       ×       1.8       ×       0.02       ×       0.63       ×       0.77       =       50.76       (76)         East       0.9x       0.77       ×       1.8       ×       113.09       ×       0.63       ×       0.77       =       62.21       (76)         East       0.9x       0.77       ×       1.8       ×       110.22       ×       0.63       ×       0.77       =       63.63       (76)         East       0.9x       0.77       ×       1.8       ×       110.22       ×       0.63       ×       0.77       =       63.63       (76)         East       0.9x       0.77       ×       1.8       ×       110.22       ×       0.63       ×       0.77       =       40.48       (76)         East       0.9x       0.77       ×       1.8       ×       45.59       ×       0.63       ×       0.77       =       40.48       (76)         East       0.9x       0.77       ×       1.8       ×       16.15       ×       0.63       ×       0.77       =       13.47       (76)         South       <	East	0.9x	0.77	x	1.8	x	38.42	x	0.63	x	0.7	=	21.14	(76)
East       0.9x       0.77       ×       1.8       ×       113.09       ×       0.63       ×       0.77       =       66.21       76         East       0.9x       0.77       ×       1.8       ×       1115.77       ×       0.63       ×       0.77       =       66.26       76         East       0.9x       0.77       ×       1.8       ×       110.22       ×       0.63       ×       0.77       =       66.23       76         East       0.9x       0.77       ×       1.8       ×       110.22       ×       0.63       ×       0.77       =       60.63       76         East       0.9x       0.77       ×       1.8       ×       73.59       ×       0.63       ×       0.77       =       40.48       76         East       0.9x       0.77       ×       1.8       ×       24.49       ×       0.63       ×       0.77       =       8.88       76         South       0.9x       0.77       ×       4.2       ×       76.57       ×       0.63       ×       0.77       =       98.28       76         South       0.9x <td>East</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>1.8</td> <td>x</td> <td>63.27</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>34.81</td> <td>(76)</td>	East	0.9x	0.77	x	1.8	x	63.27	x	0.63	x	0.7	=	34.81	(76)
East $0.9^{\circ}$ $0.77$ x $1.8$ x $115.07$ x $0.63$ x $0.7$ $0.2.1$ $0.76$ East $0.9^{\circ}$ $0.77$ x $1.8$ x $110.22$ x $0.63$ x $0.7$ = $63.69$ $76$ )East $0.9^{\circ}$ $0.77$ x $1.8$ x $94.68$ x $0.63$ x $0.7$ = $60.63$ $76$ )East $0.9^{\circ}$ $0.77$ x $1.8$ x $94.68$ x $0.63$ x $0.7$ = $40.48$ $76$ )East $0.9^{\circ}$ $0.77$ x $1.8$ x $73.59$ x $0.63$ x $0.7$ = $40.48$ $76$ )East $0.9^{\circ}$ $0.77$ x $1.8$ x $24.49$ x $0.63$ x $0.7$ = $13.47$ $76$ )East $0.9^{\circ}$ $0.77$ x $1.8$ x $24.49$ x $0.63$ x $0.7$ = $8.88$ $76$ )South $0.9^{\circ}$ $0.77$ x $1.8$ x $24.49$ x $0.63$ x $0.7$ = $8.88$ $76$ )South $0.9^{\circ}$ $0.77$ x $4.2$ x $76.57$ x $0.63$ x $0.7$ = $98.28$ $78$ )South $0.9^{\circ}$ $0.77$ x $4.2$ x $76.57$ x $0.63$ x $0.7$ = $141.49$ $78$ )South $0.9^{\circ}$ $0.77$ x $4.2$ x $110.23$	East	0.9x	0.77	x	1.8	x	92.28	x	0.63	x	0.7	=	50.76	(76)
East $0.9x$ $0.77$ $x$ $1.8$ $x$ $110.22$ $x$ $0.63$ $x$ $0.7$ $z$ $60.63$ $(76)$ East $0.9x$ $0.77$ $x$ $1.8$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $z$ $60.63$ $(76)$ East $0.9x$ $0.77$ $x$ $1.8$ $x$ $94.68$ $x$ $0.63$ $x$ $0.7$ $z$ $40.48$ $(76)$ East $0.9x$ $0.77$ $x$ $1.8$ $x$ $45.59$ $x$ $0.63$ $x$ $0.7$ $z$ $40.48$ $(76)$ East $0.9x$ $0.77$ $x$ $1.8$ $x$ $24.49$ $x$ $0.63$ $x$ $0.7$ $z$ $13.47$ $(76)$ East $0.9x$ $0.77$ $x$ $1.8$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $z$ $8.88$ $(76)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $z$ $8.88$ $(76)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $z$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $z$ $z$ $17.8$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $z$ $141.49$ $76$ South $0.$	East	0.9x	0.77	x	1.8	x	113.09	x	0.63	x	0.7	=	62.21	(76)
East $0.9x$ $0.77$ $x$ $1.8$ $x$ $94.68$ $x$ $0.63$ $x$ $0.77$ $=$ $52.08$ $(76)$ East $0.9x$ $0.77$ $x$ $1.8$ $x$ $73.59$ $x$ $0.63$ $x$ $0.77$ $=$ $40.48$ $(76)$ East $0.9x$ $0.77$ $x$ $1.8$ $x$ $24.49$ $x$ $0.63$ $x$ $0.77$ $=$ $13.47$ $(76)$ East $0.9x$ $0.77$ $x$ $1.8$ $24.49$ $x$ $0.63$ $x$ $0.77$ $=$ $13.47$ $(76)$ East $0.9x$ $0.77$ $x$ $1.8$ $x$ $16.75$ $x$ $0.63$ $x$ $0.77$ $=$ $13.47$ $(76)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $76.57$ $x$ $0.63$ $x$ $0.77$ $=$ $14.149$ $(78)$ $50.63$ $x$ $0.77$ $=$ $14.745$ $(78)$ $50.63$ $x$ $0.77$	East	0.9x	0.77	x	1.8	x	115.77	x	0.63	x	0.7	=	63.69	(76)
East $0.77$ $\times$ $1.3$ $\times$ $3.50$ $\times$ $0.63$ $\times$ $0.7$ $=$ $40.48$ $(76)$ East $0.9x$ $0.77$ $\times$ $1.8$ $\times$ $45.59$ $\times$ $0.63$ $\times$ $0.7$ $=$ $25.08$ $(76)$ East $0.9x$ $0.77$ $\times$ $1.8$ $\times$ $24.49$ $\times$ $0.63$ $\times$ $0.7$ $=$ $13.47$ $(76)$ East $0.9x$ $0.77$ $\times$ $1.8$ $\times$ $24.49$ $\times$ $0.63$ $\times$ $0.7$ $=$ $8.88$ $(76)$ South $0.9x$ $0.77$ $\times$ $4.2$ $\times$ $46.75$ $\times$ $0.63$ $\times$ $0.7$ $=$ $8.88$ $(76)$ South $0.9x$ $0.77$ $\times$ $4.2$ $\times$ $76.57$ $\times$ $0.63$ $\times$ $0.7$ $=$ $98.28$ $(78)$ South $0.9x$ $0.77$ $\times$ $4.2$ $\times$ $77.53$ $\times$ $0.63$ $\times$ $0.7$ $=$ $98.28$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $\times$ $110.23$ $x$ $0.63$ $\times$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $100.61$ $x$ $0.63$ $x$ $0.7$ $=$ $141.9$ $(78)$ South $0$	East	0.9x	0.77	x	1.8	x	110.22	x	0.63	x	0.7	=	60.63	(76)
East $0.9x$ $0.77$ x $1.8$ x $45.59$ x $0.63$ x $0.7$ = $25.08$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $24.49$ x $0.63$ x $0.7$ = $13.47$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $16.15$ x $0.63$ x $0.7$ = $8.88$ $(76)$ South $0.9x$ $0.77$ x $1.8$ x $16.15$ x $0.63$ x $0.7$ = $8.88$ $(76)$ South $0.9x$ $0.77$ x $4.2$ x $46.75$ x $0.63$ x $0.7$ = $60.01$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $76.57$ x $0.63$ x $0.7$ = $98.28$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $97.53$ x $0.63$ x $0.7$ = $141.49$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $110.23$ x $0.63$ x $0.7$ = $147.45$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $110.55$ x $0.63$ x $0.7$ = $141.9$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $106.01$ x $0.63$ x $0.7$ = $134.64$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $106.9x$ $0.$	East	0.9x	0.77	x	1.8	x	94.68	x	0.63	x	0.7	=	52.08	(76)
East $0.9x$ $0.77$ x $1.8$ x $24.49$ x $0.63$ x $0.7$ = $13.47$ $(76)$ East $0.9x$ $0.77$ x $1.8$ x $16.15$ x $0.63$ x $0.7$ = $8.88$ $(76)$ South $0.9x$ $0.77$ x $4.2$ x $46.75$ x $0.63$ x $0.7$ = $60.01$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $76.57$ x $0.63$ x $0.7$ = $98.28$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $97.53$ x $0.63$ x $0.7$ = $141.49$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $110.23$ x $0.63$ x $0.7$ = $141.49$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $110.23$ x $0.63$ x $0.7$ = $141.49$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $110.55$ x $0.63$ x $0.7$ = $141.49$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $106.01$ x $0.63$ x $0.7$ = $141.49$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $106.01$ x $0.63$ x $0.7$ = $138.64$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $104.89$	East	0.9x	0.77	x	1.8	x	73.59	x	0.63	x	0.7	=	40.48	(76)
East $0.9x$ $0.77$ $x$ $1.8$ $x$ $16.15$ $x$ $0.63$ $x$ $0.7$ $z$ $a.m$ $(76)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $=$ $60.01$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $60.01$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $98.28$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $125.19$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $100.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $100.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $106.3$ $x$ $0.7$ $=$ $130.78$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$	East	0.9x	0.77	x	1.8	x	45.59	x	0.63	x	0.7	=	25.08	(76)
South $0.9x$ $0.77$ $x$ $4.2$ $x$ $46.75$ $x$ $0.63$ $x$ $0.7$ $z$ $60.01$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $z$ $60.01$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $z$ $98.28$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $z$ $114.9$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $z$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $z$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $z$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $108.01$ $x$ $0.63$ $x$ $0.7$ $z$ $134.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $z$ $134.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $z$ $130.78$ $(78)$	East	0.9x	0.77	x	1.8	x	24.49	x	0.63	x	0.7	=	13.47	(76)
South $0.9x$ $0.77$ $x$ $4.2$ $x$ $76.57$ $x$ $0.63$ $x$ $0.7$ $=$ $98.28$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $125.19$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $125.19$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $=$ $134.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $108.01$ $x$ $0.63$ $x$ $0.7$ $=$ $133.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $=$ $130.78$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $130.78$ $(78)$ </td <td>East</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>1.8</td> <td>x</td> <td>16.15</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>8.88</td> <td>(76)</td>	East	0.9x	0.77	x	1.8	x	16.15	x	0.63	x	0.7	=	8.88	(76)
South $0.9x$ $0.77$ $x$ $4.2$ $x$ $97.53$ $x$ $0.63$ $x$ $0.7$ $=$ $125.19$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $=$ $141.9$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $=$ $141.9$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $108.01$ $x$ $0.63$ $x$ $0.7$ $=$ $141.9$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $108.01$ $x$ $0.63$ $x$ $0.7$ $=$ $134.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $=$ $134.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $=$ $134.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $71.13$ $(78)$ <td>South</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>4.2</td> <td>x</td> <td>46.75</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>60.01</td> <td>(78)</td>	South	0.9x	0.77	x	4.2	x	46.75	x	0.63	x	0.7	=	60.01	(78)
South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.23$ $x$ $0.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $141.49$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $1114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $147.45$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $=$ $141.9$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $108.01$ $x$ $0.63$ $x$ $0.7$ $=$ $138.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $=$ $133.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $=$ $133.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $=$ $130.78$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $71.13$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $51.85$ $(78)$ </td <td>South</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>4.2</td> <td>x</td> <td>76.57</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>98.28</td> <td>(78)</td>	South	0.9x	0.77	x	4.2	x	76.57	x	0.63	x	0.7	=	98.28	(78)
South $0.9x$ $0.77$ $x$ $4.2$ $x$ $114.87$ $x$ $0.63$ $x$ $0.7$ $=$ $147.45$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $=$ $141.9$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $110.55$ $x$ $0.63$ $x$ $0.7$ $=$ $141.9$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $108.01$ $x$ $0.63$ $x$ $0.7$ $=$ $138.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $=$ $134.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $101.89$ $x$ $0.63$ $x$ $0.7$ $=$ $130.78$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $82.59$ $x$ $0.63$ $x$ $0.7$ $=$ $106$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $71.13$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $51.85$ $(78)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $93.42$ $x$ $0.63$ $x$ $0.7$ $=$ $51.85$ $(78)$ <td>South</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>4.2</td> <td>x</td> <td>97.53</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>125.19</td> <td>(78)</td>	South	0.9x	0.77	x	4.2	x	97.53	x	0.63	x	0.7	=	125.19	(78)
South $0.9x$ $0.77$ x $4.2$ x $110.55$ x $0.63$ x $0.7$ = $141.9$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $108.01$ x $0.63$ x $0.7$ = $138.64$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $108.01$ x $0.63$ x $0.7$ = $138.64$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $104.89$ x $0.63$ x $0.7$ = $134.64$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $101.89$ x $0.63$ x $0.7$ = $130.78$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $82.59$ x $0.63$ x $0.7$ = $106$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $55.42$ $x$ $0.63$ x $0.7$ = $71.13$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $55.42$ $x$ $0.63$ x $0.7$ = $71.13$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $55.42$ $x$ $0.63$ x $0.7$ = $51.85$ $(78)$ West $0.9x$ $0.77$ x $3.18$ $x$ $19.64$ x $0.63$ x $0.7$ = $19.09$ $(80)$ West $0.9x$ $0.77$ x $3.18$ $x$ $38.$	South	0.9x	0.77	x	4.2	x	110.23	x	0.63	x	0.7	=	141.49	(78)
South $0.9x$ $0.77$ $x$ $4.2$ $x$ $108.01$ $x$ $0.63$ $x$ $0.7$ $=$ $138.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $=$ $134.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $104.89$ $x$ $0.63$ $x$ $0.7$ $=$ $134.64$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $101.89$ $x$ $0.63$ $x$ $0.7$ $=$ $130.78$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $82.59$ $x$ $0.63$ $x$ $0.7$ $=$ $106$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $71.13$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $71.13$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $51.85$ $(78)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $93.42$ $x$ $0.63$ $x$ $0.7$ $=$ $19.09$ $(80)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $61.49$ $(80)$ <t< td=""><td>South</td><td>0.9x</td><td>0.77</td><td>x</td><td>4.2</td><td>x</td><td>114.87</td><td>x</td><td>0.63</td><td>x</td><td>0.7</td><td>=</td><td>147.45</td><td>(78)</td></t<>	South	0.9x	0.77	x	4.2	x	114.87	x	0.63	x	0.7	=	147.45	(78)
South $0.9x$ $0.77$ x $4.2$ x $104.89$ x $0.63$ x $0.7$ = $134.64$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $101.89$ x $0.63$ x $0.7$ = $130.78$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $82.59$ x $0.63$ x $0.7$ = $130.78$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $82.59$ x $0.63$ x $0.7$ = $106$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $55.42$ x $0.63$ x $0.7$ = $71.13$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $55.42$ x $0.63$ x $0.7$ = $71.13$ $(78)$ South $0.9x$ $0.77$ x $4.2$ x $40.4$ x $0.63$ x $0.7$ = $51.85$ $(78)$ West $0.9x$ $0.77$ x $3.18$ x $19.64$ x $0.63$ x $0.7$ = $19.09$ $(80)$ West $0.9x$ $0.77$ x $3.18$ x $38.42$ x $0.63$ x $0.7$ = $37.34$ $(80)$ West $0.9x$ $0.77$ x $3.18$ x $63.27$ x $0.63$ x $0.7$ = $61.49$ $(80)$ West $0.9x$ $0.77$ x $3.18$ x $92.28$ x </td <td>South</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>4.2</td> <td>x</td> <td>110.55</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>141.9</td> <td>(78)</td>	South	0.9x	0.77	x	4.2	x	110.55	x	0.63	x	0.7	=	141.9	(78)
South       0.9x       0.77       ×       4.2       ×       101.89       ×       0.63       ×       0.77       =       130.78       (78)         South       0.9x       0.77       ×       4.2       ×       82.59       ×       0.63       ×       0.77       =       130.78       (78)         South       0.9x       0.77       ×       4.2       ×       82.59       ×       0.63       ×       0.77       =       106       (78)         South       0.9x       0.77       ×       4.2       ×       55.42       ×       0.63       ×       0.77       =       71.13       (78)         South       0.9x       0.77       ×       4.2       ×       55.42       ×       0.63       ×       0.77       =       71.13       (78)         South       0.9x       0.77       ×       4.2       ×       40.4       ×       0.63       ×       0.77       =       51.85       (78)         West       0.9x       0.77       ×       3.18       ×       19.64       ×       0.63       ×       0.77       =       19.09       (80)         West	South	0.9x	0.77	x	4.2	x	108.01	x	0.63	x	0.7	=	138.64	(78)
South $0.9x$ $0.77$ $x$ $4.2$ $x$ $82.59$ $x$ $0.63$ $x$ $0.7$ $=$ $106$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $71.13$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $71.13$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $51.85$ $(78)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $19.09$ $(80)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $38.42$ $x$ $0.63$ $x$ $0.7$ $=$ $37.34$ $(80)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $61.49$ $(80)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $89.68$ $(80)$	South	0.9x	0.77	x	4.2	x	104.89	x	0.63	x	0.7	=	134.64	(78)
South $0.9x$ $0.77$ $x$ $4.2$ $x$ $55.42$ $x$ $0.63$ $x$ $0.7$ $=$ $71.13$ $(78)$ South $0.9x$ $0.77$ $x$ $4.2$ $x$ $40.4$ $x$ $0.63$ $x$ $0.7$ $=$ $51.85$ $(78)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $19.09$ $(80)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $19.64$ $x$ $0.63$ $x$ $0.7$ $=$ $19.09$ $(80)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $63.27$ $x$ $0.63$ $x$ $0.7$ $=$ $61.49$ $(80)$ West $0.9x$ $0.77$ $x$ $3.18$ $x$ $92.28$ $x$ $0.63$ $x$ $0.7$ $=$ $89.68$ $(80)$	South	0.9x	0.77	x	4.2	x	101.89	x	0.63	x	0.7	=	130.78	(78)
South       0.9x       0.77       x       4.2       x       40.4       x       0.63       x       0.77       =       51.85       (78)         West       0.9x       0.77       x       3.18       x       19.64       x       0.63       x       0.77       =       51.85       (78)         West       0.9x       0.77       x       3.18       x       19.64       x       0.63       x       0.77       =       19.09       (80)         West       0.9x       0.77       x       3.18       x       38.42       x       0.63       x       0.77       =       37.34       (80)         West       0.9x       0.77       x       3.18       x       63.27       x       0.63       x       0.77       =       61.49       (80)         West       0.9x       0.77       x       3.18       x       92.28       x       0.63       x       0.77       =       89.68       (80)	South	0.9x	0.77	x	4.2	x	82.59	x	0.63	x	0.7	=	106	(78)
West $0.9x$ $0.77$ x $3.18$ x $19.64$ x $0.63$ x $0.7$ = $19.09$ (80)West $0.9x$ $0.77$ x $3.18$ x $38.42$ x $0.63$ x $0.7$ = $37.34$ (80)West $0.9x$ $0.77$ x $3.18$ x $63.27$ x $0.63$ x $0.7$ = $61.49$ (80)West $0.9x$ $0.77$ x $3.18$ x $92.28$ x $0.63$ x $0.7$ = $89.68$ (80)	South	0.9x	0.77	x	4.2	x	55.42	x	0.63	x	0.7	=	71.13	(78)
West $0.9x$ $0.77$ x $3.18$ x $38.42$ x $0.63$ x $0.77$ = $37.34$ (80)West $0.9x$ $0.77$ x $3.18$ x $63.27$ x $0.63$ x $0.77$ = $61.49$ (80)West $0.9x$ $0.77$ x $3.18$ x $63.27$ x $0.63$ x $0.77$ = $61.49$ (80)West $0.9x$ $0.77$ x $3.18$ x $92.28$ x $0.63$ x $0.77$ = $89.68$ (80)	South	0.9x	0.77	x	4.2	x	40.4	x	0.63	x	0.7	=	51.85	(78)
West       0.9x       0.77       x       3.18       x       63.27       x       0.63       x       0.77       =       61.49       (80)         West       0.9x       0.77       x       3.18       x       92.28       x       0.63       x       0.77       =       61.49       (80)	West	0.9x	0.77	x	3.18	x	19.64	x	0.63	x	0.7	=	19.09	(80)
West $0.9x$ 0.77 x 3.18 x 92.28 x 0.63 x 0.77 = 89.68 (80)	West	0.9x	0.77	x	3.18	x	38.42	x	0.63	x	0.7	=	37.34	(80)
	West	0.9x	0.77	x	3.18	x	63.27	x	0.63	x	0.7	=	61.49	(80)
	West	0.9x	0.77	×	3.18	x	92.28	×	0.63	x	0.7	=	89.68	(80)
West $0.9x$ 0.77 x 3.18 x 113.09 x 0.63 x 0.7 = 109.91 (80)	West	0.9x	0.77	x	3.18	x	113.09	×	0.63	x	0.7	=	109.91	(80)

	_											_					_
West	0.9x	0.77	X	3.1	8	x	1	15.77	x	0.63	>	<u>ٰ</u>	0.7		=	112.51	(80)
West	0.9x	0.77	X	3.1	8	x	1	10.22	x	0.63	)		0.7		=	107.12	(80)
West	0.9x	0.77	X	3.1	8	x	9	4.68	x	0.63	)		0.7		=	92.01	(80)
West	0.9x	0.77	X	3.1	8	x	7	'3.59	x	0.63	)		0.7		=	71.52	(80)
West	0.9x	0.77	х	3.1	8	x	4	5.59	x	0.63	>	(	0.7		=	44.31	(80)
West	0.9x	0.77	X	3.1	8	x	2	4.49	x	0.63	)	(	0.7		=	23.8	(80)
West	0.9x	0.77	X	3.1	8	x	1	6.15	x	0.63	)	(	0.7		=	15.7	(80)
Solar g	ains in	watts, ca	alculated	for eac	h month	-			(83)m	= Sum(74)n	า(82)	m				L	
(83)m=	141.05	254.51	387.59	548.74	678.98		02.85	665.61	563.	73 442.49	9 291	.75	171.5	119	.08		(83)
•			nd solar	·           · · · · · · · · · · · · · ·	· ,	<u>ب</u>	,							1		l	
(84)m=	677.84	789.01	904.23	1036.18	1136.04	11	31.18	1075.59	980.	33 874.37	7 753	.07	666.71	640	.39		(84)
7. Me	an inter	nal temp	perature	(heating	seasor	i)											
Temp	erature	during h	eating p	eriods ir	n the livi	ng	area f	from Tab	ole 9,	Th1 (°C)						21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	ı (s	ее Та	ble 9a)						_			
	Jan	Feb	Mar	Apr	Мау		Jun	Jul	Αι	ıg Sep		ct	Nov	D	ес		
(86)m=	0.99	0.99	0.98	0.96	0.89		0.78	0.64	0.7	0.88	0.9	97	0.99	1			(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=	18.92	19.11	19.46	19.94	20.41	<b>T</b>	20.76	20.91	20.8	<u>_</u>	19.	98	19.36	18.	87		(87)
Tomp	oraturo	durina h	L Leating r	u Antiode in	rost of	dw	olling	from To		, Th2 (°C)							
(88)m=	19.88	19.88	19.88	19.88	19.88	1	9.88	19.88	19.8		-	88	19.88	19.	88		(88)
						I							10.00	10.			()
			1	1		T -		e Table	, 				0.00		20		(90)
(89)m=	0.99	0.99	0.98	0.94	0.86		0.7	0.51	0.5	8 0.83	0.9	96	0.99	0.9	99		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	ps 3	to 7 in Ta	ble 9c	)				1	
(90)m=	17.09	17.38	17.89	18.57	19.23	1	9.67	19.83	19.8	19.47			17.74	17.	03		(90)
											fLA =	Livin	g area ÷ (4	4) =		0.2	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llin	g) = fl	LA x T1	+ (1 -	– fLA) × T	2			_			
(92)m=	17.46	17.72	18.2	18.85	19.47	1	9.89	20.05	20.0	19.69	18.	91	18.06	17.	39		(92)
Apply	adjustr	nent to t	he mear	interna	l temper	atu	ire fro	m Table	4e, v	where app	oropria	te				L	
(93)m=	17.31	17.57	18.05	18.7	19.32	1	9.74	19.9	19.8	37 19.54	18.	76	17.91	17.	24		(93)
			uirement														
			ernal ter or gains	•		ned	at ste	ep 11 of	Table	e 9b, so th	nat Ti,r	n=(	76)m an	d re-	calc	ulate	
ine ui	Jan	Feb	Mar	Apr	May	Г	Jun	Jul	Αι	ig Sep		ct	Nov		ес		
Utilisa			ains, hm		Iviay		Jun	501		ig   Oep	<u> </u>	01	INOV		60		
(94)m=	0.99	0.98	0.96	0.92	0.84	(	0.69	0.52	0.5	8 0.81	0.9	95	0.98	0.9	99		(94)
	l gains,	hmGm	, W = (94	1 4)m x (8⁄	1 4)m	I								I			
(95)m=	670.33	774.31	872.3	956.89	, 951.31	7	78.75	554.96	566.	95 710.64	1 712	.03	654.63	634	.45		(95)
Month	nly aver	age exte	rnal tem	perature	e 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	loss rate	e for mea	an intern	al tempe	erature,	Lm	1 , W =	=[(39)m :	x [(93	s)m– (96)r	n ]		·				
(97)m=	2346.8	2283.7	2081.66	1765.32	1372.64	9	26.22	594.15	625.	12 981.05	5 1470	).64	1948.01	2350	).52		(97)
Space	e heatin		r	r each n	nonth, k	Wh	/mon	th = 0.02	4 x [	(97)m – (9	95)m] >	k (4	1)m			I	
(98)m=	1247.3	1014.31	899.77	582.07	313.47		0	0	0	0	564	1.4	931.23	1276	6.75		

							Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	6829.3	(98)	
Space h	eating require	ement in	ı kWh/m²	/year								47.28	(99)	
9a. Energ	gy requiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)						
Space h	•	t from o			menter						1			
	of space hea				mentary	-	(202) = 1 -	- (201) -				0	(201)	
	of space heat		-	. ,			(202) = 1 (204) = (20)		(203)] -			1	(202)	
	cy of main spa	0	-				(204) - (20	02) × [1	(200)] =			90.6	(204)	
	cy of seconda		•••		n system	n %						90.0	(208)	
	Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea		
	eating require					Jui	Aug	Seb	001		Dec	KVVII/yee	u	
1247.3 1014.31 899.77 582.07 313.47 0 0 0 0 564.4 931.23 1276.75														
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ (21														
1376.71 1119.55 993.12 642.46 345.99 0 0 0 0 622.96 1027.85 1409.22														
							Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	2=	7537.86	(211)	
•	eating fuel (s			month										
= {[(98)m (215)m=	x (201)] } x 1	00÷(20	0	0	0	0	0	0	0	0	0			
(							-	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	-	0	(215)	
Water he	ating										I		J	
· ·	om water hea	T C	T							1		1		
	14.47 188.88	197.99	176.96	173.04	154.07	147.46	162.52	162.45	183.52	194.71	209.14	70.0		
	of water hea	88.46	87.86	86.48	79.9	79.9	79.9	79.9	87.72	88.55	88.92	79.9	(216) (217)	
`´Ĺ	vater heating,			00.40	10.0	10.0	10.0	10.0	01.12	00.00	00.02		()	
	(64)m x 100	) ÷ (217)				1				1		1		
(219)m= 24	41.38 212.86	223.81	201.42	200.09	192.83	184.55	203.4	203.32	209.22	219.89	235.19		٦	
Annual to	otolo						Tota	I = Sum(2 <sup>-</sup>		Mbhaa		2527.96	(219)	
	eating fuel use	ed, main	system	1					ĸ	Wh/year		<b>kWh/year</b> 7537.86	1	
Water he	ating fuel use	d	-									2527.96	Ì	
	/ for pumps, f		electric	keep-ho	t						I		J	
mechan	ical ventilation	n - balar	nced, ext	ract or p	ositive i	nput fron	n outside	e			67.02		(230a)	
central h	neating pump	:									30		(230c)	
boiler wi	ith a fan-assis	sted flue									45		(230e)	
Total elec	ctricity for the	above,	kWh/yea	r			sum	of (230a).	(230g) =			142.02	(231)	
Electricity	/ for lighting											497.35	(232)	
Total deli	vered energy	for all u	ses (211	)(221)	+ (231)	+ (232).	(237b)	=				10705.19	(338)	
12a. CO	2 emissions ·	– Individ	ual heat	ina svste	ems inclu	udina mi	cro-CHP	)			I		-	

	<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 =	1628.18 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	546.04 (264)
Space and water heating	(261) + (262) + (263) +	(264) =	2174.22 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	73.71 (267)
Electricity for lighting	(232) x	0.519 =	258.13 (268)
Total CO2, kg/year		sum of (265)(271) =	2506.05 (272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	17.35 (273)
EI rating (section 14)			82 (274)



Be Green SAP Sheets

Widdington

				User D	etails:									
Assessor Name: Software Name:	Matt Fitzp Stroma FS				Strom Softwa	are Vei				0003572 on: 1.0.5.41				
				roperty <i>i</i>	Address	: Plot 1								
Address :	Plot 1, Wid	dington, TE	BC											
1. Overall dwelling dim	ensions:				( 0)									
Ground floor					a(m²)		Av. Hei			Volume(m <sup>3</sup> )				
				1	19.31	(1a) x	2	2.5	(2a) =	298.27	(3a)			
First floor				8	4.97	(1b) x	2.	.56	(2b) =	217.61	(3b)			
Total floor area TFA = (	1a)+(1b)+(1c)+	(1d)+(1e)+	⊦(1n	) 20	04.28	(4)								
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	515.88	(5)			
2. Ventilation rate:														
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 515.882. Ventilation rate:main heating heatingsecondary heating heatingother totaltotal m³ per hour x 40 =Number of chimneys0+0=0x 40 =0														
Number of chimneys			-	] + [	0	] = [	0	x 4	40 =	0	(6a)			
Number of open flues	0		0	i + F	0	] = [	0	x2	20 =	0	(6b)			
Number of intermittent f	ans						0	x ^	10 =	0	](7a)			
Number of passive vent	S						0	x ^	10 =	0	](7b)			
Number of flueless gas							0	x 4	40 =	0	] (7c)			
,						L					](,			
									Air ch	nanges per hou	ır			
Infiltration due to chimn	eys, flues and f	ans = (6a)	+(6b)+(7	a)+(7b)+(	7c) =	Г	0	· [	÷ (5) =	0	(8)			
If a pressurisation test has			, proceed	d to (17), d	otherwise o	continue fr	om (9) to (	(16)			-			
Number of storeys in	the dwelling (n	s)								0	(9)			
Additional infiltration	/							[(9)	-1]x0.1 =	0	(10)			
Structural infiltration:							uction			0	(11)			
if both types of wall are deducting areas of oper			maing to	ine great	er wall are	a (aller								
If suspended wooden	floor, enter 0.2	2 (unsealed	d) or 0.	1 (seale	ed), else	enter 0				0	(12)			
lf no draught lobby, e	nter 0.05, else	enter 0								0	(13)			
Percentage of window	vs and doors d	raught strip	pped							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	, q50, express	ed in cubic	: metre	s per ho	our per s	quare m	etre of e	nvelope	area	4.65000009536743	(17)			
If based on air permeab	•									0.23	(18)			
Air permeability value appl		ion test has b	been don	e or a deg	gree air pe	rmeability	is being us	sed			1			
Number of sides shelter Shelter factor	ed				(20) = 1 -	[0 075 x (1	9)] =			2	(19)			
Infiltration rate incorpora	ating shelter fa	ctor			(21) = (18)					0.85	(20)			
Infiltration rate modified	-				() (10	, (-•) =				0.2	(21)			
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1				
			Uun	oui	l ''ug					1				
Monthly average wind s (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				
(22)11- 3.1 3	4.4	+.3	5.0	5.0	3.7	4	4.5	4.5	4.7	J				

Wind F	actor (22	2a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjuste	ed infiltra	tion rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m						
	0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23			
	ate effect echanical		-	rate for t	he appli	cable ca	se						_		
				andix N (2	(23a) – (23a	a) x Emv (c	auation (I	N5)) , other	wieg (23t	(232)		l		.5	(23a)
								n Table 4h)		) – (23a)		ļ		.5	(23b)
			-	-	-			HR) (24a		2h)m + ('	23h) v [ <sup>,</sup>	1 _ (23c)		0	(23c)
(24a)m=	· · · · ·			0	0		0		0		0	1 - (230)	÷ 100]		(24a)
		d mech	i anical ve	entilation	u without	heat rec	coverv (N	MV) (24b	m = (2)	1 2b)m + (2	23b)				
(24b)m=		0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole ho	ouse ex	tract ver	tilation o	r positiv	e input v	ventilatio	on from o	outside			<u> </u>			
,					•	•		c) = (22b		.5 × (23b	)				
(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(24c)
,					•	•		on from l 0.5 + [(2:		0.5]					
(24d)m=	r í r	0	0	0	0	0	0	0	0	0	0	0			(24d)
Effec	ctive air c	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in box	(25)						
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(25)
3 He	at losses	and he	at loce r	poromot	or.			•			•	•			
ELEN		Gros	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<b>&lt;</b> )	k-value kJ/m²·ł		A X kJ/K	
	IENT		SS	Openin	gs	Net Ar A ,r 2.21				A X U (W/ł 3.094	<)				
ELEN Doors	IENT	Gros	SS	Openin	gs	A ,n	n²	W/m2	К	(W/ł	<) 				
ELEN Doors	<b>IENT</b> Type 1	Gros area	SS	Openin	gs	A ,r	n <sup>2</sup> x	W/m2	K = =	(W/ł 3.094	<) 				(26)
ELEN Doors Doors Window	<b>Type 1</b> Type 2	Gros area	SS	Openin	gs	A ,r 2.21 1.89	n <sup>2</sup> x x x x x	W/m2	K = = 0.04] =	(W/ł 3.094 2.646	<) 				(26) (26)
ELEN Doors Doors Window Window	<b>IENT</b> Type 1 Type 2 ws Type	Gros area 1 2	SS	Openin	gs	A ,r 2.21 1.89 16.92	n <sup>2</sup> x x x x x1 x1	W/m2 1.4 1.4 /[1/(1.4)+	K = = = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43	<)				(26) (26) (27)
ELEN Doors Doors Window Window	<b>Type 1</b> Type 2 ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6	n <sup>2</sup> x x x x x1 x1 x1 x1	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	K = = = = = = 0.04] = = 0.04] = =	(W/H 3.094 2.646 22.43 4.77	$\diamond$				(26) (26) (27) (27)
ELEN Doors Doors Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72	n <sup>2</sup> x x x x1 x1 x1 x1 x1 x1	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/H 3.094 2.646 22.43 4.77 0.95	$\diamond$				(26) (26) (27) (27) (27)
ELEN Doors Doors Window Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72 9.9	n <sup>2</sup> x x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12					<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type ghts	Gros area 1 2 3	SS (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024		kJ/m²+ł		kJ/K	<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Window Window Window Window Rooflig Floor	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts	Gros area 1 2 3 4	21	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> 1 x 7 x	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172		kJ/m²+k 75		kJ/K 8948.25	<ul> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(28)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type ghts Type1 Type2	Gros area 1 2 3 4	21 25	Openin m	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x <sup>2</sup> x <sup>3</sup>	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/(1.4 )+ (0.12) 0.19	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64		kJ/m²+k 75 60		kJ/K 8948.25 8098.2	(26) (26) (27) (27) (27) (27) (27) (27b) (28) (29)
ELEN Doors Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type yhts Type1 Type2 Type1	Gros area 1 2 3 4 170.1 82.8	21 21 21 21	Openin m 35.24	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ (0.12 0.19 0.17	K = = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38		kJ/m²-ŀ 75 60 9		kJ/K 8948.25 8098.2 745.65	(26) (26) (27) (27) (27) (27) (27b) (28) (29) (29)
ELEN Doors Window Window Window Window Rooflig Floor Walls Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type1 Type2	Gros area 1 2 3 4 170 82.8 58.7	21 21 25 24	Openin m 35.24 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74	n <sup>2</sup> x x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/( 1.4 )+ 0.12 0.19 0.17 0.11	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46		kJ/m²-k 75 60 9 9		kJ/K 8948.25 8098.2 745.65 528.66	(26) (27) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Noalls Roof Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 (170) 82.8 58.7 18.6	21 21 25 24 25	Openin m 35.24 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64	n <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05		kJ/m²-ŀ 75 60 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 21 55 4 1	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35	n <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30) (30)
ELEN Doors Doors Window Window Window Window Rooflig Floor Walls Roof Roof Roof Roof T Roof T Roof T Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 21 55 4 1	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x <sup>1</sup>	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (29) (29) (30) (30) (30)

Interna	al floor					84.97	,				Г	18		1529.46	(32d)
Interna	al ceiling					84.97	,				Ī	9	ז ר	764.73	(32e)
			ows, use e sides of in				ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	∟ as given in	paragraph	L 1 3.2		-
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				11	9.68	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	262	28.76	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) in	n kJ/m²K			= (34)	÷ (4) =			12	28.4	(35)
	-		ere the de tailed calci		constructi	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f			-
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						26	6.11	(36)
			are not kn	own (36) =	= 0.05 x (3	1)									_
	abric he								(33) +	(36) =			14	5.79	(37)
Ventila															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug		Oct	Nov	Dec			
(38)m=	85.46	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12			(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	231.25	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91			-
Heat lo	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39)1. (4)	12 /12=	23	0.94	(39)
(40)m=	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13			
										Average =	Sum(40)1	12 /12=	1	.13	(40)
Numbe			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. Wa	ter heat	ing ener	rgy requi	rement:								kWh/ye	ear:		
Assum	ed occu	ipancy, I	N								3.	.01			(42)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	A -13.9	)2)] + 0.0	0013 x (	TFA -13.		-			
	A £ 13.9		otor ucor	no in litro	e por da	w Vd av	orogo –	(25 x N)	1.26			- 00	l		(42)
								(25 X N) to achieve		se target o		5.63			(43)
not more	e that 125	litres per p	person per	<sup>.</sup> day (all w	ater use, ł	not and co	ld)								
	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	Table 1c x	(43)							
(44)m=	116.19	111.97	107.74	103.52	99.29	95.07	95.07	99.29	103.52	107.74	111.97	116.19			
											m(44) <sub>112</sub> =		126	67.53	(44)
Energy o	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=	172.31	150.7	155.51	135.58	130.09	112.26	104.02	119.37	120.79	140.77	153.67	166.87			-
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> =	=	166	61.94	(45)
(46)m=	25.85	22.61	23.33	20.34	19.51	16.84	15.6	17.91	18.12	21.12	23.05	25.03			(46)
	storage										·	•			
0		```		0			0	within sa	ame ves	sel		180			(47)
	•	-	ind no ta		-			. ,							
Otherw	vise if no	o stored	hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)				

Water storage loss:

a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	32		(48)
Temper	ature fa	actor fro	m Table	2b							0.	54		(49)
Energy	lost fro	m water	· storage	e, kWh/ye	ear			(48) x (49	) =		0.	71		(50)
,				cylinder l									I	(54)
		-	ee secti	rom Tabl on 4.3	е 2 (кии	n/iitre/da	iy)					0		(51)
Volume	•	-		011 1.0								0		(52)
Temper	ature fa	actor fro	m Table	2b							<u> </u>	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.	71		(55)
Water s	torage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(56)
If cylinder	contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(57)
Primarv	circuit	loss (ar	nual) fro	om Table	93							0		(58)
•		•	,	for each		59)m = (	(58) ÷ 36	65 × (41)	m					
(modi	ified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	ı cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	0	0	0	0	23.26	22.51	23.26		(59)
Combi l	oss cal	culated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total he	eat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × 0	(45)m +	(46)m +	(57)m +	' (59)m + (61)m	
(62)m=	217.67	191.67	200.87	179.47	175.45	133.64	126.12	141.46	142.18	186.13	197.56	212.23		(62)
L Solar DH\	W input c	alculated	using App	endix G or	· Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add ad	ditional	lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output f	from wa	ater hea	ter	-										
(64)m=	217.67	191.67	200.87	179.47	175.45	0	0	0	0	186.13	197.56	212.23		
-								Out	out from w	ater heate	r (annual)₁	12	1561.05	(64)
Output i	immers	ion												
(64)m=	0	0	0	0	0	133.64	126.12	141.46	142.18	0	0	0		
								Out	out from in	mersion (a	annual) <sub>112</sub>		543.40413785313	9 <mark>(64)</mark>
Heat ga	ins fror	n water	heating,	, kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	93.58	82.88	87.99	80.2	79.54	54.43	52.27	57.37	57.27	83.09	86.21	91.77		(65)
incluc	de (57)r	n in calo	culation	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. Inte	ernal ga	ins (see	e Table 5	5 and 5a	):									
Metabol	lic gain	s (Table	e 5), Wat	ts										
Г	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37		(66)
Lighting	gains	(calcula	ted in Ap	pendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5	-		-		
(67)m=	34	30.2	24.56	18.59	13.9	11.73	12.68	16.48	22.12	28.09	32.78	34.95		(67)
Applian	ces gai	ns (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5			•	
(68)m=	375.1	378.99	369.18	348.3	321.94	297.17	280.62	276.72	286.53	307.41	333.77	358.54		(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	38.04	38.04	38.04	4	38.04	38.04		38.04	38.04	38.	04	38.04	38.04	38.04	38	.04		(69)
Pumps	and far	ns gains	(Tabl	e 5a	a)				1						1			
(70)m=	0	0	0		0	0	Τ	0	0	C	)	0	0	0		0		(70)
Losses	s e.g. ev	aporatio	n (ne	gati	ve value	es) (Ta	ble	5)				<b>!</b>						
(71)m=	-120.3	-120.3	-120.	3	-120.3	-120.3	- 1	120.3	-120.3	-12	0.3	-120.3	-120.3	3 -120.3	-12	20.3		(71)
Water	heating	gains (T	able :	5)										-				
(72)m=	125.78	123.34	118.2	7	111.38	106.91		75.6	70.25	77.	11	79.54	111.6	9 119.74	12	3.35		(72)
Total i	nternal	gains =						(66)	m + (67)m	n + (68	B)m +	- (69)m + (7	70)m +	(71)m + (72	!)m			
(73)m=	602.99	600.64	580.1	3	546.39	510.86	6 4	52.61	431.66	438	.42	456.31	515.3	554.4	584	4.96		(73)
6. So	lar gains	8:																
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.																		
Orientation:Access FactorAreaFluxg_FFGainsTable 6dm²Table 6aTable 6bTable 6c(W)																		
6-																		
North $0.9x$ $0.77$ x $16.92$ x $10.63$ x $0.63$ x $0.7$ = $54.98$ $(74)$ North $0.9x$ $0.77$ x $16.92$ x $20.32$ x $0.63$ x $0.7$ = $105.08$ $(74)$ North $0.9x$ $0.77$ x $16.92$ x $20.32$ x $0.63$ x $0.7$ = $105.08$ $(74)$																		
		0.77	16.9	92	x		×		0.63	×	0.7		=	105.08				
North	0.9x	0.77		x	16.9	92	x	3	34.53	×		0.63	×	0.7		=	178.56	(74)
North	0.9x	0.77		x	16.9	92	x	5	5.46	X		0.63	×	0.7		=	286.81	(74)
North	0.9x	0.77		x	16.9	92	x	7	4.72	X		0.63	×	0.7		=	386.35	(74)
North	0.9x	0.77		x	16.9	92	x	7	9.99	×		0.63	×	0.7		=	413.6	(74)
North	0.9x	0.77		x	16.9	92	x	7	4.68	×		0.63	×	0.7		=	386.15	(74)
North	0.9x	0.77		x	16.9	92	x	5	59.25	×		0.63	×	0.7		=	306.36	(74)
North	0.9x	0.77		x	16.9	92	x	4	1.52	×		0.63	×	0.7		=	214.68	(74)
North	0.9x	0.77		x	16.9	92	x	2	24.19	x		0.63	x	0.7		=	125.08	(74)
North	0.9x	0.77		x	16.9	92	x	1	3.12	x		0.63	x	0.7		=	67.83	(74)
North	0.9x	0.77		x	16.9	92	x		8.86	x		0.63	×	0.7		=	45.84	(74)
East	0.9x	0.77		x	3.6	6	x	1	9.64	x		0.63	x	0.7		=	21.61	(76)
East	0.9x	0.77		x	3.6	6	x	3	88.42	x		0.63	×	0.7		=	42.27	(76)
East	0.9x	0.77		x	3.6	6	x	6	3.27	x		0.63	×	0.7		=	69.61	(76)
East	0.9x	0.77		x	3.6	6	x	9	92.28	x		0.63	x	0.7		=	101.53	(76)
East	0.9x	0.77		x	3.6	6	x	1	13.09	x		0.63	×	0.7		=	124.43	(76)
East	0.9x	0.77		x	3.6	6	x	1	15.77	x		0.63	×	0.7		=	127.37	(76)
East	0.9x	0.77		x	3.6	6	x	1	10.22	x		0.63	×	0.7		=	121.26	(76)
East	0.9x	0.77		x	3.6	6	x	9	94.68	×		0.63	x	0.7		=	104.16	(76)
East	0.9x	0.77		x	3.6	6	x	7	3.59	×		0.63	x	0.7		=	80.96	(76)
East	0.9x	0.77		x	3.6	6	x	4	5.59	x		0.63	x	0.7		=	50.16	(76)
East	0.9x	0.77		x	3.6	6	x	2	24.49	x		0.63	x	0.7		=	26.94	(76)
East	0.9x	0.77		x	3.6	6	x	1	6.15	×		0.63	x	0.7		=	17.77	(76)
South	0.9x	0.77		x	9.9	9	x	4	6.75	×		0.63	x	0.7		=	141.45	(78)
South	0.9x	0.77		x	9.9	)	x	7	6.57	×		0.63	x	0.7		=	231.66	(78)
South	0.9x	0.77		x	9.9	)	x		97.53	×		0.63	x	0.7		=	295.1	(78)
South	0.9x	0.77		x	9.9	9	x	1	10.23	×		0.63	x	0.7		=	333.52	(78)

<b>.</b> .	.9x	0.77		x	9.9	)	x	1'	14.87	X	(	0.63	_ ×	0.7	=		347.55	(78)
- ·	.9x	0.77		x	9.9	)	X	1	10.55	X	(	0.63	_ ×	0.7	=		334.47	(78)
- ·	.9x	0.77		x	9.9	)	x	10	08.01	X	(	0.63	_ ×	0.7	=		326.8	(78)
	.9x	0.77		x	9.9	)	x	1(	04.89	X	(	0.63	×	0.7	=		317.37	(78)
	.9x	0.77		x	9.9	)	x	1(	01.89	x	(	0.63	×	0.7	=		308.26	(78)
South 0.	. <mark>9x</mark>	0.77		x	9.9	)	x	8	2.59	x	(	0.63	×	0.7	=	2	249.87	(78)
South 0.	.9x	0.77		x	9.9	)	x	5	5.42	x	(	0.63	×	0.7	=		167.67	(78)
South 0.	. <mark>9x</mark>	0.77		x	9.9	)	x	4	40.4	x	(	0.63	×	0.7	=		122.23	(78)
West 0.	. <mark>9x</mark>	0.77		x	0.7	2	x	1	9.64	x	(	).63	×	0.7	=		4.32	(80)
West 0.	. <mark>9x</mark>	0.77		x	0.7	2	x	3	8.42	x	(	).63	×	0.7	=		8.45	(80)
West 0.	.9x	0.77		x	0.7	2	x	6	3.27	x	(	0.63	×	0.7	=		13.92	(80)
West 0.	.9x	0.77		x	0.7	2	x	9	2.28	x	(	0.63	x	0.7	=		20.31	(80)
West 0.	.9x	0.77		x	0.7	2	x	1.	13.09	x	(	0.63	×	0.7	=		24.89	(80)
West 0.	.9x	0.77		x	0.7	2	x	115.77		x	(	0.63	×	0.7	=		25.47	(80)
West 0.	.9x	0.77		x	0.7	2	x	1'	10.22	x	(	0.63	×	0.7	=		24.25	(80)
West 0.	.9x	0.77		x	0.7	2	x	9	4.68	x	(	0.63		0.7	=		20.83	(80)
West 0.	.9x	0.77		x	0.7	2	x	7	3.59	x	(	0.63		0.7	=		16.19	(80)
West 0.	.9x	0.77		x	0.7	2	x	4	5.59	x	(	).63		0.7	=		10.03	(80)
West 0.	.9x	0.77		x	0.7	2	x	2	4.49	x	(	).63		0.7	= =		5.39	(80)
West 0.	.9x	0.77		x	0.7	2	x	1	6.15	x	(	0.63		0.7	= =		3.55	(80)
Rooflights 0.	.9x	1		x	2.1	6	x	· ·	15.3	x	(	0.63	 × [	0.7	= -		13.11	(82)
Rooflights 0.	.9x [	1		x	2.1	6	x	2	8.48	x	(	0.63	i x i	0.7	=		24.41	(82)
Rooflights 0.		1		x	2.1	6	x	5	0.24	x	(	0.63	 	0.7	=		43.07	(82)
Rooflights 0.	.9x [	1		x	2.1		x	<u> </u>	9.03	x		0.63	 × [	0.7	= =		76.33	(82)
Rooflights 0.9x 1 x 2.16			x		29.88	x		0.63		0.7	╡_		111.35	(82)				
	ooflights 0.9x 1 x 2.16			x		43.74	x		).63	 	0.7	=		123.22	(82)			
Rooflights 0.				x	<u> </u>	32.31	x		0.63	 × [	0.7	=   _		113.43	(82)			
Rooflights 0.			2.1		x		8.56	x		0.63	 × [	0.7	╡_		84.5	(82)		
Rooflights 0.		1		x	2.1		x		2.62	x		0.63	I   [	0.7	= -		53.69	(82)
Rooflights 0.		1		x	2.1		x	<u> </u>	4.05	x		0.63	   × [	0.7	=		29.19	(82)
Rooflights 0.		 1		x	2.1		x		8.64	x		0.63	 × [	0.7			15.98	(82)
Rooflights 0.		1		x	2.1		x		2.94	x		0.63	^     ×	0.7			11.1	(82)
0 0	Ľ	<u> </u>		~	2.1	0		'	2.04					0.7				(0)
Solar gains	s in v	watts ca	lcula	ted	for each	n mon	'n			(83)m	ı = Sur	n(74)m	.(82)m					
(83)m= 235	-	411.88	600.2	_	818.49	994.5	-	)24.14	971.89	833		673.79	464.33	283.82	200.49	1		(83)
Total gains – internal and solar $(84)m = (73)m + (83)m$ , watts																		
(84)m= 838	.47	1012.52	1180.	.38	1364.88	1505.4	3 14	476.76	1403.55	1271	1.64 1	1130.1	979.63	838.22	785.44	1		(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	Δ	ug	Sep	Oct	Nov	Dec	7					
(86)m= 0.9	_	0.99	0.97	-	0.94	0.87		0.76	0.62	0.6	<u> </u>	0.87	0.96	0.99	0.99	4		(86)
	~	0.00	0.01		0.04	0.07			0.02			5.57	0.00	0.00	0.00			(00)

Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	18.73	18.96	19.35	19.86	20.37	20.73	20.89	20.86	20.54	19.91	19.19	18.68		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)														
(88)m=	19.97	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)														
(89)m=	0.99	0.98	0.97	0.93	0.84	0.69	0.51	0.58	0.82	0.95	0.99	0.99		(89)
Mean	n internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m=	16.9	17.24	17.81	18.56	19.26	19.73	19.91	19.88	19.5	, 18.62	17.61	16.83		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.11	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$														-
(92)m=	17.11	17.44	17.99	18.7	19.39	19.84	20.02	19.99	19.62	18.77	17.79	17.04		(92)
Apply	adjustn	nent to t	he mear	n interna	l tempera	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	17.11	17.44	17.99	18.7	19.39	19.84	20.02	19.99	19.62	18.77	17.79	17.04		(93)
8. Sp	ace hea	ting requ	uirement	i			•	•						
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														
the ut		r	<u> </u>	r <u> </u>								_		
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.97	ains, hm 0.95	0.91	0.81	0.68	0.52	0.58	0.8	0.93	0.98	0.99		(94)
			, W = (94			0.00	0.52	0.56	0.0	0.95	0.98	0.99		(34)
(95)m=	826.39	986.91	· · · ·	· · · · ·	· · · · · · · · · · · · · · · · · · ·	999.19	725.8	736.05	903.81	913.43	818.62	776.04		(95)
					e from Ta		0.0	100.00		0.01.0	0.000			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	loss rate	e for mea	an intern	al tempe	erature, l	Lm , W =	L =[(39)m :	r [(93)m	– (96)m	1				
(97)m=				· · ·	1775.09		- /	828.26	1274.74		2469.13	2963.99		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Nh/mont	th = 0.02	24 x [(97	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	1589.1	1282.19	1135.92	739.94	408.26	0	0	0	0	723.2	1188.37	1627.84		
			-	-				Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	8694.81	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								42.56	(99)
9a En	erav rea	uiremer	nts – Indi	ividual h	eating sy	vstems i	ncluding	micro-C	:HP)					
	e heatir			i i i di di di	outing of		nordaning		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
-		-	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	Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$													(204)
Efficie	Efficiency of main space heating system 1													_ (206)
	•			• •	y heating	a svstem	ո. %						280.83	(208)
	-	Feb	· · ·	r				Aug	Sen	Oct	Nov	Dee		<b>_</b>
Snac	Jan a beatin		Mar	Apr	May d above)	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	41
Opaci	1589.1	1282.19	1135.92	739.94	408.26	0	0	0	0	723.2	1188.37	1627.84		
(211)m			(4)] } x 1				-	-		-				(211)
رد ۱۱)۱۱	565.87	456.58	404.49	263.49	145.38	0	0	0	0	257.52	423.17	579.66		(211)
			I	I		-					211) <sub>15,1012</sub>		3096.15	(211)
														T (

Space heating fuel (secondary), kWh/month

= {[(98	)m x (2	01)] } x 1	00 ÷ (20	08)										
(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>	2=	0	(215)
Water	heating	g												-
Output	from w	vater hea 191.67	ter (calc	ulated a	bove) 175.45	0	0	0	0	186.13	197.56	212.23	l	
Efficier		vater hea		179.47	175.45	0	0	0	0	100.13	197.50	212.23	281.39	(216)
(217)m=	-	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	201.39	(217)
· · ·		heating,					201100			201100	201100	201100		· · ·
		) <u>m x 10(</u>			r								L	
(219)m=	77.35	68.12	71.38	63.78	62.35	0	0	0	0	66.15	70.21	75.42		-
								Tota	II = Sum(2	19a) <sub>112</sub> =			554.76	(219)
Water	heating 0	requirer	<u>ment (im</u> I o		) 0	133.64	126.12	141.46	142.18	0	0	0		
Efficier	_	l ° vater hea		-	0	100.04	120.12	141.40	142.10	0	0	0	100	(216)
(217)m=				0	0	100	100	100	100	0	0	0	100	(217)
		heating	I (Immers	I sion), kW	L /h/month	l )	1	1	1					. ,
(219)m	<u>ו = [ (64 ) </u>	l)m + (21	8) m ] x	100 ÷ (2	217)m					i	i	1	1	
(219)m=	0	0	0	0	0	133.64	126.12	141.46	142.18	0	0	0		-
•								lota	II = Sum(2			_	543.4	(219)
	al totals heating		ed. main	system	1					K	Wh/yea	ſ	<b>kWh/year</b> 3096.15	٦
		fuel use		-,	-								554.76	J
	-			view)										J
	-	fuel use											543.4	
Electri	city for	pumps, f	ans and	electric	keep-ho	t								
mech	anical \	entilatio/	n - balar	nced, ext	ract or p	ositive i	nput fror	m outside	e			94.73		(230a)
Total e	electricit	y for the	above,	kWh/yea	r			sum	of (230a).	(230g) =			94.73	(231)
Electri	city for	lighting											600.52	(232)
Electri	city gen	erated b	y PVs										-614.18	(233)
Total d	lelivere	d enerav	for all u	ses (211	)(221)	+ (231)	+ (232)	(237b)	=				3731.98	(338)
				lual heat		. ,	. ,	. ,						<b>」</b> 、 、
124.	002 011		manna	iddi fiodi	ing oyou		Ŭ							
							ergy				ion fac	tor	Emissions	
-		<i>,</i> .					/h/year			kg CO	2/KVVII	1	kg CO2/yea	_
Space	heating	g (main s	system 1	)			1) x			0.5	19	=	1606.9	(261)
Space	heating	g (secon	dary)			(21	5) x			0.5	19	=	0	(263)
Water	heating	l				(219	9) x			0.5	19	=	287.92	(264)
Water	heating	(Immer	sion)			(219	9) x			0.5	19	=	282.03	(264)
Space	and wa	ater heat	ing			(26	1) + (262)	+ (263) + (	(264) =				2176.85	(265)
Electri	city for	pumps, f	ans and	electric	keep-ho	t (23 <sup>-</sup>	1) x			0.5	19	=	49.16	(267)

Electricity for lighting	(232)	x		0.519	=	311.67	(268)
Energy saving/generation technologies Item 1				0.519	=	-318.76	(269)
Total CO2, kg/year			sum of (2	265)(271) =		2218.92	(272)
Dwelling CO2 Emission Rate			(272) ÷ (4	4) =		10.86	(273)
El rating (section 14)						88	(274)

				User D	etails:										
Assessor Name: Software Name:	Matt Fitzp Stroma FS				Strom Softwa	are Ver				0003572 on: 1.0.5.41					
				operty /	Address	: Plot 2									
Address :	Plot 2, Wid	dington, TB	3C												
1. Overall dwelling dim	iensions:			_											
One word file an				<b></b>	a(m²)		Av. Hei		1	Volume(m <sup>3</sup> )	1				
Ground floor				1'	19.31	(1a) x	2	2.5	(2a) =	298.27	(3a)				
First floor				8	4.97	(1b) x	2.	.56	(2b) =	217.61	(3b)				
Total floor area TFA = (	1a)+(1b)+(1c)+	(1d)+(1e)+	(1n	) 20	04.28	(4)									
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	515.88	(5)				
2. Ventilation rate:	main secondary other total r heating heating														
Number of chimneys $\begin{array}{c c} main \\ heating \\ 0 \end{array} + \begin{array}{c} secondary \\ heating \\ 0 \end{array} + \begin{array}{c} other \\ heating \\ 0 \end{array} + \begin{array}{c} total \\ 0 \end{array} = \begin{array}{c} m^3 per hour \\ x 40 = \end{array} \begin{array}{c} 0 \end{array} (6a)$															
Number of chimneys			-	+ [	0	] = [	0	x 4	40 =	0	(6a)				
Number of open flues	0		0	i + Г	0	-   -	0	x 2	20 =	0	(6b)				
Number of intermittent f	ans						0	x 1	0 =	0	(7a)				
Number of passive vent	S						0	x 1	0 =	0	](7b)				
Number of flueless gas	fires						0	x 4	40 =	0	](7c)				
0						L					]``´				
									Air ch	nanges per hou	ır				
Infiltration due to chimn	eys, flues and t	ans = (6a)+	-(6b)+(7	a)+(7b)+(	7c) =	Γ	0	·	÷ (5) =	0	(8)				
If a pressurisation test has			proceed	l to (17), c	otherwise o	continue fr	om (9) to (	(16)			-				
Number of storeys in	the dwelling (n	s)								0	(9)				
Additional infiltration				0.05 (				[(9)-	1]x0.1 =	0	(10)				
Structural infiltration:							ruction			0	(11)				
if both types of wall are deducting areas of oper			nung to	ine great	ei wali ale	a (allel									
If suspended wooden	floor, enter 0.2	2 (unsealed	l) or 0.	1 (seale	ed), else	enter 0				0	(12)				
lf no draught lobby, e	nter 0.05, else	enter 0								0	(13)				
Percentage of window	ws and doors d	raught strip	ped							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	nvelope	area	4.65000009536743	(17)				
If based on air permeab										0.23	(18)				
Air permeability value appl		ion test has be	een don	e or a deg	gree air pe	rmeability	is being us	sed		r	1				
Number of sides shelter Shelter factor	rea				(20) = 1 -	[0.075 x (1	9)] =			2	(19)				
Infiltration rate incorpora	ating shelter fa	rtor			(21) = (18)		-/]			0.85	(20)				
Infiltration rate modified	-				. , (.0	,				0.2	(21)				
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]					
Monthly average wind s	·	· · · ·	2011	0.01	1,109					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					
			5.5	0.0	U.,	, T				J					

Wind F	actor (22	2a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjuste	ed infiltra	tion rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m						
	0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23			
	ate effect echanical		-	rate for t	he appli	cable ca	se						_		
				andix N (2	(23a) – (23a	a) x Emv (c	auation (I	N5)) , other	wieg (23t	(232)		l		.5	(23a)
								n Table 4h)		) – (23a)		ļ		.5	(23b)
			-	-	-			HR) (24a		2h)m + ('	23h) v [ <sup>,</sup>	1 _ (23c)		0	(23c)
(24a)m=	· · · · ·			0	0		0		0		0	1 - (230)	÷ 100]		(24a)
		d mech	i anical ve	entilation	u without	heat rec	coverv (N	MV) (24b	m = (2)	1 2b)m + (2	23b)				
(24b)m=		0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole ho	ouse ex	tract ver	tilation o	r positiv	e input v	ventilatio	on from o	outside			<u> </u>			
,					•	•		c) = (22b		.5 × (23b	)				
(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(24c)
,					•	•		on from l 0.5 + [(2:		0.5]					
(24d)m=	r í r	0	0	0	0	0	0	0	0	0	0	0			(24d)
Effec	ctive air c	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in box	(25)						
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(25)
3 He	at losses	and he	at loce r	poromot	or.			•			•	•			
ELEN		Gros	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<b>&lt;</b> )	k-value kJ/m²·ł		A X kJ/K	
	IENT		SS	Openin	gs	Net Ar A ,r 2.21				A X U (W/ł 3.094	<)				
ELEN Doors	IENT	Gros	SS	Openin	gs	A ,n	n²	W/m2	К	(W/ł	<) 				
ELEN Doors	<b>IENT</b> Type 1	Gros area	SS	Openin	gs	A ,r	n <sup>2</sup> x	W/m2	K = =	(W/ł 3.094	<) 				(26)
ELEN Doors Doors Window	<b>Type 1</b> Type 2	Gros area	SS	Openin	gs	A ,r 2.21 1.89	n <sup>2</sup> x x 2 x	W/m2	K = = 0.04] =	(W/ł 3.094 2.646	<) 				(26) (26)
ELEN Doors Doors Window Window	<b>IENT</b> Type 1 Type 2 ws Type	Gros area 1 2	SS	Openin	gs	A ,r 2.21 1.89 16.92	n <sup>2</sup> x x x x x1 x1	W/m2 1.4 1.4 /[1/(1.4)+	K = = = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43	<)				(26) (26) (27)
ELEN Doors Doors Window Window	<b>Type 1</b> Type 2 ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6	n <sup>2</sup> x x x x x1 x1 x1 x1	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	K = = = = = = 0.04] = = 0.04] = =	(W/H 3.094 2.646 22.43 4.77	$\diamond$				(26) (26) (27) (27)
ELEN Doors Doors Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72	n <sup>2</sup> x x x x1 x1 x1 x1 x1 x1	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/H 3.094 2.646 22.43 4.77 0.95	$\diamond$				(26) (26) (27) (27) (27)
ELEN Doors Doors Window Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72 9.9	n <sup>2</sup> x x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12					<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type ghts	Gros area 1 2 3	SS (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024		kJ/m²+ł		kJ/K	<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Window Window Window Window Rooflig Floor	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts	Gros area 1 2 3 4	21	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> 1 x 7 x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4 )+	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172		kJ/m²+k 75		kJ/K 8948.25	<ul> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(28)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type ghts Type1 Type2	Gros area 1 2 3 4	21 25	Openin m	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x <sup>2</sup> x <sup>3</sup>	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/(1.4 )+ (0.12) 0.19	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64		kJ/m²+k 75 60		kJ/K 8948.25 8098.2	(26) (26) (27) (27) (27) (27) (27) (27b) (28) (29)
ELEN Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type yhts Type1 Type2 Type1	Gros area 1 2 3 4 170.1 82.8	21 21 21 21	Openin m 35.24	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ (0.12 0.19 0.17	K = = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38		kJ/m²-ŀ 75 60 9		kJ/K 8948.25 8098.2 745.65	(26) (26) (27) (27) (27) (27) (27b) (28) (29) (29)
ELEN Doors Window Window Window Window Rooflig Floor Walls Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type1	Gros area 1 2 3 4 170 82.8 58.7	21 21 25 24	Openin m 35.24 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74	n <sup>2</sup> x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/( 1.4 )+ 0.12 0.19 0.17 0.11	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46		kJ/m²-k 75 60 9 9		kJ/K 8948.25 8098.2 745.65 528.66	(26) (27) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Noalls Roof Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 (170) 82.8 58.7 18.6	21 21 25 24 25	Openin m 35.24 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64	n <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05		kJ/m²-ŀ 75 60 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 21 55 4 1	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35	n <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30) (30)
ELEN Doors Doors Window Window Window Window Rooflig Floor Walls Roof Roof Roof Roof T Roof T Roof T Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 21 55 4 1	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x <sup>1</sup>	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (29) (29) (30) (30) (30) (30)

Interna	al floor					84.97	,				Г	18		1529.46	(32d)
Interna	al ceiling					84.97	,				Ī	9	ז ר	764.73	(32e)
			ows, use e sides of in				ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	∟ as given in	paragraph	L 1 3.2		-
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				11	9.68	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	262	28.76	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) in	n kJ/m²K			= (34)	÷ (4) =			12	28.4	(35)
	-		ere the de tailed calci		constructi	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f			-
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						26	6.11	(36)
			are not kn	own (36) =	= 0.05 x (3	1)									_
	abric he								(33) +	(36) =			14	5.79	(37)
Ventila	tion hea	at loss ca	alculated	monthl	/		·	· · · · · ·	(38)m	= 0.33 × (	25)m x (5)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	85.46	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12			(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	231.25	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91			-
Heat lo	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39)1. (4)	12 /12=	23	0.94	(39)
(40)m=	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13			
										Average =	Sum(40)1	12 /12=	1	.13	(40)
Numbe			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. Wa	ter heat	ing ener	rgy requi	rement:								kWh/ye	ear:		
Assum	ed occu	ipancy, I	N								3.	.01			(42)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	A -13.9	)2)] + 0.0	0013 x (	TFA -13.		-			
	A £ 13.9		otor ucor	no in litro	e por da	w Vd av	orogo –	(25 x N)	1.26			- 00	l		(42)
								(25 X N) to achieve		se target o		5.63			(43)
not more	e that 125	litres per p	person per	<sup>.</sup> day (all w	ater use, ł	not and co	ld)								
	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	Table 1c x	(43)							
(44)m=	116.19	111.97	107.74	103.52	99.29	95.07	95.07	99.29	103.52	107.74	111.97	116.19			
											m(44) <sub>112</sub> =		126	67.53	(44)
Energy o	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=	172.31	150.7	155.51	135.58	130.09	112.26	104.02	119.37	120.79	140.77	153.67	166.87			-
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> =	=	166	61.94	(45)
(46)m=	25.85	22.61	23.33	20.34	19.51	16.84	15.6	17.91	18.12	21.12	23.05	25.03			(46)
	storage										·	•			
		```		0 1			0	within sa	ame ves	sel		180			(47)
	•	-	ind no ta		-			. ,							
Otherw	vise if no	o stored	hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)				

Water storage loss:

a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	32		(48)
Temper	ature fa	actor fro	m Table	2b							0.	54		(49)
Energy	lost fro	m water	· storage	e, kWh/ye	ear			(48) x (49	) =		0.	71		(50)
,				cylinder l									I	(54)
		-	ee secti	rom Tabl on 4.3	е 2 (кии	n/iitre/da	iy)					0		(51)
Volume	•	-		011 1.0								0		(52)
Temper	ature fa	actor fro	m Table	2b							<u> </u>	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.	71		(55)
Water s	torage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(56)
If cylinder	contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(57)
Primarv	circuit	loss (ar	nual) fro	om Table	93							0		(58)
•		•	,	for each		59)m = (	(58) ÷ 36	65 × (41)	m					
(modi	ified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	ı cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	0	0	0	0	23.26	22.51	23.26		(59)
Combi l	oss cal	culated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total he	eat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × 0	(45)m +	(46)m +	(57)m +	' (59)m + (61)m	
(62)m=	217.67	191.67	200.87	179.47	175.45	133.64	126.12	141.46	142.18	186.13	197.56	212.23		(62)
L Solar DH\	W input c	alculated	using App	endix G or	· Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add ad	ditional	lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output f	from wa	ater hea	ter	-										
(64)m=	217.67	191.67	200.87	179.47	175.45	0	0	0	0	186.13	197.56	212.23		
-								Out	out from w	ater heate	r (annual)₁	12	1561.05	(64)
Output i	immers	ion												
(64)m=	0	0	0	0	0	133.64	126.12	141.46	142.18	0	0	0		
_								Out	out from in	mersion (a	annual) <sub>112</sub>		543.40413785313	9 <mark>(64)</mark>
Heat ga	ins fror	n water	heating,	, kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	93.58	82.88	87.99	80.2	79.54	54.43	52.27	57.37	57.27	83.09	86.21	91.77		(65)
incluc	de (57)r	n in calo	culation	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. Inte	ernal ga	ins (see	e Table 5	5 and 5a	):									
Metabol	lic gain	s (Table	e 5), Wat	ts										
Г	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37		(66)
Lighting	gains	(calcula	ted in Ap	pendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5	-		-		
(67)m=	34	30.2	24.56	18.59	13.9	11.73	12.68	16.48	22.12	28.09	32.78	34.95		(67)
Applian	ces gai	ns (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5			•	
(68)m=	375.1	378.99	369.18	348.3	321.94	297.17	280.62	276.72	286.53	307.41	333.77	358.54		(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	38.04	38.04	38.04	4	38.04	38.04		38.04	38.04	38.	04	38.04	38.04	38.04	38	.04		(69)
Pumps	and far	ns gains	(Tabl	e 5a	a)				1						1			
(70)m=	0	0	0		0	0	Τ	0	0	C	)	0	0	0		0		(70)
Losses	s e.g. ev	aporatio	n (ne	gati	ve value	es) (Ta	ble	5)				<b>!</b>						
(71)m=	-120.3	-120.3	-120.	3	-120.3	-120.3	- 1	120.3	-120.3	-12	0.3	-120.3	-120.3	3 -120.3	-12	20.3		(71)
Water	heating	gains (T	able :	5)										-				
(72)m=	125.78	123.34	118.2	7	111.38	106.91		75.6	70.25	77.	11	79.54	111.6	9 119.74	12	3.35		(72)
Total i	nternal	gains =						(66)	m + (67)m	n + (68	B)m +	- (69)m + (7	70)m +	(71)m + (72	!)m			
(73)m=	602.99	600.64	580.1	3	546.39	510.86	6 4	52.61	431.66	438	.42	456.31	515.3	554.4	584	4.96		(73)
6. So	lar gains	8:																
			0	olar	flux from	Table 6a	a and		•	tions	to co	nvert to the	e applic	able orienta	ition.			
Orienta		Access F	actor		Area			Flu Tal			т	g_ able 6b		FF Table 6c			Gains	
Table 6d $m^2$ Table 6aTable 6bTable 6c(W)North $0.9x$ $0.77$ x $16.92$ x $10.63$ x $0.63$ x $0.77$ = $54.98$ (74)																		
		0.77		x	16.9	92	x		20.32	×		0.63	×	0.7		=	105.08	(74)
North	0.9x	0.77		x	16.9	92	x	3	34.53	×		0.63	×	0.7		=	178.56	(74)
North	0.9x	0.77		x	16.9	92	x	5	5.46	X		0.63	×	0.7		=	286.81	(74)
North	0.9x	0.77		x	16.9	92	x	7	4.72	X		0.63	×	0.7		=	386.35	(74)
North	0.9x	0.77		x	16.9	92	x	7	9.99	×		0.63	×	0.7		=	413.6	(74)
North	0.9x	0.77		x	16.9	92	x	7	4.68	×		0.63	×	0.7		=	386.15	(74)
North	0.9x	0.77		x	16.9	92	x	5	59.25	×		0.63	×	0.7		=	306.36	(74)
North	0.9x	0.77		x	16.9	92	x	4	1.52	×		0.63	×	0.7		=	214.68	(74)
North	0.9x	0.77		x	16.9	92	x	2	24.19	x		0.63	x	0.7		=	125.08	(74)
North	0.9x	0.77		x	16.9	92	x	1	3.12	x		0.63	x	0.7		=	67.83	(74)
North	0.9x	0.77		x	16.9	92	x		8.86	x		0.63	×	0.7		=	45.84	(74)
East	0.9x	0.77		x	3.6	6	x	1	9.64	x		0.63	x	0.7		=	21.61	(76)
East	0.9x	0.77		x	3.6	6	x	3	88.42	x		0.63	×	0.7		=	42.27	(76)
East	0.9x	0.77		x	3.6	6	x	6	3.27	x		0.63	×	0.7		=	69.61	(76)
East	0.9x	0.77		x	3.6	6	x	9	92.28	x		0.63	x	0.7		=	101.53	(76)
East	0.9x	0.77		x	3.6	6	x	1	13.09	x		0.63	×	0.7		=	124.43	(76)
East	0.9x	0.77		x	3.6	6	x	1	15.77	x		0.63	×	0.7		=	127.37	(76)
East	0.9x	0.77		x	3.6	6	x	1	10.22	x		0.63	×	0.7		=	121.26	(76)
East	0.9x	0.77		x	3.6	6	x	9	94.68	×		0.63	x	0.7		=	104.16	(76)
East	0.9x	0.77		x	3.6	6	x	7	3.59	×		0.63	x	0.7		=	80.96	(76)
East	0.9x	0.77		x	3.6	6	x	4	5.59	x		0.63	x	0.7		=	50.16	(76)
East	0.9x	0.77		x	3.6	6	x	2	24.49	x		0.63	x	0.7		=	26.94	(76)
East	0.9x	0.77		x	3.6	6	x	1	6.15	×		0.63	x	0.7		=	17.77	(76)
South	0.9x	0.77		x	9.9	9	x	4	6.75	×		0.63	x	0.7		=	141.45	(78)
South	0.9x	0.77		x	9.9	)	x	7	6.57	×		0.63	x	0.7		=	231.66	(78)
South	0.9x	0.77		x	9.9	)	x		97.53	×		0.63	x	0.7		=	295.1	(78)
South	0.9x	0.77		x	9.9	9	x	1	10.23	×		0.63	x	0.7		=	333.52	(78)

0 11	_												-, I					_
<b>.</b> .	.9x	0.77		X	9.9	)	x	1	14.87	X	(	0.63	_ ×	0.7	=		347.55	(78)
- ·	.9x	0.77		x	9.9	)	x	1	10.55	X	(	0.63	_ ×	0.7	=		334.47	(78)
- ·	.9x	0.77		x	9.9	)	x	10	08.01	X	(	0.63	_ ×	0.7	=		326.8	(78)
	.9x	0.77		X	9.9	)	x	10	04.89	X	(	0.63	×	0.7	=		317.37	(78)
	.9x	0.77		x	9.9	)	x	10	01.89	x	(	0.63	×	0.7	=		308.26	(78)
South 0.	. <mark>9x</mark>	0.77		x	9.9	)	x	8	2.59	x	(	0.63	×	0.7	=	2	249.87	(78)
South 0.	.9x	0.77		x	9.9	)	x	5	5.42	x	(	0.63	×	0.7	=		167.67	(78)
South 0.	. <mark>9x</mark>	0.77		x	9.9	)	x		40.4	x	(	0.63	×	0.7	=		122.23	(78)
West 0.	. <mark>9x</mark>	0.77		x	0.7	2	x	1	9.64	x	(	).63	×	0.7	=		4.32	(80)
West 0.	. <mark>9x</mark>	0.77		x	0.7	2	x	3	8.42	x	(	).63	×	0.7	=		8.45	(80)
West 0.	.9x	0.77		x	0.7	2	x	6	3.27	x	(	0.63	×	0.7	=		13.92	(80)
West 0.	.9x	0.77		x	0.7	2	x	9	2.28	x	(	0.63	x	0.7	=		20.31	(80)
West 0.	.9x	0.77		x	0.7	2	x	1	13.09	x	(	0.63	×	0.7	=		24.89	(80)
West 0.	.9x	0.77		x	0.7	2	x	1	15.77	x	(	0.63	×	0.7	=		25.47	(80)
West 0.	.9x	0.77		x	0.7	2	x	1	10.22	x	(	0.63	×	0.7	=		24.25	(80)
West 0.	.9x	0.77		x	0.7	2	x	9	4.68	x	(	0.63		0.7	=		20.83	(80)
West 0.	.9x	0.77		x	0.7	2	x	7	3.59	x	(	0.63		0.7	=		16.19	(80)
West 0.	.9x	0.77		x	0.7	2	x	4	5.59	x	(	).63		0.7	=		10.03	(80)
West 0.	.9x 🗌	0.77		x	0.7	2	x	2	4.49	x	(	).63		0.7	= =		5.39	(80)
West 0.	.9x	0.77		x	0.7	2	x	1	6.15	x	(	0.63		0.7	= =		3.55	(80)
Rooflights 0.	.9x	1		x	2.1	6	x		15.3	x	(	0.63	 × [	0.7	= -		13.11	(82)
Rooflights 0.	.9x [	1		x	2.1	6	x	2	8.48	x	(	0.63	i x	0.7	=		24.41	(82)
Rooflights 0.		1		x	2.1	6	x	5	0.24	x	(	0.63	 	0.7	=		43.07	(82)
Rooflights 0.	.9x [	1		x	2.1		x	<u> </u>	9.03	x		0.63	 × [	0.7	= =		76.33	(82)
Rooflights 0.	.9x [	1		x	2.1		x		29.88	x		0.63		0.7	╡_		111.35	(82)
Rooflights 0.		1		x	2.1		x		43.74	x		).63	 	0.7	=		123.22	(82)
Rooflights 0.		1		x	2.1		x	<u> </u>	32.31	x		0.63	 × [	0.7	=   _		113.43	(82)
Rooflights 0.	.9x [	1		x	2.1		x		8.56	x		0.63	 × [	0.7	╡_		84.5	(82)
Rooflights 0.		1		x	2.1		x		2.62	x		0.63	   [	0.7	= -		53.69	(82)
Rooflights 0.		1		x	2.1		x	<u> </u>	4.05	x		0.63	   × [	0.7	=		29.19	(82)
Rooflights 0.		<u>_</u>		x	2.1		x		8.64	x		0.63	 × [	0.7			15.98	(82)
Rooflights 0.		1		x	2.1		x	<u> </u>	2.94	x		0.63	^     ×	0.7			11.1	(82)
0 0	Ľ	<u> </u>		~	2.1	0		'	2.04					0.7				(0)
Solar gains	s in v	watts ca	lcula	ted	for each	mon	'n			(83)m	ı = Sur	n(74)m	.(82)m					
(83)m= 235	-	411.88	600.2	_	818.49	994.5	-	024.14	971.89	833		673.79	464.33	283.82	200.49	1		(83)
Total gains	s — ir	nternal a	nd sc	lar	(84)m =	(73)n	<u>ו</u> + (	83)m	, watts			I				_		
(84)m= 838	.47	1012.52	1180.	38	1364.88	1505.4	3 14	476.76	1403.55	1271	1.64 1	1130.1	979.63	838.22	785.44	1		(84)
7. Mean ir	oterr	nal temp	eratu	ro (	heating	seaso	n)			1				_		_		
Temperat								area f	rom Tał	nle 9	Th1	(°C)					21	(85)
Utilisation		-					-			510 9,	,	( )					21	
Ja	- 1	Feb	Ma Ma		Apr	Mav	Ť	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec	1		
(86)m= 0.9	_	0.99	0.97	-	0.94	0.87		0.76	0.62	0.6	<u> </u>	0.87	0.96	0.99	0.99	4		(86)
	~	0.00	0.01		0.07	5.57			0.02			5.57	0.00	0.00	0.00			(00)

(177)m-       18.73       18.86       19.38       19.38       20.37       20.37       20.48       20.54       19.91       113.19       18.68       (47)         Temperature during heating periods in rest of dwelling from Table 9, h12 (°C)       (53)       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.98       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99       19.99	Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(39)m-       19.87       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       19.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88       18.88 <t< td=""><td>(87)m=</td><td>18.73</td><td>18.96</td><td>19.35</td><td>19.86</td><td>20.37</td><td>20.73</td><td>20.89</td><td>20.86</td><td>20.54</td><td>19.91</td><td>19.19</td><td>18.68</td><td></td><td>(87)</td></t<>	(87)m=	18.73	18.96	19.35	19.86	20.37	20.73	20.89	20.86	20.54	19.91	19.19	18.68		(87)
Left         Left <thleft< th="">         Left         Left         <thl< td=""><td>Temp</td><td>erature</td><td>during h</td><td>neating p</td><td>eriods ir</td><td>n rest of</td><td>dwelling</td><td>from Ta</td><td>ble 9, T</td><td>h2 (°C)</td><td></td><td></td><td></td><td></td><td></td></thl<></thleft<>	Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(8)m=         0.99         0.98         0.97         0.33         0.84         0.69         0.51         0.58         0.82         0.36         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.90         0.99         0.91         (80)         (R1)         (R1)         16.85         17.61         16.83         (90)         (90)         (90)         (R1)         17.14         17.41         17.49         18.7         19.39         19.84         20.02         19.99         19.62         18.77         17.79         17.04         (93)           30.90         17.14         17.44         17.99         18.7         19.39         19.84         20.02         19.99         19.62         18.77         17.70         17.04         (93)           35.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.	(88)m=	19.97	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98		(88)
(8)m=         0.99         0.98         0.97         0.33         0.84         0.69         0.51         0.58         0.82         0.36         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.99         0.90         0.99         0.91         (80)         (R1)         (R1)         16.85         17.61         16.83         (90)         (90)         (90)         (R1)         17.14         17.41         17.49         18.7         19.39         19.84         20.02         19.99         19.62         18.77         17.79         17.04         (93)           30.90         17.14         17.44         17.99         18.7         19.39         19.84         20.02         19.99         19.62         18.77         17.70         17.04         (93)           35.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.         5.	Utilisa	ation fac	tor for g	ains for	rest of d	welling, l	h2,m (se	e Table	9a)						
(90)me       16.9       17.24       17.81       18.56       19.26       19.73       19.91       19.86       19.5       18.62       17.61       16.83       (90)         ILA = Living area + (A) =       0.11       (91)       (92)       0.11       (92)       0.11       (91)         Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2       (92)       (92)       18.77       17.79       17.04       (92)         Space heating requirement       18.77       19.39       19.84       20.02       19.99       19.62       18.77       17.79       17.04       (93)         8. Space heating requirement       Usation factor for gains using Table 9a       using Table 9a       using Table 9b       0.80       0.97       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.89       0.91       (94)         Ulisation factor for gains, mm:       (94)m       Useful gains, hmGm, W = (94)m x (64)m       (95)       Monthy average external temperature from Table 8       (96)m       19.43       818.62       776.04       (95)         Monthy average external temperature, Lm , W = (129)m x (123)m x (123)m (123)				i	i	<u> </u>	<u>`</u>		r	0.82	0.95	0.99	0.99		(89)
(90)me       16.9       17.24       17.81       18.56       19.26       19.73       19.91       19.86       19.5       18.62       17.61       16.83       (90)         ILA = Living area + (A) =       0.11       (91)       (92)       0.11       (92)       0.11       (91)         Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2       (92)       (92)       18.77       17.79       17.04       (92)         Space heating requirement       18.77       19.39       19.84       20.02       19.99       19.62       18.77       17.79       17.04       (93)         8. Space heating requirement       Usation factor for gains using Table 9a       using Table 9a       using Table 9b       0.80       0.97       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.89       0.91       (94)         Ulisation factor for gains, mm:       (94)m       Useful gains, hmGm, W = (94)m x (64)m       (95)       Monthy average external temperature from Table 8       (96)m       19.43       818.62       776.04       (95)         Monthy average external temperature, Lm , W = (129)m x (123)m x (123)m (123)	Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to 3	7 in Tabl	e 9c)				
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 – fLA) x T2       (92)m= 17.11       17.44       17.99       18.7       19.39       19.82       18.77       17.79       17.04       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)m       17.11       17.44       17.99       18.77       17.79       17.04       (93)         3. Space heating requirement       External temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:       (94)m       0.97       0.95       0.91       0.81       0.88       0.52       0.58       0.8       0.93       0.98       0.99       (94)         Utilisation factor for gains, hm:       (94)m=       0.97       0.95       0.91       0.81       0.88       0.52       0.58       0.8       0.93       0.99       (94)         Usisation factor for gains, hm:       (96)m=       282.33       98.91       11.72.14       14.8       16.6       16.4       14.1       10.6       7.1       4.2       (96)         (96)m=       282.38       98.21       282.02       283.61       276.43       188.71       162.7.84       (97)       295.81       126.26       (98)       (97)       58.8       91.17			· · ·	i	i	i					,	17.61	16.83		(90)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	l									f	LA = Livin	g area ÷ (4	4) =	0.11	(91)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Mean	interna	l temper	ature (fo	or the wh	ole dwel	llina) = fl	A 🗙 T1	+ (1 – fl	A) x T2					4
(93)m=       17.11       17.44       17.99       18.7       19.39       19.82       18.77       17.78       17.78       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79       17.79 <td< td=""><td></td><td></td><td>· · ·</td><td>r È</td><td>r</td><td>· · · · · ·</td><td></td><td></td><td>r .</td><td>, i</td><td>18.77</td><td>17.79</td><td>17.04</td><td></td><td>(92)</td></td<>			· · ·	r È	r	· · · · · ·			r .	, i	18.77	17.79	17.04		(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           (94)         Utilisation factor for gains, hm:         (94)           (94)         0.99 0.97 0.95 0.91 0.81 0.68 0.52 0.58 0.8 0.93 0.98 0.99 (94)         (95)           Useful gains, hmCm, W = (94)m x (84)m         (95)         (96)           (96)me 4.3 4.9 0.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)         (96)           (97)me 2962.28 284.92 2652.06 2283.67 1775.09 1210.16 789.84 828.28 1274.74 188.548 2469.13 2963.99 (97)         (97)           Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m         (98)           (98)me 1588.1 1282.19 1135.92 739.94 408.26 0 0 0 0 723.2 1188.37 1627.84         (99)           Space heating requirement in kWh/m²/year         42.56 (99)           Space heating requirement in kWh/m²/year         42.56 (99)           Space heating:         (20)           Fraction of space heat from main system (s)         (20) = 1 - (201) =           Fraction of space heat from main system 1         (204) = (202) x [1 - (203)] =           Ifficiency of main space heating system 1         280.82 (0 0 0 0 723.2 1188.37 1627.84           (211)         Feb Mar Apr May Jun Jul Au		adjustn	nent to t	i he mear	interna	l tempera	ature fro	m Table	4e, whe	ere appro	opriate				
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	(93)m=	17.11	17.44	17.99	18.7	19.39	19.84	20.02	19.99	19.62	18.77	17.79	17.04		(93)
the utilisation factor for gains using Table 9a	8. Spa	ace hea	ting requ	uirement											
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$							ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Utilisation factor for gains, hm:         (94)m=       0.99       0.97       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.93       0.98       0.99         (94)m=       0.99       0.97       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.93       0.98       0.99         Useful gains, hmGm, W = (94)m x (84)m         (95)m=       826.39       986.91       1125.28       1225.38       1926.36       999.19       725.8       736.05       903.81       913.43       818.62       776.04       (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         Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m- (96)m]         (97)m=       2962.28       289.492       2652.06       2263.67       1775.09       1210.16       789.84       282.26       1274.74       1885.48       2469.13       2693.99       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	the ut			<u> </u>											
(94)m=       0.99       0.97       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.93       0.98       0.99       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)m=       826.39       986.91       1125.28       1235.98       1226.36       999.19       725.8       736.05       903.81       913.43       818.62       776.04       (95)         Monthly average external temperature from Table 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       (96)         Heat loss rate for mean intermal temperature, Lm, W =[(39)m x [(93)m- (96)m ]       (97)       Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (98)m=       1589.1       1282.19       135.92       739.94       408.26       0       0       723.2       1188.37       1627.84         (98)m=       1589.1       1280.1       1280.1       1280.19       125.92       739.94       408.26       0       0       723.2       1188.37       1627.84         (98)m=       1589.1       1280.1       1280.19       1280.19       280.28       1271.41       185.48       246.91.3       2963.99						Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = (94)m x (84)m       (95)         (95)me       826.39       966.91       1125.28       1235.98       1226.36       999.19       725.8       736.05       903.81       913.43       818.62       776.04       (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       2962.28       2894.92       2652.06       2263.67       1775.09       1210.16       789.84       828.26       1274.74       1885.48       2469.13       2963.99       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (98)       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         (98)m       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       223.2       1188.37       1627.84       (98)         Space heating:       Fraction of space heat from secondary/supplementary system       0       (201)       1 <td></td> <td></td> <td></td> <td>· · · · ·</td> <td>· · · · · ·</td> <td>0.81</td> <td>0.68</td> <td>0.52</td> <td>0.58</td> <td>0.8</td> <td>0.03</td> <td>0.98</td> <td>0.00</td> <td></td> <td>(94)</td>				· · · · ·	· · · · · ·	0.81	0.68	0.52	0.58	0.8	0.03	0.98	0.00		(94)
(95)m=       826.39       986.91       1125.28       1235.98       1226.36       999.19       725.8       736.05       903.81       913.43       818.62       776.04       (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       2962.28       2894.92       2652.06       2263.67       1775.09       1210.16       789.84       828.26       1274.74       1885.48       2469.13       2963.99       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (98)       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         Space heating requirement in kWh/m²/year							0.00	0.52	0.50	0.0	0.95	0.90	0.33		(04)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		-		· · · ·	· · ·	· · · · · · · · · · · · · · · · · · ·	999.19	725.8	736.05	903.81	913.43	818.62	776.04		(95)
(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       (96)         Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m]       (97)       (97)       2962.28       2894.92       2652.06       2263.67       1775.09       1210.16       789.84       828.26       1274.74       1885.48       2469.13       2963.99       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (98)       1289.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         Total per year (kWhyear) = Sum(98)4       =       8694.81       (98)         Space heating requirement in kWh/m2/year       42.56       (99)         Space heating:         Fraction of space heat from secondary/supplementary system       0       (201)         Fraction of total heating from main system 1       (202) = 1 - (201) =       1       (202)         Fraction of space heating system 1       (204) = (202) × [1 - (203)] =       1       (204)         Efficiency of main space heating system, %       0       (206) </td <td></td>															
(97)m=       2962.28       2894.92       2652.06       2263.67       1775.09       1210.16       789.84       828.26       1274.74       1885.48       2469.13       2963.99       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (41)m       (98)m=       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         Space heating requirement in kWh/m²/year       42.56       (99)         Space heating:         Fraction of space heat from secondary/supplementary system       0       (201)         Fraction of total heating from main system 1       (204) = (202) x [1 - (203)] =       1       (204)         Efficiency of secondary/supplementary heating system, %       0       (208)       280.83       (206)         Ifficiency of secondary/supplementary heating system, %       0       0       0       723.2       1188.37       1627.84         Ifficiency of secondary/supplementary heating system, %       0       (202) x [1 - (203)] =       1       (204)         Ifficiency of secondary/supplementary heating system, %       0       0       0       (208)         Ifficiency of secondary/supplementary heating system, % <td< td=""><td></td><td>-</td><td>-</td><td>r</td><td>i –</td><td></td><td></td><td>16.6</td><td>16.4</td><td>14.1</td><td>10.6</td><td>7.1</td><td>4.2</td><td></td><td>(96)</td></td<>		-	-	r	i –			16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m=       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         Total per year (kWh/year) = Sum(98)st: =       8694.81       (98)         Space heating 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       280.83       (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)       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627	Heat	loss rate	e for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	r [(93)m	– (96)m	]				
	(97)m=	2962.28	2894.92	2652.06	2263.67	1775.09	1210.16	789.84	828.26	1274.74	1885.48	2469.13	2963.99		(97)
Total per year (kWh/year) = Sum(98): $\underline{sa} = 12$ 6694.81 (98)Space heating requirement in kWh/m²/year42.56 (99) <b>Space heating:</b> Fraction of space heat from secondary/supplementary system0 (201)Fraction of space heat from secondary/supplementary system0 (201)Fraction of space heat from main system(s)(202) = 1 - (201) =1(202)Fraction of total heating from main system 1(204) = (202) × [1 - (203)] =1(204)Efficiency of main space heating system 1280.83(206)Ifficiency of secondary/supplementary heating system, %0(201)Image: Space heating requirement (calculated above)Image: Space heating requirement (calculated above)Issel 1 1282.19 1135.92 739.94 408.26 0 0 0 0 0 723.2 1188.37 1627.84Image: Space heating requirement (calculated above)Image: Space heating requirement (calculated above)Issel 1 1282.19 1135.92 739.94 408.26 0 0 0 0 0 0 257.52 423.17 579.66Image: Space heating requirement (calculated above)Issel 1 1282.19 1135.92 739.94 145.38 0 0 0 0 0 257.52 423.17 579.66Image: Space heating requirement (calculated above)	Space	e heatin	g require	ement fo	r each n	nonth, k	Nh/mont	h = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
Space heating requirement in kWh/m²/year <b>9a. Energy requirements – Individual heating systems including micro-CHP)Space heating:</b> Fraction of space heat from secondary/supplementary system $0$ (201)Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ Efficiency of main space heating system 1 $280.83$ (206)Efficiency of secondary/supplementary heating system, % $0$ (208)Image: Space heating requirement (calculated above) $1135.92$ 739.94 408.26 0 0 0 0 723.2 1188.37 1627.84(211) m = {[(98) m x (204)] } x 100 ÷ (206)(211)Image: Space heating with the state in the state	(98)m=	1589.1	1282.19	1135.92	739.94	408.26	0	0	0	0	723.2	1188.37	1627.84		
9a. Energy requirements – Individual heating systems including micro-CHP)Space heating: Fraction of space heat from secondary/supplementary system0 $(201)$ Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of space heating from main system 1 $(204) = (202) \times [1 - (203)] =$ Efficiency of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ Efficiency of main space heating system 1 $280.83$ Efficiency of secondary/supplementary heating system, %0JanFebMarAprMayJunJulAugSepSpace heating requirement (calculated above)1589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.191589.11282.19<			_						Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	8694.81	(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 $(204) = (202) \times [1 - (203)] =$ 1       (204)         Efficiency of main space heating system 1 $(204) = (202) \times [1 - (203)] =$ 1       (204)         Efficiency of main space heating system 1 $280.83$ (206)       (208)         Image: Space heating requirement (calculated above)       0       0       0       (208)         Space heating requirement (calculated above)       1188.37       1627.84       (211)       (211)         Image: Space heating x (204)] } x 100 ÷ (206)       0       0       0       257.52       423.17       579.66	Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								42.56	(99)
Space heating:         Fraction of space heat from secondary/supplementary system       0       (201)         Fraction of space heat from main system(s) $(202) = 1 - (201) =$ 1       (202)         Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1       (204)         Efficiency of main space heating system 1 $(204) = (202) \times [1 - (203)] =$ 1       (204)         Efficiency of main space heating system 1 $280.83$ (206)       (208)         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)       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         (211)m = {[(98)m x (204)] } x 100 ÷ (206)       (211)         565.87       456.58       404.49       263.49       145.38       0       0       0       257.52       423.17       579.66	9a, En	erav rea	uiremer	nts – Indi	ividual h	eating sv	vstems i	ncludina	micro-C	CHP)					
Fraction of space heat from secondary/supplementary system0(201)Fraction of space heat from main system(s)(202) = 1 - (201) =1(202)Fraction of total heating from main system 1(204) = (202) × $[1 - (203)] =$ 1(204)Efficiency of main space heating system 1(204) = (202) × $[1 - (203)] =$ 1(204)Efficiency of main space heating system 1(204)Efficiency of secondary/supplementary heating system, %0(208)JanFebMarAprMayJunJulAugSepOctNovDeckWh/yearSpace heating requirement (calculated above)[1589.11282.191135.92739.94408.26000723.21188.371627.84(211)565.87456.58404.49263.49145.38000257.52423.17579.66								9							
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1 $(204)$ Efficiency of main space heating system 1       280.83 $(206)$ 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)       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         (211)m = {[(98)m x (204)] } x 100 ÷ (206)       (211)         565.87       456.58       404.49       263.49       145.38       0       0       0       257.52       423.17       579.66       (211)	-		-	at from s	econdar	y/supple	mentary	system						0	(201)
Efficiency of main space heating system 1       280.83       (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)       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         (211)m = {[[(98)m x (204)] } x 100 ÷ (206)       (211)         565.87       456.58       404.49       263.49       145.38       0       0       0       257.52       423.17       579.66	Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 ·	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, %       0       (208)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       kWh/year         Space heating requirement (calculated above) $1589.1$ $1282.19$ $1135.92$ $739.94$ $408.26$ $0$ $0$ $0$ $723.2$ $1188.37$ $1627.84$ (211)m = {[[98)m x (204)] $x$ $100 \div (206)$ (211)       (211)       (255.87) $456.58$ $404.49$ $263.49$ $145.38$ $0$ $0$ $0$ $257.52$ $423.17$ $579.66$ (211)	Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [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) $1589.1$ $1282.19$ $1135.92$ $739.94$ $408.26$ $0$ $0$ $0$ $723.2$ $1188.37$ $1627.84$ (211)m = {[[98)m x (204)] $x$ $100 \div (206)$ (211)       (211)       (255.87) $456.58$ $404.49$ $263.49$ $145.38$ $0$ $0$ $0$ $257.52$ $423.17$ $579.66$ (211)	Efficie	ency of I	main spa	ace heat	ing syste	em 1								280.83	(206)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Efficie	ency of s	seconda	ry/suppl	ementar	v heating	a system	n, %						0	(208)
Space heating requirement (calculated above)         1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         (211)m = {[(98)m x (204)] } x 100 ÷ (206) $(211)$ $(255.87)$ $456.58$ $404.49$ $263.49$ 145.38       0       0       0 $257.52$ $423.17$ $579.66$		-			· · · · ·				Δυσ	Sen	Oct	Nov	Dec		<b>]</b>
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Space							501	Aug	Oep	001		Dec	KWII/yee	
$(211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $565.87  456.58  404.49  263.49  145.38  0  0  0  0  257.52  423.17  579.66 $ $(211)$	Spade		<u> </u>	i È	ì			0	0	0	723.2	1188.37	1627.84		
565.87 456.58 404.49 263.49 145.38 0 0 0 0 257.52 423.17 579.66	(211)m	) = {[(98							1			1			(211)
	()//		· · · ·	1	i İ	· · · · · · · · · · · · · · · · · · ·	0	0	0	0	257.52	423.17	579.66		()
$101a1 (kvv1/year) = 3011(2+1)_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{15,1012} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{1$				ļ	ļ				Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	-	3096.15	(211)

Space heating fuel (secondary), kWh/month

= {[(98	)m x (2	01)] } x 1	00 ÷ (20	08)										
(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>	2=	0	(215)
Water	heating	g												-
Output	from w	vater hea 191.67	ter (calc	ulated a	bove) 175.45	0	0	0	0	186.13	197.56	212.23	l	
Efficier		vater hea		179.47	175.45	0	0	0	0	100.13	197.50	212.23	281.39	(216)
(217)m=	-	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	201.39	(217)
· · ·		heating,					201100			201100	201100	201100		· · ·
		) <u>m x 10(</u>			r								L	
(219)m=	77.35	68.12	71.38	63.78	62.35	0	0	0	0	66.15	70.21	75.42		-
								Tota	II = Sum(2	19a) <sub>112</sub> =			554.76	(219)
Water	heating 0	requirer	<u>ment (im</u> I o		) 0	133.64	126.12	141.46	142.18	0	0	0		
Efficier	_	l ° vater hea		-	0	100.04	120.12	141.40	142.10	0	0	0	100	(216)
(217)m=				0	0	100	100	100	100	0	0	0	100	(217)
		heating	I (Immers	I sion), kW	L /h/month	l )	1	1	1					. ,
(219)m	<u>ו = [ (64 ) </u>	l)m + (21	8) m ] x	100 ÷ (2	217)m					i	i	1	1	
(219)m=	0	0	0	0	0	133.64	126.12	141.46	142.18	0	0	0		-
•								lota	II = Sum(2			_	543.4	(219)
	al totals heating		ed. main	system	1					K	Wh/yea	ſ	<b>kWh/year</b> 3096.15	٦
		fuel use		-,	-								554.76	J
	-			view)										J
	-	fuel use											543.4	
Electri	city for	pumps, f	ans and	electric	keep-ho	t								
mech	anical \	entilatio/	n - balar	nced, ext	ract or p	ositive i	nput fror	m outside	Э			94.73		(230a)
Total e	electricit	y for the	above,	kWh/yea	r			sum	of (230a).	(230g) =			94.73	(231)
Electri	city for	lighting											600.52	(232)
Electri	city gen	erated b	y PVs										-614.18	(233)
Total d	lelivere	d enerav	for all u	ses (211	)(221)	+ (231)	+ (232)	(237b)	=				3731.98	(338)
				lual heat		. ,	. ,	. ,						<b>」</b> 、 、
124.	002 011		manna	iddi fiodi	ing oyou		Ŭ							
							ergy				ion fac	tor	Emissions	
-		<i>,</i> .					/h/year			kg CO	2/KVVII	1	kg CO2/yea	_
Space	heating	g (main s	system 1	)			1) x			0.5	19	=	1606.9	(261)
Space	heating	g (secon	dary)			(21	5) x			0.5	19	=	0	(263)
Water	heating	l				(219	9) x			0.5	19	=	287.92	(264)
Water	heating	(Immer	sion)			(219	9) x			0.5	19	=	282.03	(264)
Space	and wa	ater heat	ing			(26	1) + (262)	+ (263) + (	(264) =				2176.85	(265)
Electri	city for	pumps, f	ans and	electric	keep-ho	t (23 <sup>-</sup>	1) x			0.5	19	=	49.16	(267)

Electricity for lighting	(232)	x		0.519	=	311.67	(268)
Energy saving/generation technologies Item 1				0.519	=	-318.76	(269)
Total CO2, kg/year			sum of (2	265)(271) =		2218.92	(272)
Dwelling CO2 Emission Rate			(272) ÷ (4	4) =		10.86	(273)
El rating (section 14)						88	(274)

					User D	etails:									
Assessor Name: Software Name:		tt Fitzpat oma FSA				Strom Softwa	are Vei				0003572 on: 1.0.5.41				
					roperty	Address	: Plot 3								
Address :		t 3, Widdi	ngton,	твс											
1. Overall dwelling dir	nension	S:				( ))			• • • • • •						
Ground floor					<b></b>	a(m²)			ight(m)		Volume(m <sup>3</sup> )				
					1	19.31	(1a) x	2	2.5	(2a) =	298.27	(3a)			
First floor					8	84.97	(1b) x	2	.56	(2b) =	217.61	(3b)			
Total floor area TFA =	(1a)+(1t	o)+(1c)+(′	1d)+(1e	e)+(1r	I) 2	04.28	(4)								
Dwelling volume							(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	515.88	(5)			
2. Ventilation rate:	main secondary other total r heating heating														
Number of chimneys $\begin{array}{c c} main \\ heating \\ 0 \end{array} + \begin{array}{c} secondary \\ heating \\ 0 \end{array} + \begin{array}{c} other \\ heating \\ 0 \end{array} + \begin{array}{c} total \\ 0 \end{array} = \begin{array}{c} m^3 per hour \\ x 40 = \end{array} \begin{array}{c} 0 \end{array} (6a)$															
Number of chimneys	Ĺ			-	] + [	0	] = [	0	x 4	40 =	0	(6a)			
Number of open flues	Ē	0	i + F	0		0	] = [	0	x2	20 =	0	(6b)			
Number of intermittent	L fans							0	x ^	10 =	0	(7a)			
Number of passive ven	ts							0	x ^	10 =	0	(7b)			
Number of flueless gas	fires							0	x 4	40 =	0	(7c)			
Ũ							L					]`´			
										Air ch	nanges per hou	r			
Infiltration due to chimr	neys, flu	es and fa	ns = <mark>(6</mark>	a)+(6b)+(7	a)+(7b)+(	7c) =	Г	0	·	÷ (5) =	0	(8)			
If a pressurisation test has				ed, procee	d to (17), o	otherwise of	continue fr	rom (9) to (	(16)			-			
Number of storeys in	the dwo	elling (ns)	)								0	(9)			
Additional infiltration	0.05 (		4	(	0.05 (-				[(9)	-1]x0.1 =	0	(10)			
Structural infiltration: if both types of wall are								uction			0	(11)			
deducting areas of ope				ponung ic	line great	er wan are	a (allel								
If suspended wooder	n floor, e	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)			
If no draught lobby, e	enter 0.0	)5, else e	nter 0								0	(13)			
Percentage of windo	ws and	doors dra	aught st	ripped							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	nvelope	area	4.65000009536743	(17)			
If based on air permea											0.23	(18)			
Air permeability value app		ressurisation	n test has	s been dor	e or a deg	gree air pe	rmeability	is being us	sed			lue			
Number of sides shelte Shelter factor	rea					(20) = 1 -	[0.075 x (1	[9]] =			2 0.85	(19) (20)			
Infiltration rate incorpor	ating sh	elter fact	or			(21) = (18		/-			0.00	(21)			
Infiltration rate modified	-			ł		х <i>у</i> х -					0.2	]()			
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]				
Monthly average wind			-			1	1 - 24				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				
				I		I	I		I		J				

Wind F	actor (22	2a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjuste	ed infiltra	tion rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m						
	0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23			
	ate effect echanical		-	rate for t	he appli	cable ca	se						_		
				andix N (2	(23a) – (23a	a) x Emv (c	auation (I	N5)) , other	wieg (23t	(232)		l		.5	(23a)
								n Table 4h)		) – (23a)		l		.5	(23b)
			-	-	-			HR) (24a		2h)m + ('	23h) v [ <sup>,</sup>	1 _ (23c)		0	(23c)
(24a)m=	· · · · ·			0	0		0		0		0	1 - (230)	÷ 100]		(24a)
		d mech	i anical ve	entilation	u without	heat rec	coverv (N	MV) (24b	m = (2)	1 2b)m + (2	23b)				
(24b)m=		0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole ho	ouse ex	tract ver	tilation o	r positiv	e input v	ventilatio	on from o	outside			<u> </u>			
,					•	•		c) = (22b		.5 × (23b	)				
(24c)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(24c)
,					•	•		on from l 0.5 + [(2:		0.5]					
(24d)m=	r í r	0	0	0	0	0	0	0	0	0	0	0			(24d)
Effec	ctive air c	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in box	(25)						
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			(25)
3 He	at losses	and he	at loce r	poromot	or.			•			•	•	l		
ELEN		Gros	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<b>&lt;</b> )	k-value kJ/m²·ł		A X kJ/K	
	IENT		SS	Openin	gs	Net Ar A ,r 2.21				A X U (W/ł 3.094	<)				
ELEN Doors	IENT	Gros	SS	Openin	gs	A ,n	n²	W/m2	К	(W/ł	<) 				
ELEN Doors	<b>IENT</b> Type 1	Gros area	SS	Openin	gs	A ,r	n <sup>2</sup> x	W/m2	K = =	(W/ł 3.094	<) 				(26)
ELEN Doors Doors Window	<b>Type 1</b> Type 2	Gros area	SS	Openin	gs	A ,r 2.21 1.89	n <sup>2</sup> x x x x x	W/m2	K = = 0.04] =	(W/ł 3.094 2.646	<) 				(26) (26)
ELEN Doors Doors Window Window	<b>IENT</b> Type 1 Type 2 ws Type	Gros area 1 2	SS	Openin	gs	A ,r 2.21 1.89 16.92	n <sup>2</sup> x x x x x1 x1	W/m2 1.4 1.4 /[1/(1.4)+	K = = = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43	<				(26) (26) (27)
ELEN Doors Doors Window Window	<b>Type 1</b> Type 2 ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6	n <sup>2</sup> x x x x x1 x1 x1 x1	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	K = = = = = = 0.04] = = 0.04] = =	(W/H 3.094 2.646 22.43 4.77	$\diamond$				(26) (26) (27) (27)
ELEN Doors Doors Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72	n <sup>2</sup> x x x x1 x1 x1 x1 x1 x1	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/H 3.094 2.646 22.43 4.77 0.95	$\diamond$				(26) (26) (27) (27) (27)
ELEN Doors Doors Window Window Window	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type	Gros area 1 2 3	SS	Openin	gs	A ,r 2.21 1.89 16.92 3.6 0.72 9.9	n <sup>2</sup> x x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12					<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig	Type 1 Type 2 ws Type ws Type ws Type ws Type ws Type ghts	Gros area 1 2 3	SS (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024		kJ/m²+ł		kJ/K	<ul> <li>(26)</li> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> </ul>
ELEN Doors Window Window Window Window Rooflig Floor	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts	Gros area 1 2 3 4	21	Openin	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3	n <sup>2</sup> x x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x <sup>2</sup>	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4 )+	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172		kJ/m²+k 75		kJ/K 8948.25	<ul> <li>(26)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(27)</li> <li>(28)</li> </ul>
ELEN Doors Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type ghts Type1 Type2	Gros area 1 2 3 4	21 25	Openin m	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9	n <sup>2</sup> x x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x <sup>2</sup> x <sup>3</sup>	W/m2 1.4 (1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/(1.4 )+ (0.12) 0.19	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64		kJ/m²+k 75 60		kJ/K 8948.25 8098.2	(26) (26) (27) (27) (27) (27) (27) (27b) (28) (29)
ELEN Doors Doors Window Window Window Rooflig Floor Walls	MENT Type 1 Type 2 ws Type ws Type ws Type yhts Type1 Type2 Type1	Gros area 1 2 3 4 170.1 82.8	21 21 21 21	Openin m 35.24	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85	n <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ (0.12 0.19 0.17	K = = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38		kJ/m²-ŀ 75 60 9		kJ/K 8948.25 8098.2 745.65	(26) (26) (27) (27) (27) (27) (27b) (28) (29) (29)
ELEN Doors Window Window Window Window Rooflig Floor Walls Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type1	Gros area 1 2 3 4 170 82.8 58.7	21 21 25 24	Openin m 35.24 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74	n <sup>2</sup> x x x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ (1/( 1.4 )+ 0.12 0.19 0.17 0.11	K = = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46		kJ/m²-k 75 60 9 9		kJ/K 8948.25 8098.2 745.65 528.66	(26) (27) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Noalls Roof Roof T	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 (170) 82.8 58.7 18.6	21 21 25 24 25	Openin m 35.24 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64	n <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = =	(W/H 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05		kJ/m²-ŀ 75 60 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30)
ELEN Doors Doors Window Window Window Rooflig Floor Walls Roof Roof Roof Roof Roof Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 21 55 4 1	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35	n <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (30) (30) (30)
ELEN Doors Doors Window Window Window Window Rooflig Floor Walls Roof Roof Roof Roof T Roof T Roof T Roof	MENT Type 1 Type 2 ws Type ws Type ws Type ws Type yhts Type1 Type2 Type2 Type3 Type3	Gros area 1 2 3 4 170 82.8 58.7 18.6 16.3 37.	21 21 55 4 1	Openin m 35.24 0 0 0 0	gs 1 <sup>2</sup>	A ,r 2.21 1.89 16.92 3.6 0.72 9.9 2.16 119.3 134.9 82.85 58.74 18.64 16.35 34.94	n <sup>2</sup> x x x <sup>1</sup>	W/m2 1.4 1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.19 0.17 0.11 0.11	K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 3.094 2.646 22.43 4.77 0.95 13.12 3.024 14.3172 25.64 14.38 6.46 2.05 1.7		kJ/m²-k 75 60 9 9 9 9		kJ/K 8948.25 8098.2 745.65 528.66 167.76 147.15	(26) (27) (27) (27) (27) (27) (27b) (28) (29) (29) (29) (29) (29) (30) (30) (30)

Interna	al floor					84.97	,				Г	18		1529.46	(32d)
Interna	al ceiling					84.97	,				Ī	9	ז ר	764.73	(32e)
			ows, use e sides of in				ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	∟ as given in	paragraph	L 1 3.2		-
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				11	9.68	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	262	28.76	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) in	n kJ/m²K			= (34)	÷ (4) =			12	28.4	(35)
	-		ere the de tailed calci		constructi	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f			-
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						26	6.11	(36)
			are not kn	own (36) =	= 0.05 x (3	1)									_
	abric he								(33) +	(36) =			14	5.79	(37)
Ventila	tion hea	at loss ca	alculated	monthl	/		·	· · · · · ·	(38)m	= 0.33 × (	25)m x (5)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	85.46	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12	85.12			(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	231.25	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91	230.91			-
Heat lo	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39)1. (4)	12 /12=	23	0.94	(39)
(40)m=	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13			
										Average =	Sum(40)1	12 /12=	1	.13	(40)
Numbe			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. Wa	ter heat	ing ener	rgy requi	rement:								kWh/ye	ear:		
Assum	ed occu	ipancy, I	N								3.	.01			(42)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	A -13.9	)2)] + 0.0	0013 x (	TFA -13.		-			
	A £ 13.9		otor ucor	no in litro	e por da	w Vd av	orogo –	(25 x N)	1.26			- 00	l		(42)
								(25 X N) to achieve		se target o		5.63			(43)
not more	e that 125	litres per p	person per	<sup>.</sup> day (all w	ater use, ł	not and co	ld)								
	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	Table 1c x	(43)							
(44)m=	116.19	111.97	107.74	103.52	99.29	95.07	95.07	99.29	103.52	107.74	111.97	116.19			
											m(44) <sub>112</sub> =		126	67.53	(44)
Energy o	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=	172.31	150.7	155.51	135.58	130.09	112.26	104.02	119.37	120.79	140.77	153.67	166.87			-
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> =	=	166	61.94	(45)
(46)m=	25.85	22.61	23.33	20.34	19.51	16.84	15.6	17.91	18.12	21.12	23.05	25.03			(46)
	storage										·	•			
		```		0 1			0	within sa	ame ves	sel		180			(47)
	•	-	ind no ta		-			. ,							
Otherw	vise if no	o stored	hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)				

Water storage loss:

a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	32		(48)
Temper	ature fa	actor fro	m Table	2b							0.	54		(49)
Energy	lost fro	m water	· storage	e, kWh/ye	ear			(48) x (49	) =		0.	71		(50)
,				cylinder l									I	(54)
		-	ee secti	rom Tabl on 4.3	е 2 (кии	n/iitre/da	iy)					0		(51)
Volume	•	-		011 1.0								0		(52)
Temper	ature fa	actor fro	m Table	2b							<u> </u>	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.	71		(55)
Water s	torage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(56)
If cylinder	contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(57)
Primarv	circuit	loss (ar	nual) fro	om Table	93							0		(58)
•		•	,	for each		59)m = (	(58) ÷ 36	65 × (41)	m					
(modi	ified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	ı cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	0	0	0	0	23.26	22.51	23.26		(59)
Combi l	oss cal	culated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total he	eat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × 0	(45)m +	(46)m +	(57)m +	' (59)m + (61)m	
(62)m=	217.67	191.67	200.87	179.47	175.45	133.64	126.12	141.46	142.18	186.13	197.56	212.23		(62)
L Solar DH\	W input c	alculated	using App	endix G or	· Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add ad	ditional	lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output f	from wa	ater hea	ter	-										
(64)m=	217.67	191.67	200.87	179.47	175.45	0	0	0	0	186.13	197.56	212.23		
-								Out	out from w	ater heate	r (annual)₁	12	1561.05	(64)
Output i	immers	ion												
(64)m=	0	0	0	0	0	133.64	126.12	141.46	142.18	0	0	0		
								Out	out from in	mersion (a	annual) <sub>112</sub>		543.40413785313	9 <mark>(64)</mark>
Heat ga	ins fror	n water	heating,	, kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	93.58	82.88	87.99	80.2	79.54	54.43	52.27	57.37	57.27	83.09	86.21	91.77		(65)
incluc	de (57)r	n in calo	culation	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. Inte	ernal ga	ins (see	e Table 5	5 and 5a	):									
Metabol	lic gain	s (Table	e 5), Wat	ts										
Г	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37	150.37		(66)
Lighting	gains	(calcula	ted in Ap	pendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5	-		-		
(67)m=	34	30.2	24.56	18.59	13.9	11.73	12.68	16.48	22.12	28.09	32.78	34.95		(67)
Applian	ces gai	ns (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5			•	
(68)m=	375.1	378.99	369.18	348.3	321.94	297.17	280.62	276.72	286.53	307.41	333.77	358.54		(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	38.04	38.04	38.04	4	38.04	38.04		38.04	38.04	38.	04	38.04	38.04	38.04	38	.04		(69)
Pumps	and far	ns gains	(Tabl	e 5a	a)				1					I	1			
(70)m=	0	0	0		0	0	Τ	0	0	C	)	0	0	0		0		(70)
Losses	s e.g. ev	aporatio	n (ne	gati	ve value	es) (Ta	ble	5)				<b>!</b>						
(71)m=	-120.3	-120.3	-120.	3	-120.3	-120.3	- 1	120.3	-120.3	-12	0.3	-120.3	-120.3	3 -120.3	-12	20.3		(71)
Water	heating	gains (T	able :	5)										-				
(72)m=	125.78	123.34	118.2	7	111.38	106.91		75.6	70.25	77.	11	79.54	111.6	9 119.74	12	3.35		(72)
Total i	nternal	gains =						(66)	m + (67)m	n + (68	B)m +	- (69)m + (7	70)m +	(71)m + (72	!)m			
(73)m=	602.99	600.64	580.1	3	546.39	510.86	6 4	52.61	431.66	438	.42	456.31	515.3	554.4	584	4.96		(73)
6. So	lar gains	8:																
			0	olar	flux from	Table 6a	a and		•	tions	to co	nvert to the	e applic	able orienta	ition.			
Orienta		Access F Fable 6d	actor		Area m <sup>2</sup>			Flu Tal	x ble 6a		т	g_ able 6b		FF Table 6c			Gains (W)	
N La utla	-									1			_				(**)	<b>-</b>
North	0.9x	0.77		x	16.9		x		0.63	X		0.63	×	0.7		=	54.98	(74)
North	0.9x	0.77		x	16.9	92	x		20.32	×		0.63	×	0.7		=	105.08	(74)
North	0.9x	0.77		x	16.9	92	x	3	34.53	×		0.63	×	0.7		=	178.56	(74)
North	0.9x	0.77		x	16.9	92	x	5	5.46	X		0.63	×	0.7		=	286.81	(74)
North	0.9x	0.77		x	16.9	92	x	7	4.72	X		0.63	×	0.7		=	386.35	(74)
North	0.9x	0.77		x	16.9	92	x	7	9.99	×		0.63	×	0.7		=	413.6	(74)
North	0.9x	0.77		x	16.9	92	x	7	4.68	×		0.63	×	0.7		=	386.15	(74)
North	0.9x	0.77		x	16.9	92	x	5	59.25	×		0.63	×	0.7		=	306.36	(74)
North	0.9x	0.77		x	16.9	92	x	4	1.52	×		0.63	×	0.7		=	214.68	(74)
North	0.9x	0.77		x	16.9	92	x	2	24.19	x		0.63	x	0.7		=	125.08	(74)
North	0.9x	0.77		x	16.9	92	x	1	3.12	x		0.63	x	0.7		=	67.83	(74)
North	0.9x	0.77		x	16.9	92	x		8.86	x		0.63	×	0.7		=	45.84	(74)
East	0.9x	0.77		x	3.6	6	x	1	9.64	x		0.63	x	0.7		=	21.61	(76)
East	0.9x	0.77		x	3.6	6	x	3	88.42	x		0.63	×	0.7		=	42.27	(76)
East	0.9x	0.77		x	3.6	6	x	6	3.27	x		0.63	×	0.7		=	69.61	(76)
East	0.9x	0.77		x	3.6	6	x	9	92.28	x		0.63	x	0.7		=	101.53	(76)
East	0.9x	0.77		x	3.6	6	x	1	13.09	x		0.63	×	0.7		=	124.43	(76)
East	0.9x	0.77		x	3.6	6	x	1	15.77	x		0.63	×	0.7		=	127.37	(76)
East	0.9x	0.77		x	3.6	6	x	1	10.22	x		0.63	×	0.7		=	121.26	(76)
East	0.9x	0.77		x	3.6	6	x	9	94.68	×		0.63	x	0.7		=	104.16	(76)
East	0.9x	0.77		x	3.6	6	x	7	3.59	×		0.63	x	0.7		=	80.96	(76)
East	0.9x	0.77		x	3.6	6	x	4	5.59	x		0.63	x	0.7		=	50.16	(76)
East	0.9x	0.77		x	3.6	6	x	2	24.49	x		0.63	x	0.7		=	26.94	(76)
East	0.9x	0.77		x	3.6	6	x	1	6.15	×		0.63	x	0.7		=	17.77	(76)
South	0.9x	0.77		x	9.9	9	x	4	6.75	×		0.63	x	0.7		=	141.45	(78)
South	0.9x	0.77		x	9.9	)	x	7	6.57	×		0.63	x	0.7		=	231.66	(78)
South	0.9x	0.77		x	9.9	)	x		97.53	×		0.63	x	0.7		=	295.1	(78)
South	0.9x	0.77		x	9.9	9	x	1	10.23	×		0.63	x	0.7		=	333.52	(78)

0 11	_												-, I					_
<b>.</b> .	.9x	0.77		X	9.9	)	x	1	14.87	X	(	0.63	_ ×	0.7	=		347.55	(78)
- ·	.9x	0.77		x	9.9	)	x	1	10.55	X	(	0.63	_ ×	0.7	=		334.47	(78)
- ·	.9x	0.77		x	9.9	)	x	10	08.01	X	(	0.63	_ ×	0.7	=		326.8	(78)
	.9x	0.77		X	9.9	)	x	1(	04.89	X	(	0.63	×	0.7	=		317.37	(78)
	.9x	0.77		x	9.9	)	x	10	01.89	x	(	0.63	×	0.7	=		308.26	(78)
South 0.	. <mark>9x</mark>	0.77		x	9.9	)	x	8	2.59	x	(	0.63	×	0.7	=	2	249.87	(78)
South 0.	.9x	0.77		x	9.9	)	x	5	5.42	x	(	0.63	×	0.7	=		167.67	(78)
South 0.	. <mark>9x</mark>	0.77		x	9.9	)	x		40.4	x	(	0.63	×	0.7	=		122.23	(78)
West 0.	. <mark>9x</mark>	0.77		x	0.7	2	x	1	9.64	x	(	).63	×	0.7	=		4.32	(80)
West 0.	. <mark>9x</mark>	0.77		x	0.7	2	x	3	8.42	x	(	).63	×	0.7	=		8.45	(80)
West 0.	.9x	0.77		x	0.7	2	x	6	3.27	x	(	0.63	×	0.7	=		13.92	(80)
West 0.	.9x	0.77		x	0.7	2	x	9	2.28	x	(	0.63	x	0.7	=		20.31	(80)
West 0.	.9x	0.77		x	0.7	2	x	1	13.09	x	(	0.63	×	0.7	=		24.89	(80)
West 0.	.9x	0.77		x	0.7	2	x	1	15.77	x	(	0.63	×	0.7	=		25.47	(80)
West 0.	.9x	0.77		x	0.7	2	x	1	10.22	x	(	0.63	×	0.7	=		24.25	(80)
West 0.	.9x	0.77		x	0.7	2	x	9	4.68	x	(	0.63		0.7	=		20.83	(80)
West 0.	.9x	0.77		x	0.7	2	x	7	3.59	x	(	0.63		0.7	=		16.19	(80)
West 0.	.9x	0.77		x	0.7	2	x	4	5.59	x	(	).63		0.7	=		10.03	(80)
West 0.	.9x	0.77		x	0.7	2	x	2	4.49	x	(	).63		0.7	= =		5.39	(80)
West 0.	.9x	0.77		x	0.7	2	x	1	6.15	x	(	0.63		0.7	= =		3.55	(80)
Rooflights 0.	.9x	1		x	2.1	6	x		15.3	x	(	0.63	 × [	0.7	= -		13.11	(82)
Rooflights 0.	.9x [	1		x	2.1	6	x	2	8.48	x	(	0.63	i x	0.7	=		24.41	(82)
Rooflights 0.		1		x	2.1	6	x	5	0.24	x	(	0.63	 	0.7	=		43.07	(82)
Rooflights 0.	.9x [	1		x	2.1		x	<u> </u>	9.03	x		0.63	 × [	0.7	= =		76.33	(82)
Rooflights 0.	.9x [	1		x	2.1		x		29.88	x		0.63		0.7	╡_		111.35	(82)
Rooflights 0.		1		x	2.1		x		43.74	x		).63	 	0.7	=		123.22	(82)
Rooflights 0.		1		x	2.1		x	<u> </u>	32.31	x		0.63	 × [	0.7	=   _		113.43	(82)
Rooflights 0.	.9x [	1		x	2.1		x		8.56	x		0.63	 × [	0.7	╡_		84.5	(82)
Rooflights 0.		1		x	2.1		x		2.62	x		0.63	   [	0.7	= -		53.69	(82)
Rooflights 0.		1		x	2.1		x	<u> </u>	4.05	x		0.63	   × [	0.7	=		29.19	(82)
Rooflights 0.		 1		x	2.1		x		8.64	x		0.63	 × [	0.7			15.98	(82)
Rooflights 0.		1		x	2.1		x	<u> </u>	2.94	x		0.63	^     ×	0.7			11.1	(82)
0 0	Ľ	<u> </u>		~	2.1	0		'	2.04					0.7				(0)
Solar gains	s in v	watts ca	lcula	ted	for each	mon	'n			(83)m	ı = Sur	n(74)m	.(82)m					
(83)m= 235	-	411.88	600.2	_	818.49	994.5	-	024.14	971.89	833		673.79	464.33	283.82	200.49	1		(83)
Total gains	s – ir	nternal a	nd sc	lar	(84)m =	(73)n	<u>ו</u> + (	83)m	, watts			I				_		
(84)m= 838	.47	1012.52	1180.	38	1364.88	1505.4	3 14	476.76	1403.55	1271	1.64 1	1130.1	979.63	838.22	785.44	1		(84)
7. Mean ir	oterr	nal temp	eratu	ro (	heating	seaso	n)			1				_		_		
Temperat								area f	rom Tał	nle 9	Th1	(°C)					21	(85)
Utilisation		-					-			510 9,	,	( )					21	
Ja	- 1	Feb	Ma Ma		Apr	Mav	Ť	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec	1		
(86)m= 0.9	_	0.99	0.97	-	0.94	0.87		0.76	0.62	0.6	<u> </u>	0.87	0.96	0.99	0.99	4		(86)
	~	0.00	0.01		0.07	5.57			0.02			5.57	0.00	0.00	0.00			(00)

(177)m-       18.73       18.86       19.38       19.38       20.37       20.37       20.48       20.54       19.91       113.19       18.68       (47)         Temperature during heating periods in rest of dwelling from Table 9, h12 (°C)       (53)       19.98       19.99	Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(39)m-       19.87       19.88       18.88 <t< td=""><td>(87)m=</td><td>18.73</td><td>18.96</td><td>19.35</td><td>19.86</td><td>20.37</td><td>20.73</td><td>20.89</td><td>20.86</td><td>20.54</td><td>19.91</td><td>19.19</td><td>18.68</td><td></td><td>(87)</td></t<>	(87)m=	18.73	18.96	19.35	19.86	20.37	20.73	20.89	20.86	20.54	19.91	19.19	18.68		(87)
Left         Left <thleft< th="">         Left         Left         <thl< td=""><td>Temp</td><td>erature</td><td>during h</td><td>neating p</td><td>eriods ir</td><td>n rest of</td><td>dwelling</td><td>from Ta</td><td>ble 9, T</td><td>h2 (°C)</td><td></td><td></td><td></td><td></td><td></td></thl<></thleft<>	Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(8)m=         0.99         0.98         0.97         0.33         0.84         0.69         0.51         0.58         0.82         0.36         0.99         0.90         0.11         (90)           (90)m=         16.9         17.24         17.8         18.56         19.20         19.99         19.62         18.77         17.79         17.04         (92)           (93)m=         17.11         17.44         17.99         18.7         19.39         19.84         20.02         19.99         19.62         18.77         17.79         17.04         (93)           Soca         beating requirement         Use the utilisation factor for gains, hm:         Use the utilisation factor for gains, hm:         Utilisation factor for gains,	(88)m=	19.97	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98		(88)
(8)m=         0.99         0.98         0.97         0.33         0.84         0.69         0.51         0.58         0.82         0.36         0.99         0.90         0.11         (90)           (90)m=         16.9         17.24         17.8         18.56         19.20         19.99         19.62         18.77         17.79         17.04         (92)           (93)m=         17.11         17.44         17.99         18.7         19.39         19.84         20.02         19.99         19.62         18.77         17.79         17.04         (93)           Soca         beating requirement         Use the utilisation factor for gains, hm:         Use the utilisation factor for gains, hm:         Utilisation factor for gains,	Utilisa	ation fac	tor for g	ains for	rest of d	welling, l	h2,m (se	e Table	9a)						
(90)me       16.9       17.24       17.81       18.56       19.26       19.73       19.91       19.86       19.5       18.62       17.61       16.83       (90)         ILA = Living area + (A) =       0.11       (91)       (92)       0.11       (92)       0.11       (91)         Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2       (92)       (92)       18.77       17.79       17.04       (92)         Space heating requirement       18.77       19.39       19.84       20.02       19.99       19.62       18.77       17.79       17.04       (93)         8. Space heating requirement       Usation factor for gains using Table 9a       using Table 9a       using Table 9b       0.80       0.97       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.89       0.91       (94)         Ubisation factor for gains, mm:       (94)m       0.93       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.89       0.91       (95)         Monthy average external temperature from Table 8       (90)m       (92)m       123.58       123.58       193.63       90.91       13.43       18.62       776.04       (95) <td></td> <td></td> <td></td> <td>i</td> <td>i</td> <td><u> </u></td> <td><u>`</u></td> <td></td> <td>, <u> </u></td> <td>0.82</td> <td>0.95</td> <td>0.99</td> <td>0.99</td> <td></td> <td>(89)</td>				i	i	<u> </u>	<u>`</u>		, <u> </u>	0.82	0.95	0.99	0.99		(89)
(90)me       16.9       17.24       17.81       18.56       19.26       19.73       19.91       19.86       19.5       18.62       17.61       16.83       (90)         ILA = Living area + (A) =       0.11       (91)       (92)       0.11       (92)       0.11       (91)         Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2       (92)       (92)       18.77       17.79       17.04       (92)         Space heating requirement       18.77       19.39       19.84       20.02       19.99       19.62       18.77       17.79       17.04       (93)         8. Space heating requirement       Usation factor for gains using Table 9a       using Table 9a       using Table 9b       0.80       0.97       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.89       0.91       (94)         Ubisation factor for gains, mm:       (94)m       0.93       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.89       0.91       (95)         Monthy average external temperature from Table 8       (90)m       (92)m       123.58       123.58       193.63       90.91       13.43       18.62       776.04       (95) <td>Mean</td> <td>interna</td> <td>l temper</td> <td>ature in</td> <td>the rest</td> <td>of dwelli</td> <td>na T2 (fo</td> <td>ollow ste</td> <td>eps 3 to 3</td> <td>7 in Tabl</td> <td>e 9c)</td> <td></td> <td></td> <td></td> <td></td>	Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to 3	7 in Tabl	e 9c)				
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 – fLA) x T2       (92)m= 17.11       17.44       17.99       18.7       19.39       19.82       18.77       17.79       17.04       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)m       17.11       17.44       17.99       18.77       17.79       17.04       (93)         3. Space heating requirement       External temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:       (94)m       0.97       0.95       0.91       0.81       0.88       0.52       0.58       0.8       0.93       0.98       0.99       (94)         Utilisation factor for gains, hm:       (94)m=       0.97       0.95       0.91       0.81       0.88       0.52       0.58       0.8       0.93       0.99       (94)         Usisation factor for gains, hm:       (96)m=       282.33       98.91       11.72.14       14.8       16.6       16.4       14.1       10.6       7.1       4.2       (96)         (96)m=       282.38       98.21       282.02       283.61       276.43       188.71       162.7.84       (97)       295.81       126.26       (98)       (97)       58.8       91.17			· · ·	i	i	i					,	17.61	16.83		(90)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	l									f	LA = Livin	g area ÷ (4	4) =	0.11	(91)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Mean	interna	l temper	ature (fo	or the wh	ole dwel	llina) = fl	A 🗙 T1	+ (1 – fl	A) x T2					4
(93)m=       17.11       17.44       17.99       18.7       19.39       19.82       18.77       17.78       17.78       17.79 <td< td=""><td></td><td></td><td>· · ·</td><td>r È</td><td>r</td><td>· · · · · ·</td><td></td><td></td><td>r .</td><td>, i</td><td>18.77</td><td>17.79</td><td>17.04</td><td></td><td>(92)</td></td<>			· · ·	r È	r	· · · · · ·			r .	, i	18.77	17.79	17.04		(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           (94)         Utilisation factor for gains, hm:         (94)           (94)         0.99 0.97 0.95 0.91 0.81 0.68 0.52 0.58 0.8 0.93 0.98 0.99 (94)         (95)           Useful gains, hmCm, W = (94)m x (84)m         (95)         (96)           (96)me 4.3 4.9 0.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)         (96)           (97)me 2962.28 284.92 2652.06 2283.67 1775.09 1210.16 789.84 828.28 1274.74 188.548 2469.13 2963.99 (97)         (97)           Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m         (98)           (98)me 1588.1 1282.19 1135.92 739.94 408.26 0 0 0 0 723.2 1188.37 1627.84         (99)           Space heating requirement in kWh/m²/year         42.56 (99)           Space heating requirement in kWh/m²/year         42.56 (99)           Space heating:         (20)           Fraction of space heat from main system (s)         (20) = 1 - (201) =           Fraction of space heat from main system 1         (204) = (202) x [1 - (203)] =           Ifficiency of main space heating system 1         280.82 (0 0 0 0 723.2 1188.37 1627.84           (211)         Feb Mar Apr May Jun Jul Au		adjustn	nent to t	i he mear	interna	l tempera	ature fro	m Table	4e, whe	ere appro	opriate				
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	(93)m=	17.11	17.44	17.99	18.7	19.39	19.84	20.02	19.99	19.62	18.77	17.79	17.04		(93)
the utilisation factor for gains using Table 9a	8. Spa	ace hea	ting requ	uirement											
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$							ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Utilisation factor for gains, hm:         (94)m=       0.99       0.97       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.93       0.98       0.99         (94)m=       0.99       0.97       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.93       0.98       0.99         Useful gains, hmGm, W = (94)m x (84)m         (95)m=       826.39       986.91       1125.28       1225.38       1926.36       999.19       725.8       736.05       903.81       913.43       818.62       776.04       (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         Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m- (96)m]         (97)m=       2962.28       289.492       2652.06       2263.67       1775.09       1210.16       789.84       282.26       1274.74       1885.48       2469.13       2693.99       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	the ut			<u> </u>											
(94)m=       0.99       0.97       0.95       0.91       0.81       0.68       0.52       0.58       0.8       0.93       0.98       0.99       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)m=       826.39       986.91       1125.28       1235.98       1226.36       999.19       725.8       736.05       903.81       913.43       818.62       776.04       (95)         Monthly average external temperature from Table 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       (96)         Heat loss rate for mean intermal temperature, Lm, W =[(39)m x [(93)m- (96)m ]       (97)       Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (98)m=       1589.1       1282.19       135.92       739.94       408.26       0       0       723.2       1188.37       1627.84         (98)m=       1589.1       1280.1       1280.1       1280.19       125.92       739.94       408.26       0       0       723.2       1188.37       1627.84         (98)m=       1589.1       1280.1       1280.19       1280.19       280.28       1271.41       185.48       246.91.3       2963.99						Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = (94)m x (84)m       (96)m       826.39       966.91       1125.28       1235.98       1226.36       999.19       725.8       736.05       903.81       913.43       818.62       776.04       (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       2962.28       2894.92       2652.06       2263.67       1775.09       1210.16       789.84       828.26       1274.74       1885.48       2469.13       2963.99       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (98)m       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         (98)m       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       222.1       188.37       1627.84         Space heating requirement in kWh/m²/year       0       (201) =       1       (202)       1       200       (201)         <				· · · · ·		0.81	0.68	0.52	0.58	0.8	0.03	0.98	0.00		(94)
(95)m=       826.39       986.91       1125.28       1235.98       1226.36       999.19       725.8       736.05       903.81       913.43       818.62       776.04       (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       2962.28       2894.92       2652.06       2263.67       1775.09       1210.16       789.84       828.26       1274.74       1885.48       2469.13       2963.99       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (98)       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         Space heating requirement in kWh/m²/year							0.00	0.52	0.50	0.0	0.95	0.90	0.33		(04)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		-		· · · ·	· · ·	· · · · · · · · · · · · · · · · · · ·	999.19	725.8	736.05	903.81	913.43	818.62	776.04		(95)
(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       (96)         Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m]       (97)       (97)       2962.28       2894.92       2652.06       2263.67       1775.09       1210.16       789.84       828.26       1274.74       1885.48       2469.13       2963.99       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (98)       1289.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         Total per year (kWhyear) = Sum(98)4       =       8694.81       (98)         Space heating requirement in kWh/m2/year       42.56       (99)         Space heating:         Fraction of space heat from secondary/supplementary system       0       (201)         Fraction of total heating from main system 1       (202) = 1 - (201) =       1       (202)         Fraction of space heating system 1       (204) = (202) × [1 - (203)] =       1       (204)         Efficiency of main space heating system, %       0       (206) </td <td></td>															
(97)m=       2962.28       2894.92       2652.06       2263.67       1775.09       1210.16       789.84       828.26       1274.74       1885.48       2469.13       2963.99       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m       (41)m       (98)m=       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         Space heating requirement in kWh/m²/year       42.56       (99)         Space heating:         Fraction of space heat from secondary/supplementary system       0       (201)         Fraction of total heating from main system 1       (204) = (202) x [1 - (203)] =       1       (204)         Efficiency of secondary/supplementary heating system, %       0       (208)       280.83       (206)         Ifficiency of secondary/supplementary heating system, %       0       0       0       723.2       1188.37       1627.84         Ifficiency of secondary/supplementary heating system, %       0       (202) x [1 - (203)] =       1       (204)         Ifficiency of secondary/supplementary heating system, %       0       0       0       (208)         Ifficiency of secondary/supplementary heating system, % <td< td=""><td></td><td>-</td><td>-</td><td>r</td><td>i –</td><td></td><td></td><td>16.6</td><td>16.4</td><td>14.1</td><td>10.6</td><td>7.1</td><td>4.2</td><td></td><td>(96)</td></td<>		-	-	r	i –			16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m=       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         Total per year (kWh/year) = Sum(98)st: =       8694.81       (98)         Space heating 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       280.83       (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)       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627	Heat	loss rate	e for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	r [(93)m	– (96)m	]				
	(97)m=	2962.28	2894.92	2652.06	2263.67	1775.09	1210.16	789.84	828.26	1274.74	1885.48	2469.13	2963.99		(97)
Total per year (kWh/year) = Sum(98): $\underline{sa} = 12$ 6694.81 (98)Space heating requirement in kWh/m²/year42.56 (99) <b>Space heating:</b> Fraction of space heat from secondary/supplementary system0 (201)Fraction of space heat from secondary/supplementary system0 (201)Fraction of space heat from main system(s)(202) = 1 - (201) =1Fraction of total heating from main system 1(204) = (202) × [1 - (203)] =1(204)Efficiency of main space heating system 1280.83(204)Efficiency of secondary/supplementary heating system, %0(201)Ifficiency of secondary/supplementary heating system, %0(201)Ifficiency of secondary/supplementary heating system, %0(208)Ifficiency of secondary/supplementary heating system, %0(208)Isse: I a 1282.19 1135.92 739.94 408.26 0 0 0 0 723.2 1188.37 1627.84(211)I fig: I a 1282.19 1135.92 739.94 408.26 0 0 0 0 0 257.52 423.17 579.66(211)I fig: I a 162.58 404.49 263.49 145.38 0 0 0 0 0 257.52 423.17 579.66	Space	e heatin	g require	ement fo	r each n	nonth, k	Nh/mont	h = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
Space heating requirement in kWh/m²/year <b>9a. Energy requirements – Individual heating systems including micro-CHP)Space heating:</b> Fraction of space heat from secondary/supplementary system $0$ (201)Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ Efficiency of main space heating system 1 $280.83$ (206)Efficiency of secondary/supplementary heating system, % $0$ (208)Image: Space heating requirement (calculated above) $1135.92$ 739.94 408.26 0 0 0 0 723.2 1188.37 1627.84(211) m = {[(98) m x (204)] } x 100 ÷ (206)(211)Image: Space heating with the state in the state	(98)m=	1589.1	1282.19	1135.92	739.94	408.26	0	0	0	0	723.2	1188.37	1627.84		
9a. Energy requirements – Individual heating systems including micro-CHP)Space heating: Fraction of space heat from secondary/supplementary system0 $(201)$ Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of space heating from main system 1 $(204) = (202) \times [1 - (203)] =$ Efficiency of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ Efficiency of main space heating system 1 $280.83$ Efficiency of secondary/supplementary heating system, %0JanFebMarAprMayJunJulAugSepSpace heating requirement (calculated above)1589.11282.19<			_						Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	8694.81	(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 $(204) = (202) \times [1 - (203)] =$ 1       (204)         Efficiency of main space heating system 1 $(204) = (202) \times [1 - (203)] =$ 1       (204)         Efficiency of main space heating system 1 $280.83$ (206)       (208)         Image: Space heating requirement (calculated above)       0       0       0       (208)         Space heating requirement (calculated above)       1188.37       1627.84       (211)       (211)         Image: Space heating x (204)] } x 100 ÷ (206)       0       0       0       257.52       423.17       579.66	Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								42.56	(99)
Space heating:         Fraction of space heat from secondary/supplementary system       0       (201)         Fraction of space heat from main system(s) $(202) = 1 - (201) =$ 1       (202)         Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1       (204)         Efficiency of main space heating system 1 $(204) = (202) \times [1 - (203)] =$ 1       (204)         Efficiency of main space heating system 1 $280.83$ (206)       (208)         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)       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         (211)m = {[(98)m x (204)] } x 100 ÷ (206)       (211)         565.87       456.58       404.49       263.49       145.38       0       0       0       257.52       423.17       579.66	9a, En	erav rea	uiremer	nts – Indi	ividual h	eating sv	vstems i	ncludina	micro-C	CHP)					_
Fraction of space heat from secondary/supplementary system0(201)Fraction of space heat from main system(s)(202) = 1 - (201) =1(202)Fraction of total heating from main system 1(204) = (202) × $[1 - (203)] =$ 1(204)Efficiency of main space heating system 1(204) = (202) × $[1 - (203)] =$ 1(204)Efficiency of main space heating system 1(204)Efficiency of secondary/supplementary heating system, %0(208)JanFebMarAprMayJunJulAugSepOctNovDeckWh/yearSpace heating requirement (calculated above)[1589.11282.191135.92739.94408.26000723.21188.371627.84(211)565.87456.58404.49263.49145.38000257.52423.17579.66								9							
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1 $(204)$ Efficiency of main space heating system 1       280.83 $(206)$ 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)       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         (211)m = {[(98)m x (204)] } x 100 ÷ (206)       (211)         565.87       456.58       404.49       263.49       145.38       0       0       0       257.52       423.17       579.66       (211)	-		-	at from s	econdar	y/supple	mentary	system						0	(201)
Efficiency of main space heating system 1       280.83       (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)       1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         (211)m = {[[(98)m x (204)] } x 100 ÷ (206)       (211)         565.87       456.58       404.49       263.49       145.38       0       0       0       257.52       423.17       579.66	Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 ·	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, %       0       (208)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       kWh/year         Space heating requirement (calculated above) $1589.1$ $1282.19$ $1135.92$ $739.94$ $408.26$ $0$ $0$ $0$ $723.2$ $1188.37$ $1627.84$ (211)m = {[[98)m x (204)] $x$ $100 \div (206)$ (211)       (211)       (255.87) $456.58$ $404.49$ $263.49$ $145.38$ $0$ $0$ $0$ $257.52$ $423.17$ $579.66$ (211)	Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [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) $1589.1$ $1282.19$ $1135.92$ $739.94$ $408.26$ $0$ $0$ $0$ $723.2$ $1188.37$ $1627.84$ (211)m = {[[98)m x (204)] $x$ $100 \div (206)$ (211)       (211)       (255.87) $456.58$ $404.49$ $263.49$ $145.38$ $0$ $0$ $0$ $257.52$ $423.17$ $579.66$ (211)	Efficie	ency of I	main spa	ace heat	ing syste	em 1								280.83	(206)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Efficie	ency of s	seconda	ry/suppl	ementar	v heating	a system	n, %						0	(208)
Space heating requirement (calculated above)         1589.1       1282.19       1135.92       739.94       408.26       0       0       0       723.2       1188.37       1627.84         (211)m = {[(98)m x (204)] } x 100 ÷ (206) $(211)$ $(255.87)$ $456.58$ $404.49$ $263.49$ 145.38       0       0       0 $257.52$ $423.17$ $579.66$		-							Δυσ	Sen	Oct	Nov	Dec		<b>]</b>
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Space							501	Aug	Oep	001		Dec	KWII/yee	
$(211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $565.87  456.58  404.49  263.49  145.38  0  0  0  0  257.52  423.17  579.66 $ $(211)$	Spade		<u> </u>	i È	ì			0	0	0	723.2	1188.37	1627.84		
565.87 456.58 404.49 263.49 145.38 0 0 0 0 257.52 423.17 579.66	(211)m	) = {[(98							1			1			(211)
	()//		· · · ·	1	i İ	· · · · · · · · · · · · · · · · · · ·	0	0	0	0	257.52	423.17	579.66		()
$101a1 (kvv1/year) = 3011(2+1)_{15,1012} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{112} = 3096.15 ((2+1))_{1$				ļ	ļ				Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	-	3096.15	(211)

Space heating fuel (secondary), kWh/month

= {[(98	3)m x (2	01)] } x 1	00 ÷ (20	)8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
				-		-	-	Tota	ll (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	2	0	(215)
	heating	-												
Outpu	t from w 217.67	/ater hea	ter (calc 200.87	ulated a	bove) 175.45	0	0	0	0	186.13	197.56	212.23		
Efficie		vater hea											281.39	(216)
(217)m=	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39		(217)
		heating,						I		I				
(219)n (219)m=		)m x 100 68.12	) ÷ (217 71.38	)m 63.78	62.35	0	0	0	0	66.15	70.21	75.42		
(213)11-	11.55	00.12	71.50	05.70	02.55	0	0	-	l = Sum(2		70.21	7 3.42	554.76	(219)
Water	heating	ı reauirer	ment (im	mersion	)					/112				
	0	0	0	0	0	133.64	126.12	141.46	142.18	0	0	0		
Efficie	ncy of w	vater hea	ater (Imn	nersion)									100	(216)
(217)m=	0	0	0	0	0	100	100	100	100	0	0	0		(217)
		•	•	sion), kW		۱								
(219)n=		0		<u>100 ÷ (2</u> 0	0	133.64	126.12	141.46	142.18	0	0	0		
				1		1	1	Tota	I = Sum(2	19a) <sub>112</sub> =			543.4	(219)
Annua	al totals	5								k	Wh/year	r	kWh/year	-
Space	heating	g fuel use	ed, main	system	1								3096.15	
Water	heating	fuel use	ed										554.76	
Water	heating	fuel use	ed (Imme	ersion)									543.4	]
Electri	city for	pumps, f	ans and	electric	keep-ho	t								_
mech	nanical v	ventilatio	n - balar	nced, ext	ract or p	ositive i	nput fror	n outside	Э			94.73		(230a
Total e	electricit	y for the	above,	kWh/yea	ır			sum	of (230a).	(230g) =			94.73	(231)
	city for												600.52	(232)
	-	erated b	v PVs										-1433.09	 ](233)
				ises (211	) (221)	L (221)	т ( <u>3</u> 32)	(237h)	_				2913.07	(338)
				`	, , ,	. ,	、 ,	. ,					2913.07	](550)
IZd.	CO2 en	115510115		lual heat	ing syste		uaing mi							
							ergy				ion fac	tor	Emissions	
•		, .		`			/h/year			kg CO			kg CO2/yea	-
•		g (main s	•	)			1) x			0.5	19	=	1606.9	(261)
Space	heating	g (secon	dary)			(21	5) x			0.5	19	=	0	(263)
Water	heating	l				(21	9) x			0.5	19	=	287.92	(264)
Water	heating	(Immer	sion)			(21	9) x			0.5	19	=	282.03	(264)
Space	and wa	ater heat	ing			(26	1) + (262)	+ (263) + (	(264) =				2176.85	(265)
Electri	city for	pumps, f	ans and	electric	keep-ho	t (23	1) x			0.5	19	=	49.16	(267)

Electricity for lighting	(232) x	0.519	=	311.67	(268)
Energy saving/generation technologies Item 1		0.519	=	-743.77	(269)
Total CO2, kg/year		sum of (265)(271) =		1793.91	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		8.78	(273)
El rating (section 14)				90	(274)

			User D	etails:						
Assessor Name: Software Name:	Matt Fitzpatric Stroma FSAP			Stroma Softwa					0003572 on: 1.0.5.41	
			roperty A	Address:	Plot 4					
Address :	Plot 4, Widdingt	on, TBC								
1. Overall dwelling dimen	sions:									
Ground floor			Area 14	. ,	(1a) x	<b>Av. He</b> i	<b>ight(m)</b> 2.5	(2a) =	Volume(m <sup>3</sup> ) 361.07	(3a)
Total floor area TFA = (1a)	+(1b)+(1c)+(1d)-	+(1e)+(1r	n) <u>1</u> 4	14.43	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	361.07	(5)
2. Ventilation rate:				_						
Number of chimneys	0	secondar heating	+	0 0	] = [	total 0		40 =	m <sup>3</sup> per hour	(6a)
Number of open flues	0	• 0	+	0		0	X 2	20 =	0	(6b)
Number of intermittent fan	6					0	x ^	10 =	0	(7a)
Number of passive vents						0	x ′	10 =	0	(7b)
Number of flueless gas fire	es					0	× 4	40 =	0	(7c)
								Air ch	anges per hou	ur
Infiltration due to chimneys					continue fro	0 om (9) to (		÷ (5) =	0	(8)
Number of storeys in the Additional infiltration	e dwelling (ns)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	sent, use the value c s); if equal user 0.35	orresponding to	o the greate	er wall area	a (after	uction			0	](11)
If suspended wooden flo			.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	-								0	(13)
Percentage of windows Window infiltration	and doors draug	nt stripped		0.25 - [0.2	$\mathbf{v}(14) \div 1$	001 -			0	(14)
Infiltration rate				(8) + (10) ·			⊦ (15) –		0	(15)
Air permeability value, q	50 expressed in	cubic metre				<i>·</i> · · ·		area	0 4.6500000953674	(16)
If based on air permeability	•		•	•	•		nvelope	uicu	0.23	(18)
Air permeability value applies						is being us	sed		0.23	
Number of sides sheltered									2	(19)
Shelter factor				(20) = 1 - [	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporatin	g shelter factor			(21) = (18)	x (20) =				0.2	(21)
Infiltration rate modified for	monthly wind sp	beed							1	
Jan Feb M	lar Apr N	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7								1	
(22)m= 5.1 5 4	.9 4.4 4.	.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22)$	m ÷ 4									
(22a)m= 1.27 1.25 1.	23 1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltr	ation rat	e (allow	ing for sł	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
	0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23	]	
		c <i>tive air</i> al ventila	-	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (	N5)) , othe	rwise (23b	o) = (23a)			0.5	(23b)
				iency in %						, , ,			0:0	(23c)
a) If	balance	d mech	anical ve	entilation	with he	at recove	erv (MV	HR) (24a	a)m = (2	2b)m + (	23b) × [ <sup>-</sup>	1 – (23c)	-	(100)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If	balance	d mech	anical ve	entilation	without	heat rec	covery (I	и VIV) (24t	)m = (2	1 2b)m + (i	23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If	whole h	ouse ex	tract ver	ntilation of	or positiv	ve input v	ventilatio	on from o	outside		•			
i	f (22b)n	n < 0.5 >	< (23b), 1	then (24	c) = (23k	o); other\	vise (24	c) = (22	b) m + 0	.5 × (23b	) 	i	,	
(24c)m=		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	J	(24c)
,				ole hous m = (221		•				0.5]			_	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24d)
Effec	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	ld) in bo	x (25)					
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
3. He	at losse	s and he	eat loss	paramet	er:									
ELEN	IENT	Gros area		Openin rr		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
Doors	Type 1					2.55	x	1.4	=	3.57				(26)
Doors	Type 2					2.1	x	1.4	=	2.94	=			(26)
Window	ws Type	e 1				15.74	⊥ x1	/[1/( 1.4 )+	0.04] =	20.87	=			(27)
Window	ws Type	e 2				1.8		/[1/( 1.4 )+	0.04] =	2.39	=			(27)
Window	ws Type	e 3				3.18		/[1/( 1.4 )+	0.04] =	4.22	=			(27)
Window	ws Type	94				4.2		/[1/( 1.4 )+	0.04] =	5.57	=			(27)
Floor						144.4	3 X	0.12	=	17.331	 6	75	108	32.25 (28)
Walls		172.	48	29.5	7	142.9	1 ×	0.19	=	27.15	i F	60	85	74.6 (29)
Roof		144.	43	0		144.4	3 X	0.11	=	15.89	i F	9	129	99.87 (30)
Total a	rea of e	elements	s, m²			461.3	4							(31)
Interna	l wall **					248.9	9				ſ	9	224	40.91 (32c)
				effective wi nternal wal			ated using	g formula 1	1/[(1/U-valı	ue)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30	) + (32) =				99.92	(33)
Heat c	apacity	Cm = S	(A x k )						((28).	(30) + (32	2) + (32a).	(32e) =	22947.6	3 (34)
Therma	al mass	parame	eter (TMI	- = Cm -	- TFA) ir	n kJ/m²K			= (34)	) ÷ (4) =			158.88	(35)
	-		ere the de tailed calc		construct	ion are noi	t known pi	recisely the	e indicative	e values of	TMP in T	able 1f		_
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix I	<						20.7	(36)
	of therma abric he		are not kr	10wn (36) =	= 0.05 x (3	1)			(33) +	+ (36) =			120.62	(37)

Ventila	tion hea	t loss ca	alculated	dmonthl	у				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	59.81	59.58	59.58	59.58	59.58	59.58	59.58	59.58	59.58	59.58	59.58	59.58		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	180.43	180.2	180.2	180.2	180.2	180.2	180.2	180.2	180.2	180.2	180.2	180.2		
										-	Sum(39)1.	12 /12=	180.22	(39)
	oss para	、 、	i ,,	1				1	· ,	= (39)m ÷	· · ·			
(40)m=	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25		
Numbe	er of day	rs in mor	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 /12=	1.25	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
				-	-	-	-	-		-				
4. Wa	ter heat	ing ener	rgy requ	irement:								kWh/ye	ear:	
A			NI .											(10)
	ied occu A > 13.9			(1 - exp	(-0.0003	849 x (TF	- A -13.9	)2)] + 0.(	)013 x ( <sup>-</sup>	TFA -13.		93		(42)
	A £ 13.9				(	- (		, ,,			- /			
								(25 x N) to achieve		se target o		3.67		(43)
		-		r day (all w		-	-	io acilieve	a water us	se largel o	I			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate				ach month	,			Ŭ Ŭ	Ocp	000	1100	Dee		
(44)m=	114.04	109.89	105.74	101.6	97.45	93.3	93.3	97.45	101.6	105.74	109.89	114.04		
									-	Total = Su	m(44) <sub>112</sub> =		1244.05	(44)
Energy of	content of	hot water	used - ca	lculated m	onthly $= 4$ .	190 x Vd,n	n x nm x D	OTm / 3600	) kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)		_
(45)m=	169.11	147.91	152.63	133.07	127.68	110.18	102.1	117.16	118.56	138.17	150.82	163.78		
										Total = Su	m(45) <sub>112</sub> =	-	1631.15	(45)
								boxes (46)		i				
	25.37 storage	22.19	22.89	19.96	19.15	16.53	15.31	17.57	17.78	20.72	22.62	24.57		(46)
	-		includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If com	munity h	eating a	ind no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Otherv	vise if no	stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage													
				oss facto	or is kno	wn (kWł	n/day):				1.	32		(48)
	erature fa										0.	54		(49)
			•	e, kWh/ye		ar ia nat	known	(48) x (49)	=		0.	71		(50)
				cylinder l rom Tabl								0		(51)
	nunity h	-										0		(01)
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
			-	e, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter	(50) or (	54) in (5	55)								0.	71		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)ı	m				
(56)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(56)

If cylinder of	contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (50	0), else (57	7)m = (56)i	m where (	H11) is fro	m Append	ix H	
(57)m=	22.1	19.96	22.1	21.38	22.1	21.38	22.1	22.1	21.38	22.1	21.38	22.1		(57)
Primary	circuit	loss (an	nual) fro	om Table	e 3							0		(58)
Primary							. ,	. ,						
· –			rom Tab		i	i		<u> </u>	-		<u> </u>	1		
(59)m=	23.26	21.01	23.26	22.51	23.26	0	0	0	0	23.26	22.51	23.26		(59)
Combi lo	oss cal	culated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m			-			
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total hea	at requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 2	214.47	188.88	197.99	176.96	173.04	131.56	124.19	139.25	139.94	183.52	194.71	209.14		(62)
Solar DHW	N input o	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0'	if no sola	r contribut	ion to wate	er heating)		
(add add	ditiona	lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix C	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output fr	rom wa	ater hea	ter											
(64)m= 2	214.47	188.88	197.99	176.96	173.04	0	0	0	0	183.52	194.71	209.14		-
								Outp	out from wa	ater heate	r (annual)₁	12	1538.72	(64)
Output ir	mmers	ion												
(64)m=	0	0	0	0	0	131.56	124.19	139.25	139.94	0	0	0		_
								Outp	out from im	mersion (a	annual) <sub>112</sub>	2	534.947209287422	(64)
Heat gai	ins fror	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	92.52	81.96	87.04	79.36	78.74	53.74	51.62	56.63	56.53	82.23	85.26	90.74		(65)
include	le (57)r	n in calo	culation of	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Inter	rnal ga	ins (see	e Table 5	and 5a	):									
Metaboli	ic gain	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 1	146.25	146.25	146.25	146.25	146.25	146.25	146.25	146.25	146.25	146.25	146.25	146.25		(66)
Lighting	gains	(calcula	ted in Ap	pendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5		-	-		
(67)m=	28.16	25.01	20.34	15.4	11.51	9.72	10.5	13.65	18.32	23.26	27.15	28.94		(67)
Applianc	ces gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ole 5				
(68)m=	314.4	317.66	309.44	291.93	269.84	249.08	235.2	231.94	240.16	257.67	279.76	300.52		(68)
Cooking	gains	(calcula	ited in Ap	opendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63		(69)
Pumps a	and far	ns gains	(Table 5	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)								
_	-117	-117	-117	-117	-117	, -117	-117	-117	-117	-117	-117	-117		(71)
Water he	eating	gains (T	able 5)											
_	124.35	121.96	, 116.98	110.22	105.83	74.64	69.39	76.12	78.51	110.52	118.42	121.97		(72)
Total int	ternal	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + (	70)m + (7	1)m + (72)	m		
		<u> </u>									1			
(73)m= 5	533.79	531.5	513.64	484.43	454.06	400.31	381.97	388.59	403.87	458.33	492.21	518.31		(73)

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

Orientat	ion:	Access Facto Table 6d	or Area m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)		
North	0.9x	0.77	x	15.74	x	10.63	x	0.63	x	0.7	=	51.15	(74)	
North	0.9x	0.77	x	15.74	x	20.32	x	0.63	x	0.7	=	97.75	(74)	
North	0.9x	0.77	x	15.74	x	34.53	x	0.63	x	0.7	=	166.1	(74)	
North	0.9x	0.77	x	15.74	x	55.46	x	0.63	x	0.7	=	266.8	(74)	
North	0.9x	0.77	x	15.74	x	74.72	x	0.63	x	0.7	=	359.41	(74)	
North	0.9x	0.77	x	15.74	x	79.99	x	0.63	x	0.7	=	384.76	(74)	
North	0.9x	0.77	x	15.74	x	74.68	x	0.63	x	0.7	=	359.22	(74)	
North	0.9x	0.77	x	15.74	x	59.25	x	0.63	x	0.7	=	285	(74)	
North	0.9x	0.77	x	15.74	x	41.52	x	0.63	x	0.7	=	199.71	(74)	
North	0.9x	0.77	x	15.74	x	24.19	x	0.63	x	0.7	=	116.36	(74)	
North	0.9x	0.77	x	15.74	x	13.12	x	0.63	x	0.7	=	63.1	(74)	
North	0.9x	0.77	x	15.74	x	8.86	x	0.63	x	0.7	=	42.64	(74)	
East	0.9x	0.77	x	1.8	x	19.64	x	0.63	x	0.7	=	10.8	(76)	
East	0.9x	0.77	x	1.8	x	38.42	x	0.63	x	0.7	=	21.14	(76)	
East	0.9x	0.77	x	1.8	x	63.27	x	0.63	x	0.7	=	34.81	(76)	
East	0.9x	0.77	x	1.8	x	92.28	x	0.63	x	0.7	=	50.76	(76)	
East	0.9x	0.77	x	1.8	x	113.09	x	0.63	x	0.7	=	62.21	(76)	
East	0.9x	0.77	x	1.8	x	115.77	x	0.63	x	0.7	=	63.69	(76)	
East	0.9x	0.77	x	1.8	x	110.22	x	0.63	x	0.7	=	60.63	(76)	
East	0.9x	0.77	x	1.8	x	94.68	x	0.63	x	0.7	=	52.08	(76)	
East	0.9x	0.77	x	1.8	x	73.59	x	0.63	x	0.7	=	40.48	(76)	
East	0.9x	0.77	x	1.8	x	45.59	x	0.63	x	0.7	=	25.08	(76)	
East	0.9x	0.77	x	1.8	x	24.49	x	0.63	x	0.7	=	13.47	(76)	
East	0.9x	0.77	x	1.8	x	16.15	x	0.63	x	0.7	=	8.88	(76)	
South	0.9x	0.77	x	4.2	x	46.75	x	0.63	x	0.7	=	60.01	(78)	
South	0.9x	0.77	x	4.2	x	76.57	x	0.63	x	0.7	=	98.28	(78)	
South	0.9x	0.77	x	4.2	x	97.53	x	0.63	x	0.7	=	125.19	(78)	
South	0.9x	0.77	x	4.2	x	110.23	x	0.63	x	0.7	=	141.49	(78)	
South	0.9x	0.77	x	4.2	x	114.87	x	0.63	x	0.7	=	147.45	(78)	
South	0.9x	0.77	x	4.2	x	110.55	x	0.63	x	0.7	=	141.9	(78)	
South	0.9x	0.77	x	4.2	x	108.01	x	0.63	x	0.7	=	138.64	(78)	
South	0.9x	0.77	x	4.2	x	104.89	x	0.63	x	0.7	=	134.64	(78)	
South	0.9x	0.77	x	4.2	x	101.89	x	0.63	x	0.7	=	130.78	(78)	
South	0.9x	0.77	x	4.2	x	82.59	x	0.63	x	0.7	=	106	(78)	
South	0.9x	0.77	x	4.2	×	55.42	x	0.63	x	0.7	=	71.13	(78)	
South	0.9x	0.77	x	4.2	x	40.4	x	0.63	x	0.7	=	51.85	(78)	
West	0.9x	0.77	x	3.18	x	19.64	x	0.63	x	0.7	=	19.09	(80)	
West	0.9x		x	3.18	×	38.42	x	0.63	x	0.7	=	37.34	(80)	
West	0.9x	0.77	x	3.18	×	63.27	x	0.63	x	0.7	=	61.49	(80)	

10/						г			ı r							<b>-</b>
West	0.9x	0.77	X	3.1	8	×L	9	2.28	X		0.63	×	0.7	=	89.68	(80)
West	0.9x	0.77	X	3.1	8	×L	11	13.09	X		0.63	×	0.7	=	109.91	(80)
West	0.9x	0.77	x	3.1	8	×	11	15.77	x		0.63	x	0.7	=	112.51	(80)
West	0.9x	0.77	x	3.1	8	×	11	10.22	x		0.63	x	0.7	=	107.12	(80)
West	0.9x	0.77	x	3.1	8	×	9	4.68	x		0.63	x	0.7	=	92.01	(80)
West	0.9x	0.77	х	3.1	8	×	7	3.59	x		0.63	x	0.7	=	71.52	(80)
West	0.9x	0.77	x	3.1	8	×	4	5.59	x		0.63	x	0.7	=	44.31	(80)
West	0.9x	0.77	x	3.1	8	×	2	4.49	x		0.63	x	0.7	=	23.8	(80)
West	0.9x	0.77	x	3.1	8	×	1	6.15	x		0.63	x	0.7	=	15.7	(80)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m												-				
(83)m=	141.05	254.51	387.59	548.74	678.98	702	2.85	665.61	563.	.73	442.49	291.75	5 171.5	119.08		(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts																
(84)m=	674.84	786.01	901.23	1033.18	1133.04	110	)3.16	1047.58	952.	.31	846.36	750.07	663.71	637.39		(84)
7. Me	an inte	rnal temp	perature	(heating	season	)										
Temp	erature	during h	neating p	periods in	n the livi	ng a	area f	rom Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ation fa	ctor for g	ains for	living are	ea, h1,m	ı (se	e Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May	Ĵ	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	]	
(86)m=	0.99	0.99	0.98	0.96	0.89	0.	.79	0.65	0.7	'1	0.89	0.97	0.99	1	1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)																
(87)m=	18.92	19.11	19.46	19.93	20.41		).75	20.9	20.8		20.56	19.98	19.34	18.87	1	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)									1	(88)						
(88)m=         19.88 <t< td=""><td>(00)</td></t<>												(00)				
	· · · · · · · · · · · · · · · · · · ·	ctor for g	i	1	<u> </u>	1	<u></u>		r í						1	
(89)m=	0.99	0.99	0.98	0.94	0.86	0.	.71	0.53	0.5	9	0.84	0.96	0.99	0.99		(89)
Mean	interna	al temper	ature in	the rest	of dwell	ing <sup>-</sup>	T2 (fo	ollow ste	eps 3	to 7	in Tabl	e 9c)			-	
(90)m=	17.09	17.37	17.88	18.57	19.23	19	9.66	19.83	19.	.8	19.45	18.64	17.73	17.02	-	(90)
											f	LA = Liv	ing area ÷ (	4) =	0.2	(91)
Mean	interna	al temper	ature (fo	or the wh	ole dwe	lling	ı) = fL	_A × T1	+ (1 ·	– fLA	A) × T2					
(92)m=	17.45	17.72	18.2	18.84	19.47	<u> </u>	9.88	20.04	20.0		, 19.68	18.91	18.05	17.39	]	(92)
Apply	adjust	ment to t	he meai	n interna	l temper	atur	e fro	m Table	4e, v	wher	e appro	priate		<u> </u>	4	
(93)m=	17.45	17.72	18.2	18.84	19.47	19	9.88	20.04	20.0	01	19.68	18.91	18.05	17.39	]	(93)
8. Sp	ace hea	ating requ	uiremen	t											-	
				•		ned a	at ste	ep 11 of	Tabl	e 9b,	, so tha	t Ti,m=	(76)m an	d re-cal	culate	
the ut		n factor fo	<u> </u>	T Č	1	-			r				-	r	1	
	Jan	Feb	Mar	Apr	May	J	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
	r	ctor for g	r	r	0.04		74	0.55			0.00	0.05		0.00	1	(04)
(94)m=	0.99	0.98	0.97	0.93	0.84	0.	.71	0.55	0.6	01	0.83	0.95	0.98	0.99		(94)
(95)m=	667.71	, hmGm 772	, VV = (9 870.75	4)m x (8 957.42	4)m 956.6	70	3.93	571.98	580.	16	703.89	711.43	652.28	631.76	1	(95)
		age exte						571.90	500.	. 10	103.09	111.43	052.20	031.70	J	(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.	4	14.1	10.6	7.1	4.2	1	(96)
		e for mea												L	J	. /
(97)m=	2373.4	2310.1	2108.22		1399.34	1	, <b>vv</b> <u>–</u> 1.47	620.51	651.	ŕ	1004.62		8 1973.84	2377.08	]	(97)
()				L		Ľ								1	J	× /

Spac	e heatin	g requir	ement fo	or each n	nonth, k	/Vh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	1269.03	1033.6	920.67	600.51	329.39	0	0	0	0	584.6	951.53	1298.52		
		-		-	-	-		Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	6987.86	(98)
Spac	e heatin	g requir	ement ir	۱ kWh/m²	²/year								48.38	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:										_		_
Fract	ion of sp	ace hea	at from s	econdar	y/supple	mentary	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													282.19	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Spac	e heatin	g requir	ement (o	calculate	d above)	)		•				·		
	1269.03	1033.6	920.67	600.51	329.39	0	0	0	0	584.6	951.53	1298.52		
(211)n	n = {[(98	)m x (20	04)] } x ′	100 ÷ (20	)6)	-						·		(211)
	449.71	366.28	326.26	212.8	116.73	0	0	0	0	207.16	337.19	460.15		_
								Tota	ll (kWh/yea	ar) =Sum(2	211) <sub>15,101</sub>	2=	2476.28	(211)
•				∵y), kWh/	month									
	<u> </u>	)1)]}x1	00 ÷ (20	)8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		-
								lota	ll (kWh/yea	ar) = Sum(2)	215) <sub>15,10</sub> 1	2=	0	(215)
	heating		4 - n / I -		h									
Output	214.47	ater nea 188.88	197.99	ulated a	bove) 173.04	0	0	0	0	183.52	194.71	209.14		
Efficie	L ncy of w												281.39	(216)
	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39	281.39		(217)
		l heating.	ı kWh/m	onth										
		•	) ÷ (217											
(219)m=	76.22	67.12	70.36	62.89	61.49	0	0	0	0	65.22	69.2	74.32		_
								Tota	II = Sum(2	19a) <sub>112</sub> =			546.83	(219)
Water				mersion		404 50		400.05	400.04					
<b>-</b> <i>u</i> :	0	0	0	0	0	131.56	124.19	139.25	139.94	0	0	0		
		1	ater (Imn	,									100	(216)
(217)m=		0	0	0	0	100	100	100	100	0	0	0		(217)
		-	•	sion), kW 100 ÷ (2		)								
(219)m=		0		0	0	131.56	124.19	139.25	139.94	0	0	0		
			1	1			1	Tota	I = Sum(2	19a) <sub>112</sub> =	1		534.95	(219)
Annual totals kWh/year											r L	kWh/year	-	
Space	heating	fuel use	ed, main	system	1								2476.28	
Water	heating	fuel use	ed									Ē	546.83	7
Water heating fuel used (Immersion)										Г	534.95	Ī		

Electricity for pumps, fans and electric keep-hot					
mechanical ventilation - balanced, extract or posit		(230a)			
Total electricity for the above, kWh/year	\$	sum of (230a)(230g) =		67.02	(231)
Electricity for lighting				497.35	(232)
Electricity generated by PVs				-2456.73	(233)
Total delivered energy for all uses (211)(221) + (	231) + (232)(23	7b) =		1130.75	(338)
12a. CO2 emissions – Individual heating systems	including micro-C	HP			
	<b>Energy</b> kWh/year	<b>Emission fac</b> kg CO2/kWh	tor	<b>Emissions</b> kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.519	=	1285.19	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	283.8	(264)
Water heating (Immersion)	(219) x	0.519	=	277.64	(264)
Space and water heating	(261) + (262) + (263	) + (264) =		1846.63	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	34.78	(267)
Electricity for lighting	(232) x	0.519	=	258.13	(268)
Energy saving/generation technologies Item 1		0.519	=	-1275.04	(269)
Total CO2, kg/year		sum of (265)(271) =		864.5	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		5.99	(273)
El rating (section 14)				94	(274)