

# Energy Strategy Report

14-1230 35 York Way, London, N7 9QF

November 2016 Rev C



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The signatories below verify that this document has been prepared in accordance with our quality control requirements. These procedures do not affect the content and views expressed by the originator.

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# 1. Addendum 1 – Response to Council Comments 1<sup>st</sup> November 2016

Table A below summarises the proposed development's design principles in relation to the Council's policy DP22 as requested by the Local Authority on 1<sup>st</sup> November 2016 following the submission of Rev A of this report dated 18<sup>th</sup> October 2016.

Design Principles Project Response			
Design			
The layout of uses	The apartments have been configured to ensure that the living spaces open out on to terraces facing away from York way to minimise acoustic issues and maximise air quality to the apartment. The apartments have been designed to provide multi-lateral fenestration to maximise daylight throughout the day with all apartments befitting from a minimum of glazing to 3 facades.		
Floorplates size/depth The floor plates have been designed at depths which will maximise cross ver and allow natural light deep into the plan forms from a minimum of 3 facad apartment.			
Floor to ceiling heights The apartments have been designed to provide floor to ceiling heights of which provides a balance between visually positive spaces and environm are economical to heat and ventilate.			
Location, size and	The majority of glazing can be seen on the eastern façade where mostly bedrooms have been allocated allowing the benefit of morning sun to be used by occupants as well as evening sun in the living rooms.		
depth of windows	Additionally, the average glazing ratio for the dwellings is 15% which is near the advised value to benefit from solar gains and natural lighting but reducing the risk of overheating through excessive solar gains.		
Limiting excessive	The majority of glazing is on the eastern and western façade. This along with the room allocation (mentioned above) allows the habitable areas to be warmed at a comfortable level at beneficial times of the day.		
solar gain	Additionally, the average glazing ratio for the dwellings is 15% which is near the advised value to benefit from solar gains and natural lighting but reducing the risk of overheating through excessive solar gains.		
	Please refer to Section 7.1 mon page 19 for more detail		
	The majority of glazing is on the eastern and western façade. This along with the room allocation (mentioned above) allows the habitable areas to be warmed at a comfortable level at beneficial times of the day.		
Reducing the need for artificial lighting	Additionally, the average glazing ratio for the dwellings is 15% which is near the advised value to benefit from solar gains and natural lighting but reducing the risk of overheating through excessive solar gains.		
	Please refer to Section 7.1 mon page 19 for more detail		
Shading methods,	Due to the window areas, room depths and orientation the dwellings do not require		
both on or around the building	a large amount of shading other than what is provided by surrounding structures.		
Optimising natural ventilation	All windows are openable and cross ventilation possible. As such the required air change rate for a comfortable area is provided.		
Design for an	Prease refer to Section 7.1 on page 20 for more detail		
inclusion of renewable energy	be provided for the dwellings.		
technologies	See the Be Green Section (9.2) on page 30 for more detail.		

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Design Principles	Project Response		
Impact on existing	The proposed development does not exceed the surrounding areas height		
renewable and low	therefore no additional shading will be caused by the development.		
carbon technologies			
in the area	It is unknown what existing technology is installed in the area.		
Sustainable urban	It is currently proposed that drainage be provided by the existing system, however		
drainage including	this will be reviewed post planning.		
provision of a green			
and/or brown roof			
Adequate storage	Dedicated bin stores (including separate stores for recycling and refuse) will be		
space for recyclable	provided within screened storage areas within the amenity space of the		
materials,	development within easy access of the apartment entrance. Sufficient space as well		
composting where	as access will be provided to meet the council's allocation requirements.		
possible			
	'Sheffield' style bicycle stands are proposed and are to be housed within a covered		
	cycle store. A total of 16 no. stands are to be provided.		
	The dimensions of the cycle store can be seen on the drawing below. The		
	dimensions are aligned with the requirements set out in Camden Planning Guidance		
	7 – Transport.		
Bicycle storage	Si Terrace		
	c 500 12.0 m <sup>2</sup>		
	Contra stores		
	R Ann 28 Print Stands - Were, -		
	overled schades		
	The development utilizes the following:		
	The development utilises the following:		
Measures to adapt	natural ventilation through openable windows		
to climate chance	• new landscaping with biodiverse planting on an area which is currently		
	completed hard landscaped		
	all new hard landscaping will be permeable		
Impact on	The proposed design will have either a natural or positive impact on the		
microclimate			
	Fabric/Services		
	insulation and material use has been considered to ensure fabric efficiency is		
Loval of inculation	enhanced where possible. The largered of Values at this stage in design are far		
	better than minimum levels required by Fart L 2013 OF Building Regulations.		
	Please refer to Section 7.1 on page 10 for more dotail		
	rease refer to section 7.1 on page 15 for more detail		

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Design Principles	Project Response	
Choice of materials, including –	The Applicant will endeavour to source materials from suppliers who participate in responsible sourcing schemes such as the BRE BES 6001:2008 Responsible Sourcing Standard.	
responsible sourcing, re-use and recycled content	Where possible timber will be sourced from schemes supported by the Central Point of Expertise for Timber Procurement such as Forest Stewardship Council (FSC) accreditation (which ensures that the harvest of timber and non-timber products maintains the forest's ecology and its long-term viability).	
Air tightness	The proposed design is targeting a maximum air tightness of 4m <sup>3</sup> /m <sup>2</sup> h @50Pa, which is better than minimum requirements set by Part L 2013 of Building Regulations.	
Efficient heating, cooling and lighting systems	It is currently proposed that space heating and domestic hot water is provided by efficient individual gas boilers (90% efficiency). No cooling has been design at this stage based on the design as comfort levels are met by natural ventilation and non-excessive solar gains. 100% LED lighting will be used throughout the development. See Section 7.2 on page 20 for more detail.	
Effective building management systemsNo Building Management Systems will be required for this development a landlord/communal areas of which the demand will be small. It is assume dwellings will be controlled by the residents individually.		
Source of energy used	Mains gas will be used for space heating and domestic hot water with electricity demand coming from lighting and auxiliary uses. It is expected that the main demand will be for gas.	
Metering	Each dwelling will be metered individually for utilities. Smart meters will also be considered for occupants as they are being made available by utility companies	
Counteracting the heat expelled from plant equipment	All plant will be fully insulated to avoid waste heat from plant. Additionally, there will be no plant space as such due to local systems rather than communal.	
Enhancement of/provision for biodiversity	There is currently no soft landscaping on the existing site making the ecological value very low. The proposed development includes a new landscaped area including planting and green space. Local habitat friendly species will be preferred for these areas.	
Efficient water use	It is proposed that the dwellings will be specified with low flow rate and consumption fittings. Targeted values have been set and can be found in the appendix of this report (Addendum dated 02/11/16 – Water Consumption)	
Re-use of water	Where feasible rainwater will be collected and used for irrigation of the landscaped areas, e.g. the provision of water butts.	
Educational Each dwelling will be metered individually for utilities. Smart meters wil considered for occupants as they are being made available by utility con meters		
On-going management and review	It is currently unknown on the tenure of these developments and will be discussed post planning.	

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### 2. Executive Summary

This Energy Statement demonstrates the predicted energy performance and carbon dioxide emissions of the proposed development at, **35 York Way, London N7 9QF** based on the information provided by the design team. The development will comprise of the **new construction of 9 flats within the London Borough of Camden.** 

#### 2.1. **Policy Requirements**

The Council requires new developments to incorporate sustainable design and construction measures. The table below summarises the local policy requirements for the proposed development.

Policies	Requirements	Notes
London Plan 5.2 Policy DM10	An overall 35% reduction of carbon emissions over the Building Regulation Part L 2013.	The development can demonstrate through the proposed strategy that an improvement of 35.4% can be achieved, therefore the policy requirement has been met
Policy DM11	A 20% carbon reduction via on-site renewable technologies	Through the installation of 6.75kWp of rooftop photovoltaic (PV) panels an improvement of 25.1% carbon emissions from on-site renewable technologies can be demonstrated. Therefore the policy requirement has been met
Policy DM13	Code for Sustainable Home (CSH) Level 4	As CSH was withdrawn by the government as of April 2015, a pre- assessment has not been provided as part of this report.

Table 1 Policy Requirements

#### 2.2. Methodology and Strategies

The methodology used to determine the CO<sub>2</sub> emissions is in accordance with the London Plan's threestep Energy Hierarchy (Policy 5.2). The below table shows the Energy Hierarchy and suggested strategies for the proposed development.

Stages	Strategies	
<b>BE LEAN</b> Energy efficient design	<ul> <li>U-values better than Building Regulations Part L.</li> <li>Accredited Construction Details for all junctions</li> <li>High efficient individual gas combi boilers for heating and hot water demand</li> <li>Natural ventilation with extract fans in wet rooms</li> <li>Low energy lights</li> </ul>	
<b>BE CLEAN</b> District heat networks or communal heating systems	Communal heating was not seen as a feasible heating option for this development due to unavailability of plant space and the site is not within reasonable proximity to existing or potential district heat networks.	

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BE GREEN
On-site renewable technologies

PV panels of 6.75kWp on the roof (approximate 27 panels with 250 w/p were used to demonstrate this at this stage of design).

Table 2 Energy Hierarchy and suggested strategies

#### 2.3. Assessment Results

After the application of all strategies based on the Energy Hierarchy, the regulated carbon dioxide emissions have been reduced as follows;

Energy Hierarchy		Carbon Emissions (Tonnes CO <sub>2</sub> /yr)
		Regulated
BASELINE	TER set by Building Regulations 2013 Part L	13.99
BE LEAN	After energy demand reduction	12.06
BE CLEAN	After CHP/ Communal Heating	12.06
BE GREEN	After renewable energy	9.03

Table 3 Carbon Emissions after each stage of the proposed strategy

This carbon savings from each stage can be calculated based on the results above. The chart below summarises the total cumulative savings and the Carbon Offset Fund contribution based on the shortfall:

	Energy Hierarchy	Regulated Carbon Savings	
		Tonnes CO <sub>2</sub> /yr	%
BE LEAN After energy demand reduction		1.93	13.8 %
BE CLEAN After heat network/ CHP		-	-
BE GREEN After renewable energy		3.03	25.1 %
Total Cumul	ative Savings	4.96	35.4%
Total Target	Savings	4.90	35 %
Shortfall		-0.06	-0.4%
Carbon Offs	et Fund	£	0

Table 4 Carbon dioxide Emissions after each stage of the Energy Hierarchy

The table above demonstrates that the requirements of the London Plan and Local Policy DM10 to achieve a 35% carbon reduction have been met, i.e. and improvement of >35% carbon emissions over the Part L 2013 baseline and 20% carbon offset from on-site renewable technologies. Therefore, a payment into **the Carbon Offset Fund** is not required to satisfy council requirements, in accordance with GLA guidance on preparing energy assessments adopted March 2016.

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Figure 1 The Energy Hierarchy

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#### 3. Introduction

This Energy Statement will be included as part of the planning application that addresses the environmental impact of the development. This report focuses on the energy strategy for the proposed scheme and how energy consumption and carbon emissions will be minimised and to meet the targeted carbon emissions in accordance with the London Plan and Local planning policy.

The development is to be located in the London Borough of Camden and it is in close proximity to bus stops for the 274 and the 390, Camden Road overground Station (approx. 0.6 miles) and Caledonian Road & Barnsbury Overground Station (approx. 0.6 miles). The proposal is new construction of a 4 storey building comprising of 9 no. of residential units.



**Figure 2 Site Location** 

**NEW CONSTRUCTION** Net Internal Floor Name of unit Floor No. of Bedrooms Type Area (m<sup>2</sup>) **Ground Floor** Flat 1 2 93.10 Ground Floor Flat 2 1 50.11 **Ground Floor** Flat 3 1 54.43 1<sup>st</sup> Floor Flat 4 2 94.62 1<sup>st</sup> Floor Residential Flat 5 4 108.62 2<sup>nd</sup> Floor Flat 6 3 94.61 2<sup>nd</sup> Floor Flat 7 3 91.09 3<sup>rd</sup> Floor 2 Flat 8 80.00 3<sup>rd</sup> Floor Flat 9 2 70.80 Total 737.38

The following table presents the type, area and number of units to be assessed within this report.

Table 5 Proposed units to be assessed for the development

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#### 4. Planning Policy

#### 4.1. National Planning Policy Framework (March 2012)

The National Planning Policy Framework is a key part of our reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth.

# 4.2. The London Plan – The Spatial Development Strategy for London Consolidated with Alterations Since 2011 (March 2015)



#### Policy 5.2, 5.4, 5.5, 5.6, & 5.7

According to Policy 5.2 all major new developments should show an improvement of 35% from 2013 to 2016 over 2013 Building Regulations, unless it can be demonstrated that such provision is not feasible. For retrofitting developments, it will be a challenge to meet these target. However, available reductions in carbon emissions should be demonstrated along with water saving measures as per Policy 5.4. Furthermore, intent must be shown for connecting to a Decentralised Energy Network and utilizing a Combined Heat & Power according to Policy 5.5 and 5.6. The Mayor and boroughs should in their DPDs adopt a presumption that developments will achieve a reduction in carbon dioxide emissions of 20% from onsite renewable energy generation according to paragraph 5.42 of Policy 5.7 Renewable Energy.

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#### 4.3. London Borough of Camden



#### Camden Development Policies 2010-2025

#### Policy DP22: Promoting Sustainable Design and Construction

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

- a. demonstrate how sustainable development principles, have been incorporated into the design and proposed implementation; and
- b. Incorporate green or brown roofs and green walls wherever suitable.

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

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

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

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

#### Policy DP23: Water

The Council will require developments to reduce their water consumption, the pressure on the combined sewer network and the risk of flooding by:

- a) incorporating water efficient features and equipment and capturing, retaining and re-using surface water and grey water on-site;
- b) limiting the amount and rate of run-off and waste water entering the combined storm water and sewer network through the methods outlined in part a) and other sustainable urban drainage methods to reduce the risk of flooding;
- c) reducing the pressure placed on the combined storm water and sewer network from foul water and surface water run-off and ensuring developments in the areas identified by the North London Strategic Flood Risk Assessment and shown on Map 2 as being at risk of surface

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water flooding are designed to cope with the potential flooding;

- d) ensuring that developments are assessed for upstream and downstream groundwater flood risks in areas where historic underground streams are known to have been present; and
- e) Encouraging the provision of attractive and efficient water features.

#### Camden Core Strategy 2010-2025

#### Policy CS13 – Tackling climate change through promoting higher environmental standards

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

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

- a. ensuring patterns of land use that minimize the need to travel by car and help support local energy networks;
- b. promoting the efficient use of land and buildings;
- c. minimizing carbon emissions from there development, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:
  - 1. ensuring developments use less energy,
  - 2. making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralized energy networks;
  - 3. generating renewable energy on-site;
- d. Ensuring buildings and spaces are designed to cope with, and minimize the effects of, climate change.

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

#### Local energy generation

The Council will promote local energy generation and networks by:

- e. working with our partners and developers to implement local energy networks in the parts of Camden most likely to support them, i.e. in the vicinity of
  - housing estates with community heating or the potential for community heating and other uses with large heating loads;
  - the growth areas of King's Cross; Euston; Tottenham Court Road; West Hampstead Interchange and Holborn;
  - schools to be redeveloped as part of Building Schools for the Future programme;
  - existing or approved combined heat and power/local energy networks (see Map4);
  - Other locations where land ownership would facilitate their implementation.
- f. protecting existing local energy networks where possible (e.g. at Gower Street and Bloomsbury) and safeguarding potential network routes (e.g. Euston Road);

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#### Water and surface water flooding

We will make Camden a water efficient borough and minimise the potential for surface water flooding by:

- g. protecting our existing drinking water and foul water infrastructure, including Barrow Hill Reservoir, Hampstead Heath Reservoir, Highgate Reservoir and Kidderpore Reservoir;
- h. making sure development incorporates efficient water and foul water infrastructure;
- i. requiring development to avoid harm to the water environment, water quality or drainage systems and prevents or mitigates local surface water and downstream flooding, especially in areas up-hill from, and in, areas known to be at risk from surface water flooding such as South and West Hampstead, Gospel Oak and King's Cross (see Map 5).

#### Camden's carbon reduction measures

The Council will take a lead in tackling climate change by:

- j. taking measures to reduce its own carbon emissions;
- k. trialling new energy efficient technologies, where feasible; and
- 1. Raising awareness on mitigation and adaptation measures.

#### Generating renewable energy on-site

13.11 Buildings can also generate energy, for example, by using photovoltaic panels to produce electricity, or solar thermal panels, which produce hot water. Once a building and its services have been designed to make sure energy consumption will be as low as possible and the use of energy efficient sources has been considered, **the Council will expect developments to achieve a reduction in carbon dioxide emissions of 20% from on-site renewable energy generation** (which can include sources of site-related decentralised renewable energy) unless it can be demonstrated that such provision is not feasible. Details on ways to generate renewable energy can be found in our Camden Planning Guidance supplementary document.



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### 5. Assessment Methodology

#### 5.1. Mayor's Energy Hierarchy

The energy hierarchy is a classification of different methods to improve energy performance in a parallel sequence. This includes primarily a focus on reducing energy use by avoiding unnecessary use, to then improving the efficiency of energy systems to minimise loss, this is followed by exploiting renewable energy sources and then low carbon energy solutions for energy needs and finally, any remaining demand can be catered for by conventional fuel sources.

The Mayor's Energy Strategy adopts a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. These guiding principles have been reordered since the publication of the Mayor's Energy Strategy in Feb 2004 and the adopted replacement London Plan 2011 with further alterations in 2015 stating that the following hierarchy should be used to assess applications:

- **BE LEAN** By using less energy and taking into account the further energy efficiency measure in comparison to the baseline building.
- **BE CLEAN** By supplying energy efficiently. The clean building looks at further carbon dioxide emission savings over the lean building by taking into consideration the use of decentralise energy via CHP.
- **BE GREEN** By integrating renewable energy into the scheme which can further reduce the carbon dioxide emission rate.



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#### 5.1. Software and Input data

The Government approved software, i.e. **FSAP 2012** has been utilised to carry out **Standard Assessment Procedure (SAP)** calculations - the SAP for the proposed residential units.

Syntegra received the architectural drawings and relevant documents, and they were used to undertake the energy assessments. The document references are listed in the table below.

No.	Document Name	Received Date
1	12E Proposed Plans 0F+1F	28-04-2016
2	13E Proposed Plans 2F+3F	28-04-2016
3	15D Proposed Elevs East	28-04-2016
4	16C Proposed Elevs West	28-04-2016
5	17D Proposed Elevs North	28-04-2016
6	18D Proposed Elevs South	28-04-2016

Table 6 The document list

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Carbon SMART







### 6. Baseline – Target Emission Rate

The baseline (known as Target Emission Rate), as calculated in line with the Building Regulation 2013, is the maximum amount of carbon dioxide a dwelling or non-residential unit is allowed to emit. The Target Emission Rate (TER) includes carbon dioxide emissions which are covered by Part L of the Building Regulations, known as regulated emissions (space and water heating, ventilation, lighting, pumps, fans & controls). The baseline energy uses and resulting CO<sub>2</sub> emissions rates of the development have been assessed using the Government approved software.

The baseline regulated  $CO_2$  emissions for the development as a whole are presented in the tables below:

BASELINE: TER		Regulated CO <sub>2</sub> Emissions (Tonnes CO <sub>2</sub> /yr)
	Flat 1	1.77
	Flat 2	1.07
	Flat 3	1.31
	Flat 4	1.64
Residential	Flat 5	1.74
	Flat 6	1.67
	Flat 7	1.52
	Flat 8	1.80
	Flat 9	1.46
TOTAL		13.98

### **4** BASELINE

Table 7 Regulated Energy Use and Carbon Emissions at Baseline

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# 7. BE LEAN – Energy Efficient Design

This section outlines the energy efficient measures taken in order to minimise the building's energy demand and therefore reduce energy use and CO<sub>2</sub> emissions further than the Baseline requirements (Building Regulations 2013 Part L compliance).

#### 7.1. Passive Design Measures

#### • Enhanced Building Elements

At the 'BE LEAN' stage of the energy hierarchy, energy efficient building elements have been incorporated into the build. The heat loss of different building element is dependent upon their U-value, air tightness, and thermal bridging y-values. Therefore, better U-values and air permeability than the minimum values set in the Part L 2013 have been suggested in this development. And, Accredited Construction Detail for Part L was also applied for all thermal bridging junctions to reduce the heat loss from the thermal bridging. Please see below more specifically:

		Part L 2013 min. required values	Proposed building values	
		L1A		
	Wall	0.30	0.13	
	Window	2.00	1.1	
U-value (W/m² K)	Floor	0.25	0.10	
	Roof	0.20	0.09	
	Door	1.0 (notional)	1.4	
<b>Air Permeability</b> (m <sup>3</sup> /h.m <sup>2</sup> at 50 Pa)		10	4	
Use of Accredited Construction Details		YES (thermal bridging calculations have been carried out for residential units based on ACD for Part L)		

Table 8 Proposed Building Elements

#### • Orientation & Natural Daylighting

Passive solar gain reduces the amount of energy required for space heating during the winter months. The building is typically positioned to have east aspect aligned with the roads and also maximise the passive solar gains into the building throughout the day. Moreover, the internal layout of the development has been designed to improve daylighting in all habitable spaces, as a way of improving the health and wellbeing of occupants.

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#### • Natural Ventilation

A natural ventilation strategy will be adopted in all residential units with extract fans in wet rooms; toilets, kitchen, and utility rooms. Therefore, higher energy consumption and CO<sub>2</sub> emissions due to mechanical ventilation is avoided.

#### 7.2. Active Design Measures

#### • Heating and Hot Water System

The space heating and hot water are provided by energy efficient systems as summarised in the table below. At the 'BE LEAN' stage **High efficiency individual combi gas boilers (90% efficiency) have been examined for space heating and hot water demand in residential units.** The heating control will be time and temperature zone control by suitable arrangement of plumbing and electrical services. The pump will be in heated space and the boiler will be interlocked. Design flow temperature will be  $\leq$ 45°C. Fuel burning type is On/Off and the fuel type is unknown at the moment. No fan assisted flue has been applied.

Systems	General Specification	Controls
Heating system	Individual Combi gas Boilers (Efficiency of 90%)	<ul> <li>Time and temperature zone control by suitable arrangement from plumbing and TRVs and bypass</li> <li>Heating Emitter – Underfloor heating (bathrooms)</li> <li>Heating Emitter – Radiators</li> </ul>
Hot water system	Same as space heating	-

#### Table 9 Heating and Hot water systems

All suggested specifications above are provisional, and have to be reviewed with mechanical engineers and contractors at detailed design stage.

#### • High Efficiency Lighting

The proposed light fittings will be low energy efficient fittings. These can be **T5 fluorescent fittings** with high frequency ballasts, or LED fittings for residential units. The suggested specifications should be reviewed at detailed design stage with electric engineers.

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		BASELINE	BE LEAN
		CO <sub>2</sub> Emissions (Tonnes CO <sub>2</sub> /yr)	CO <sub>2</sub> Emissions (Tonnes CO <sub>2</sub> /yr)
	Flat 1	1.77	1.59
	Flat 2	1.07	0.99
	Flat 3	1.31	1.17
	Flat 4	1.64	1.49
Residential	Flat 5	1.74	1.56
	Flat 6	1.67	1.51
	Flat 7	1.52	1.38
	Flat 8	1.80	1.32
	Flat 9	1.46	1.04
тот	AL	13.98	12.06
Carbon Re	eduction	-	13.8%

# 📥 BE LEAN STAGE

Table 10 Regulated Energy Use and Carbon Emissions at Be Lean Stage

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# 8. BE CLEAN – CHP & Decentralised Energy Networks

The Energy Hierarchy encourages the use of a CHP system and the connection to District Heating system to reduce CO<sub>2</sub> emissions further.

#### 8.1. Decentralised Energy Network

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

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

The feasibility of connecting into an existing heating network or providing the building with its own combined heat and power plant has been assessed alongside the **London Heat Map Study for the London Borough of Camden** as part of this assessment. The study identifies that the site is not located near the existing district heating networks. This is demonstrated clearly from the London Heat Map (http://www.londonheatmap.org.uk) snapshot below.



Figure 4 London Heat Map near the site

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Moreover, the London heat map below identifies existing DH networks in more broaden area, and it could not find any existing DH networks (in yellow) within 1km radius from the property. The costs involved in extending the existing DH network would outweigh the advantages in this development. Therefore, utilisation of the DH network has not been a feasible option for this development.



Figure 5 Existing DH Network near the site

However, as can be seen on the map below, there may be a potential DH network passing through near the site at around 1.8 Km from the development site.



Figure 6 Potential DH Network near the site

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# 8.2. **CHP**

The Energy Hierarchy identifies the combined heat and power (CHP) as a method of producing heat and electricity with much lower emissions than separate heat and power. Also, it encourages the creation of district heating systems supplied by CHP. The implementation of a CHP strategy should be decided according to good practice design. Key factors for the efficient implementation of the CHP system are:

- Development with high heating load for the majority of the year.
- CHP operation based on maximum heat load for minimum 10 hours per day.
- CHP operation at maximum capacity of 90% of its operating period.

To ensure that CHP is financially viable it is essential that the unit is selected to meet the base heat load and that this load is maintained over a large proportion of the day (a figure of 14 - 17 hours per day is often quoted subject to the load profiles and gas and electricity prices) to ensure that the additional costs (maintenance) associated with running a CHP unit can be recovered. This need to run the CHP plant, as far as possible continuously makes the building load profile of prime importance when reviewing the viability of such solutions and in particular the summer time heat load profile. To enable the CHP plant to run continuously when it is operating, a thermal store is often used so that excess CHP capacity can be used to generate hot water for use at a later time.

The feasibility of installing CHP has been assessed for this development. Since this development has only 9 residential units that would not create high heating loads, installing the CHP system would not be beneficial given the cost. Moreover, the development does not have enough plant space for the CHP system. Hence a CHP system has not been considered for this development. Hence, no CO<sub>2</sub> reduction can be achieved at Be Clean stage.

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# 🖊 BE CLEAN stage

		BE LEAN	BE CLEAN
		<b>CO<sub>2</sub> Emissions</b> (Tonnes CO <sub>2</sub> /yr)	<b>CO<sub>2</sub> Emissions</b> (Tonnes CO <sub>2</sub> /yr)
	Flat 1	1.59	1.59
	Flat 2	0.99	0.99
	Flat 3	1.17	1.17
	Flat 4	1.49	1.49
Residential	Flat 5	1.56	1.56
	Flat 6	1.51	1.51
	Flat 7	1.38	1.38
	Flat 8	1.32	1.32
	Flat 9	1.04	1.04
TOTAL		12.06	12.06
Carbon Ro	eduction	-	0.00%

Table 1111 Regulated Energy Use and Carbon Emissions at Be Clean Stage

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# 9. BE GREEN – Renewable Energy

In this section the viable renewable energy technologies that could reduce the development's CO<sub>2</sub> emissions are examined. In determining the appropriate renewable technology for the site, the following factors were considered;

- Renewable energy resource or fuel availability of the LZC technology on the site.
- Space limitations due to building design and urban location of the site.
- Capital, operating and maintenance cost.
- Planning Permission
- Implementation with regards the overall M&E design strategy for building type
- Available Grants

The table below summarises the various low zero carbon technologies considered for the projects, and we have identified that **Photovoltaic (PV)** would be the most appropriate option in this development. Solar Thermal was also seen as a feasible technology, however due to the individual heating systems the infrastructure required for the solar thermal to be used on site would create additional problems. Additionally, there was a greater carbon offset from PV alone therefore this technology was discounted at this stage.

Technology	Local Planning Requirements	Carbon Payback	arbon Grants/ Funding		
Photovoltaic (PV)	Spatial and Shadowing	Spatial and Shadowing High Feed-in Tariff (FIT)		HIGH	
Air Source Heat Pumps (ASHP)	Noise Issues from External units	High	MEDIUM		
Solar Thermal	Spatial and Shadowing	Low	Low Renewable Heat Incentive (RHI)		
Ground Source Heat Pumps (GSHP)	Spatial issues for Bore Holes and noise		Renewable Heat Incentive (RHI)	LOW	
Biomass	Spatial requirement for fuel storage and biomass odour	High	High Renewable Heat Incentive (RHI)		
Wind Power	Extensive planning requirements for noise and local biodiversity	Low	Feed-in Tariff (FIT)	LOW	

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energy







Technology	Local Planning Requirements	Carbon Payback	Grants/ Funding	Feasibility
Hydro Power	Extensive planning requirements for noise and water quality	None	Feed-in Tariff (FIT)	ZERO

Table 12 Feasibility Study of LZC Technologies

#### 9.1. Non-feasible Technology

#### • Ground Source Heat Pumps (GSHP)

Ground source heat pump would be a feasible option to meet the space heating requirements, however, it requires ground space for bore holes to extract the ground heat to be utilised for space heating requirements. In this case there is no available ground space for a borehole or trench system, the ground source loop would have to be incorporated within the foundation piles of the structure, which would result in additional cost. Hence, this option is not suitable for this development.

#### • Solar Thermal

The use of solar thermal for this development would be limited to domestic hot water only. The use of solar thermal for space heating would not be practical as it is not required when solar thermal is at its most effective during the summer months. Therefore, this system would require additional plumbing and space for hot water storage, incurring additional financial cost. Moreover, the amount of carbon offset from the system is generally lower than other technologies. Therefore, this technology is deemed to be unsuitable for this development.

#### • Hydro power

There is no river or lake within the development site boundaries. Therefore, small scale hydro-electric will not be studied any further because of the location and the spatial limitations of the development.

#### • Biomass

A biomass system designed for this development would be fueled by wood pellets which have a high energy content. However, a biomass system would not be an appropriate technology for the site for the following reasons:

- i. The burning of wood pellets releases substantially more NOx emissions when compared to similar gas boilers. As the development is situated within an urban area, the installation of a biomass boiler would further impact on the air quality in this area.
- ii. the lack of spaces for pellet boiler and storage on the site.
- iii. Pellets would need to be transported from local pellet suppliers, which causes carbon emissions to the air.

However, if the biomass system is considered at detailed design stage, local suppliers can be found near the site as shown in the map below (http://biomass-suppliers-list.service.gov.uk).

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Company name	Contact	Fuel Supplied	Telephone
Wolseley UK Ltd	www.pipecenter.co.uk k94.kingscross@wolseley.co.uk	Pellets	0207 3804230
City Plumbing Suppliers (CPS) part of the Travis Perkins Group	www.cityplumbing.co.uk shaun.jackson@cityplumbing.co.uk	Briquettes, Pellets	02076973480
Travis Perkins Trading Co. Ltd	www.travisperkins.co.uk sean.mahon@travisperkins.co.uk	Pellets	0207 380 6480
Wolseley UK Ltd	www.plumbcenter.co.uk FFP.Camden@wolseley.co.uk	Pellets	0207 4240957
Travis Perkins Trading Co. Ltd	www.travisperkins.co.uk toby.duncan@travisperkins.co.uk	Pellets	0207 561 0516
Wolseley UK Ltd	www.plumbcenter.co.uk YM.Highbury@wolseley.co.uk	Pellets	0207 7041830
Travis Perkins Trading Co. Ltd	www.travisperkins.co.uk keith.gittins@travisperkins.co.uk	Pellets	020 7251 6999
Travis Perkins Trading Co. Ltd	www.travisperkins.co.uk kenneth.walker@travisperkins.co.uk	Pellets	08705 005500
Travis Perkins Trading Co. Ltd	www.travisperkins.co.uk kelly.thomson@travisperkins.co.uk	Pellets	020 7254 1200
Travis Perkins Trading Co. Ltd	www.travisperkins.co.uk daniel.marsden@travisperkins.co.uk	Pellets	020 7254 1442

Figure 7 Biomass seller in the development area

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#### • Wind Power

Wind turbines need extensive planning requirements and they are only feasible at consistent wind speed. Moreover, since the development is located in an urban area, the site does not have sufficient wind speed to operate wind turbine at the height of 10meters as shown below (http://tools.decc.gov.uk/en/windspeed/default.aspx). Hence this option has been discounted.

Wind speed at 45m agl (in m/s)

6.4	6.5	6.9
6.5	6.5	7.1
6.7	6.7	7.1

Wind speed at 25m agl (in m/s)

5.8	5.8	6.3
5.9	5.9	6.6
6.2	6.2	6.6

Wind speed at 10m agl (in m/s)

4.9	4.9	5.5
5	5	5.9
5.3	5.3	5.8

Blank squares indicate areas outside the land area of the UK - i.e. areas at sea or of neighbouring countries.

agl = above ground level.

Squares surrounding the central square correspond to wind speeds for surrounding grid squares.

Figure 8 Wind speed analysis for the development area

#### • Air Source Heat Pumps (ASHP)

ASHP can meet the space heating demands on site efficiently in comparison with gas boilers. Although this low carbon technology consumes electricity to operate, due to higher efficiency the heat output is much greater. However, the use of air source heat pumps would not be feasible for the residential units based on the following reasons:

- i. ASHP evaporators would need to be located externally, any noise associated with the units could potentially be an issue.
- ii. Issues of noise may be of concern at night, as the development is largely residential.

Hence, this option has not been considered as a feasible option for the residential units.

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#### 9.2. Proposed Technology

#### • Photovoltaic (PV)

Based on the feasibility study above, PV would be the most suitable renewable Technology for the following reasons:

- i. The installation of PV is much simpler when compared to other renewable technologies
- ii. There is sufficient roof space available to install enough PV modules to have a significant impact on carbon emissions of the development
- iii. PV panels sited on the roof within an urban area are less visually intrusive when compared to wind turbines

The PV system capacity for the whole development depends upon the heating system selected. Therefore, the amount of PV relating to the proposed heating system option is outlined below:

#### Individual Combi Boilers for residential

+ 6.75 kWp PV

The tables below illustrate the indicative PV panel's detail, should it be feasible to implement:

Orientation	South East/ South West	Number of Panels	Approximate 27			
Panel Tilt	30°	Power Output	250 W/p			
Overshading	Less than 20 percent	Туре	Monocrystalline			
Proportion Exported	50%	PV Area	Approximate 45 m <sup>2</sup> (27 panels * 1.65 m <sup>2</sup> )			
Annual Ouput	Approximate 5,133 kWh					

Table 12 Suggested PV details

For the 6.75 kWp system, 27 monocrystalline PV panels with 250 w/p power output, would to be installed at 30°. The area on the roof could be utilised for the PV panels and condenser units. For flat roofs as a rule of thumb, 400mm between rows of panels has been considered. The proposed PV panels are subject to further consideration at detailed design stage. In order to qualify both the installer and the equipment, the system must be certified under the Microgeneration Certification Scheme (MCS).

The Feed - In – Tariffs (FIT) were introduced in order to give an incentive for PV generated electricity. The FIT scheme is based on the principle that the energy supplier pays generation tariff for every kWh the PV system generates and an export tariff for every kWh of electricity supplied back to the national grid. The table below shows FIT payment rate from 1 April 2016 – 31 March 2019 (https://www.ofgem.gov.uk/publications-and-updates/feed-tariff-fit-generation-export-payment-rate-table-01-april-30-june-2016).

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			201	6/17		2017/18			2018/19				
		1 Apr– 30 Jun	1 Jul– 30 Sep	1 Oct– 31 Dec	1 Jan– 31Mar	1 Apr– 30 Jun	1 Jul– 30 Sep	1 Oct– 31 Dec	1 Jan– 31Mar	1 Apr– 30 Jun	1 Jul– 30 Sep	1 Oct– 31 Dec	1 Jan– 31Mar
Solar	Higher	4.32	4.25	4.18	4.11	4.04	3.97	3.90	3.83	3.76	3.69	3.62	3.55
photovoltaic	Middle	3.89	3.83	3.76	3.70	3.64	3.57	3.51	3.45	3.38	3.32	3.26	3.20
(≤10kW)	Lower	0.74	0.68	0.63	0.58	0.52	0.47	0.41	0.37	0.32	0.26	0.21	0.15
Solar	Higher	4.53	4.46	4.39	4.32	4.25	4.19	4.12	4.05	3.98	3.91	3.85	3.78
photovoltaic (>10kW &	Middle	4.08	4.01	3.95	3.89	3.83	3.77	3.71	3.65	3.58	3.52	3.47	3.40
≤50kW)	Lower	0.74	0.68	0.63	0.58	0.52	0.47	0.41	0.37	0.32	0.26	0.21	0.15
Solar	Higher	2.38	2.32	2.26	2.21	2.15	2.10	2.04	1.98	1.93	1.87	1.82	1.76
photovoltaic (>50kW &	Middle	2.14	2.09	2.03	1.99	1.94	1.89	1.84	1.78	1.74	1.68	1.64	1.58
≤250kW)	Lower	0.74	0.68	0.63	0.58	0.52	0.47	0.41	0.37	0.32	0.26	0.21	0.15

Table 13 FIT Generation & Export Payment Rate Table (pence/kWh)

Given the proposed LZC technologies on the site (**PVs**), the overall  $CO_2$  reduction at BE GREEN stage can be calculated as shown below. And, it can be seen that the overall  $CO_2$  reduction via on-site renewables is <u>25.1%</u> for the total emissions.

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# \rm BE GREEN stage

		BE CLEAN	BE GREEN		
		<b>CO<sub>2</sub> Emissions</b> (Tonnes CO <sub>2</sub> /yr)	<b>CO<sub>2</sub> Emissions</b> (Tonnes CO <sub>2</sub> /yr)		
Residential	Flat 1	1.59	1.26		
	Flat 2	0.99	0.65		
	Flat 3	1.17	0.83		
	Flat 4	1.49	1.15		
	Flat 5	1.56	1.22		
	Flat 6	1.51	1.17		
	Flat 7	1.38	1.05		
	Flat 8	1.32	0.99		
	Flat 9	1.04	0.71		
TOTAL		12.06	9.03		
Carbon Reduction		-	25.1%		

Table 14 Regulated Energy Use and Carbon Reduction at Be Green Stage

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## 10. Conclusion

This report assesses the predicted energy performance and carbon dioxide emissions of the proposed development at **35 York Way, London N7 9QF,** based on the information provided by the design team.

In line with the London Plan's three step energy hierarchy the regulated CO<sub>2</sub> emissions for this development have been reduced by **35.4%** over Building Regulation 2013, once all measures in the table below are taken into account.

Stages	Strategies	
<b>BE LEAN</b> Energy efficient design	<ul> <li>U-values better than Building Regulations Part L.</li> <li>Accredited Construction Details for all junctions</li> <li>High efficient individual combi gas boilers for heating and hot water demand in residential units</li> <li>Natural ventilation with extract fans in wet rooms</li> <li>Low energy lights</li> </ul>	
<b>BE CLEAN</b> District heat networks or communal heating systems	Communal heating was not seen as a feasible heating optic for this development due to unavailability of plant space ar the site is not within reasonable proximity to existing or potential district heat networks.	
<b>BE GREEN</b> On-site renewable technologies	• PV panels of 6.75kWp on the roof (approximate 27 panels with 250 w/p were used to demonstrate how this can be achieved).	

Table 1615 Energy Hierarchy and suggested strategies

The carbon savings from each stage can be calculated as shown below. The total cumulative savings satisfy the requirement of the local policy requirements (35% reduction), and therefore there is no requirement to make a payment to the Carbon Offset Fund based on the shortfall below:

	Energy Hierarchy	Regulated Carbon Savings			
		Tonnes CO <sub>2</sub> /yr	%		
BE LEAN	After energy demand reduction	1.93	13.8 %		
<b>BE CLEAN</b>	After heat network/ CHP	-	-		
<b>BE GREEN</b>	After renewable energy3.0325.1 %				
Total Cumulative Savings					
Total Cumul	ative Savings	4.96	35.4 %		
Total Cumul Total Target	ative Savings Savings	<b>4.96</b> 4.90	<b>35.4 %</b> 35.0 %		
Total Cumul Total Target Shortfall	ative Savings Savings	<b>4.96</b> 4.90 -0.06	<b>35.4 %</b> 35.0 % -0.4 %		

Table 16 Carbon dioxide Emissions after each stage of the Energy Hierarchy

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Figure 9 The Energy Hierarchy

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Carbon SMART SWART







# 11. Appendix

✓ SAP Block Compliance and SBEM reports

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# SAP WorkSheet: New dwelling design stage

User Details:														
Assessor Name: Software Name:	Anthony Wing-King Stroma FSAP 2012			Stroma Number:STRSoftware Version:Ver			STRO Versic	10002972 sion: 1.0.3.15						
		Р	roperty /	Address:	Flat 1									
Address :	Flat 1, 35 York W	/ay, Camd	en, Lonc	lon										
1. Overall dwelling dimen	isions:		-	( 0)										
Ground floor			Area د	<b>a(m²)</b> 93.1	(1a) x	<b>Av. He</b>	ight(m) 7	(2a) =	251.37	(3a)				
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(	1e)+(1r	I) g	93.1	(4)									
Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	251.37	(5)				
2. Ventilation rate:	-													
Number of chimneys	main heating	heating	у ] + [_	0 0	] = [	total 0	X	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				- <u> </u>	3	x ′	10 =	30	(7a)				
Number of passive vents						0	x '	10 =	0	(7b)				
Number of flueless gas fire	es				Ē	0	x 4	40 =	0	(7c)				
								Air ch	anges per ho	_ ur				
Infiltration due to chimney	, fluor and fana -	$(6_2)_{\pm}(6_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}(7_2)_{\pm}($	a)+(7b)+(	7c) -	Г					 7 (0)				
If a pressurisation test has be	en carried out or is inte	nded. procee	d to (17).	otherwise o	continue fro	30 om (9) to (	(16)	÷ (5) =	0.12	(8)				
Number of storeys in the	e dwelling (ns)	····, .					)		0	(9)				
Additional infiltration [(9)-1]x0.1 =						-1]x0.1 =	0	(10)						
Structural infiltration: 0.2	25 for steel or timbe	er frame or	0.35 for	masonr	y constr	uction			0	(11)				
if both types of wall are pre deducting areas of opening	esent, use the value cor gs); if equal user 0.35	responding to	the greate	er wall are	a (after					_				
If suspended wooden flo	oor, enter 0.2 (unse	ealed) or 0.	1 (seale	ed), else	enter 0				0	(12)				
If no draught lobby, ente	er 0.05, else enter	)							0	(13)				
Percentage of windows	and doors draught	stripped		0.25 [0.2	$x(14) \cdot 1$	001 -			0	(14)				
window inflitration				(8) + (10) + (11) + (12) + (13) + (15) =					0	(15)				
$\begin{array}{c} \text{Initiation rate} \\ \text{Air permechility value, g50, expressed in cubic metres per bour per square metre of epvelope area \\ \text{Air permechility value, g50, expressed in cubic metres per bour per square metre of epvelope area \\ \text{Air permechility value, g50, expressed in cubic metres per bour per square metre of epvelope area \\ \text{Air permechility value, g50, expressed in cubic metres per bour per square metres of epvelope area \\ \text{Air permechility value, g50, expressed in cubic metres per bour per square metres of epvelope area \\ \text{Air permechility value, g50, expressed in cubic metres per bour per square metres of epvelope area \\ \text{Air permechility value, g50, expressed in cubic metres per bour per square metres of epvelope area \\ \text{Air permechility value, g50, expressed in cubic metres per bour per square metres of epvelope area \\ \text{Air per square metres per square metres of epvelope area } \\ Air per square metres per square m$						area	0	(10)						
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$					uicu	4	(17)							
Air permeability value applies	if a pressurisation test	has been don	e or a deg	gree air pei	rmeability	is being us	sed		0.02					
Number of sides sheltered	I								2	(19)				
Shelter factor				(20) = 1 - [0.075 x (19)] =				0.85	(20)					
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$					0.27	(21)								
Infiltration rate modified fo	r monthly wind spe	ed							1					
Jan Feb M	Mar Apr Ma	y Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind spe	ed from Table 7								1					
(22)m= 5.1 5 4	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7						
Wind Factor (22a)m = (22	)m ÷ 4													
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18						
Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x (	(22a)m					
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	0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.31	0.32		
Calcula	ate effec	ctive air	change .	rate for t	he appli	cable ca	se				-		-	(00-)
II ME	echanica			ondix N (2	2h) - (22a		quation (I	NE)) othor	wice (22k	(222)			0	(23a)
If bala	aust all the			ionovin %	(25a) = (25a)	or in uso fr	octor (fron	n Tabla 4b)	wise (23t	)) = (23a)			0	(23b)
									)=		001-)	<b>1</b> (00 c)	0	(23c)
a) II								HR) (24a	m = (2)	20)m + (. 1	230) × [	1 - (230)	) ÷ 100] ]	(24a)
(24a)111=	balanaa	d maab			without				)m (2)	2b)m + ('	0 00k)	0	J	(244)
0) II (24b)m-					without				$\frac{1}{2}$ $\frac{1}{2}$	$\frac{20}{1}$ $\frac{1}{0}$	230)	0	1	(24b)
(240)III=			tracture				U vontilatio			0	0	0	J	(240)
c) n i	f (22b)m	ouse ex n < 0.5 x	(23b), t	then (24	c) = (23b)	): otherv	vise (24	c) = (22b)	) m + 0	.5 x (23b	))			
(24c)m=	0	0	0	0	0	0	0		0	0	0	0	1	(24c)
d) If	natural	ventilatio	n or wh	l ole hous	e positiv	/e input v	ventilatio	on from l	oft				1	
i	f (22b)n	n = 1, th	en (24d)	m = (22	o)m othe	erwise (2	4d)m =	0.5 + [(22	2b)m² x	0.5]			_	
(24d)m=	0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d)
Effec	ctive air	change	rate - er	nter (24a	) or (24b	o) or (240	c) or (24	d) in box	(25)				_	
(25)m=	0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
0.116		e en el le c												
് 3. Hea	at losse	s and ne	eat loss l	paramete	er:									
3. Hea	at losse: IENT	s and ne Gros	eat loss   SS	oarameto Openin	er: as	Net Are	ea	U-valu	ie	AXU		k-value	Э	AXk
S. Hea	at losse: IENT	Gros Gros area	eat loss ss (m²)	Openin Openin m	er: gs I <sup>2</sup>	Net Are A ,n	ea n²	U-valu W/m2	ie K	A X U (W/I	K)	k-value kJ/m²⊷	e K	A X k kJ/K
3. Hea ELEN Doors	AT IOSSE:	s and ne Gros area	ss (m²)	Openin r	er: gs 1 <sup>2</sup>	Net Are A ,n 2.3	ea n² x	U-valu W/m2	ie K	A X U (W/I 3.22	K)	k-value kJ/m²⊷	e K	A X k kJ/K (26)
3. Head	<b>IENT</b> ws Type	Gros area	eat loss   ss (m²)	Openin r	er: gs 1 <sup>2</sup>	Net Are A ,n 2.3 3.52	ea n² X x1	U-valu W/m2 1.4 /[1/( 1.1 )+	ue K = 0.04] =	A X U (W/I 3.22 3.71	K)	k-value kJ/m²-	e K	A X k kJ/K (26) (27)
3. Here ELEN Doors Window Window	<b>IENT</b> ws Type ws Type	Gros area area	ss (m²)	Openin Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Maramete Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo Marameteo M	gs 2 <sup>2</sup>	Net Ard A ,n 2.3 3.52 2.24	ea n <sup>2</sup> x x1 x1	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+	ue K = 0.04] = 0.04] =	A X U (W/I 3.22 3.71 2.36	K)	k-value kJ/m²⊷	e K	A X k kJ/K (26) (27) (27)
3. Her ELEN Doors Window Window	WS Type ws Type ws Type	Gros area 9 1 9 2 9 3	ss (m <sup>2</sup> )	Openin M	gs 2	Net Are A ,n 2.3 3.52 2.24 2.24	ea n <sup>2</sup> x x1 x1 x1	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	ue K = = 0.04] = 0.04] =	A X U (W/ 3.22 3.71 2.36 2.36	K)	k-value kJ/m²⊷	e K	A X k kJ/K (26) (27) (27) (27)
3. Her ELEN Doors Window Window Window	WS Type WS Type WS Type WS Type WS Type	Gros area 9 1 9 2 9 3 9 4	ss (m <sup>2</sup> )	Openin m	gs <sub>2</sub>	Net Ara A ,n 2.3 3.52 2.24 2.24 1.83	ea n <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1	U-valu W/m2 [1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	ue K = = 0.04] = 0.04] = 0.04] =	A X U (W/I 3.22 3.71 2.36 2.36 1.93	K)	k-value kJ/m²∙l	e K	A X k kJ/K (26) (27) (27) (27) (27)
3. Her ELEN Doors Window Window Window Window	WS Type WS Type WS Type WS Type WS Type WS Type	Gros area 9 1 9 2 9 3 9 4 9 5	ss (m <sup>2</sup> )	Openin M	er: gs <sub>12</sub>	Net Are A ,n 2.3 3.52 2.24 2.24 1.83 2.24	ea n <sup>2</sup> x1 x1 x1 x1 x1 x1 x1 x	U-valu W/m2 [1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	<b>Je</b> K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 3.22 3.71 2.36 2.36 1.93 2.36	K)	k-value kJ/m²∙l	e K	A X k kJ/K (26) (27) (27) (27) (27) (27)
3. Her ELEN Doors Window Window Window Window Window	WS Type WS Type WS Type WS Type WS Type WS Type WS Type	Gros area 4 5 6	SS (m <sup>2</sup> )	Openin M	gs 2	Net Are A ,n 2.3 3.52 2.24 2.24 1.83 2.24 1.83	ea n <sup>2</sup> x1 x1 x1 x1 x1 x1 x1 x	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	Je         K         0.04]         0.04]         0.04]         0.04]         0.04]         0.04]         0.04]         0.04]         0.04]	A X U (W/ 3.22 3.71 2.36 2.36 1.93 2.36 1.93	<>	k-value kJ/m²∙	e K	A X k kJ/K (26) (27) (27) (27) (27) (27) (27)
3. Her ELEN Doors Window Window Window Window Floor	IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type	Gros area 9 1 9 2 9 3 9 4 9 5 9 6	ss (m <sup>2</sup> )	Openin m	gs <sub>2</sub>	Net Ara A ,n 2.3 3.52 2.24 2.24 1.83 2.24 1.83 93.1	ea n <sup>2</sup> x1 x1 x1 x1 x1 x1 x1 x1 x1 x	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	Ie         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]	A X U (W/I 3.22 3.71 2.36 2.36 1.93 2.36 1.93 8.37900	<>	k-value kJ/m²∙	÷	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Her ELEN Doors Window Window Window Window Window Floor Walls	IENT ws Type ws Type ws Type ws Type ws Type ws Type	Gros area 9 1 9 2 9 3 9 4 9 5 9 6	ss (m <sup>2</sup> )	Openin m	er: gs ,²	Net Are A ,n 2.3 3.52 2.24 2.24 1.83 2.24 1.83 93.1 17.42	ea n <sup>2</sup> x1 x1 x1 x1 x1 x1 x1 x1 x1 x	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ 0.09 0.13	Je         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]         =         0.04]         =	A X U (W/I 3.22 3.71 2.36 2.36 1.93 2.36 1.93 8.37900 2.26		k-value kJ/m²-I	ж К	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Her ELEN Doors Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window Window	WS Type WS Type WS Type WS Type WS Type WS Type WS Type Type1	Gros area 9 1 9 2 9 3 9 4 9 5 9 6 19.6 33.0	56 52 53 53 56 56 56 52 52 52 53 53 54 55 55 55 55 55 55 55 55 55	2.24	er: gs ²	Net Are A ,n 2.3 3.52 2.24 2.24 1.83 2.24 1.83 93.1 17.42 29.5	ea n <sup>2</sup> x1 x1 x1 x1 x1 x1 x1 x1 x1 x	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ 0.09 0.13 0.13	Je         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]         =	A X U (W/I 3.22 3.71 2.36 2.36 1.93 2.36 1.93 8.37900 2.26 3.84		k-value kJ/m²-	ж К	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Her ELEN Doors Window Window Window Window Window Floor Walls T Walls T	IENT ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3	Gros area 9 1 9 2 9 3 9 4 9 5 9 6 19.6 33.0 27.5	66 62 63 64 65 65 65 65 65 65 65 65 65 65	2.24		Net Ara A ,n 2.3 3.52 2.24 2.24 1.83 2.24 1.83 93.1 17.42 29.5	ea n <sup>2</sup> X1	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ 0.09 0.13 0.13	Ie         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]         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =      <	A X U (W/I 3.22 3.71 2.36 2.36 1.93 2.36 1.93 8.37900 2.26 3.84 2.56		k-value kJ/m²+	÷ K	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Her ELEN Doors Window Window Window Window Window Floor Walls 1 Walls 1 Walls 1	IENT ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3 Type4	$\begin{array}{c} \text{S and } \text{R} \\ \text{Gros} \\ \text{area} \\ \text{area} \\ \text{a} \\ \text{a} \\ \text{a} \\ \text{a} \\ \text{a} \\ \text{a} \\ \text{b} \\ \text{b} \\ \text{c} \\ \text{c}$	SS (m <sup>2</sup> )	2.24 3.52 8.14		Net Are A ,n 2.3 3.52 2.24 2.24 1.83 2.24 1.83 2.24 1.83 93.1 17.42 29.5 19.67	ea n <sup>2</sup> x1 x1 x1 x1 x1 x1 x1 x1 x1 x	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ 0.09 0.13 0.13 0.13	Je         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]         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =      <	A X U (W/I 3.22 3.71 2.36 2.36 1.93 2.36 1.93 8.37900 2.26 3.84 2.56		k-value kJ/m²-I	ж К	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
S. Her ELEN Doors Window Window Window Window Window Floor Walls 1 Walls 1 Walls 1 Roof	IENT ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3 Type4	$\begin{array}{c} \text{S and } \text{Re} \\ \text{Gros} \\ \text{area} \\ \text{area} \\ \text{a} \\ \text{a} \\ \text{a} \\ \text{a} \\ \text{a} \\ \text{a} \\ \text{b} \\ \text{a} \\ \text{b} \\ \text{b} \\ \text{c} \\ c$	56 53 56 56 56 53	Openin           m           2.24           3.52           8.14           2.3	er: gs ,²	Net Ara A ,n 2.3 3.52 2.24 2.24 1.83 2.24 1.83 93.1 17.42 29.5 19.67 12.23	ea n <sup>2</sup> x1 x1 x1 x1 x1 x1 x1 x1 x1 x	U-valu W/m2 1.4 /[1/(1.1)+ /[1/(1.1)+ /[1/(1.1)+ /[1/(1.1)+ /[1/(1.1)+ /[1/(1.1)+ 0.09 0.13 0.13 0.13 0.12	Je         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]         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =      <	A X U (W/I 3.22 3.71 2.36 2.36 1.93 2.36 1.93 8.37900 2.26 3.84 2.56 1.44		k-value kJ/m²-I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
3. Her ELEN Doors Window Window Window Window Window Floor Walls 1 Walls 1 Walls 1 Walls 1 Roof Total a	IENT ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3 Type4		66 31 53 53 53 53 53 53 53 53 53 53	Openin         m         0         2.24         3.52         8.14         2.3         0		Net Ara A ,n 2.3 3.52 2.24 2.24 1.83 2.24 1.83 2.24 1.83 93.1 17.42 29.5 19.67 12.23 10	ea n <sup>2</sup> X1	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ 0.09 0.13 0.13 0.13 0.12 0.1	Je         K         0.04]         0.04]         0.04]         0.04]         0.04]         0.04]         0.04]         =         0.04]         =         0.04]         =         0.04]         =         0.04]         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =	A X U (W/I 3.22 3.71 2.36 2.36 1.93 2.36 1.93 8.37900 2.26 3.84 2.56 1.44 1		k-value kJ/m²+		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	37.34
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	16926.47
Thermal mass parameter (TMP = $Cm \div TFA$ ) in kJ/m <sup>2</sup> K	Indicative Value: Medium	250

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

(33) (34) (35)

can be i	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridge	əs : S (L	x Y) cal	culated	using Ap	pendix l	<						13.84	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			51.18	(37)
Ventila	ation hea	at loss ca	alculated	monthl	ý				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	46.44	46.25	46.06	45.17	45.01	44.23	44.23	44.09	44.53	45.01	45.34	45.7		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	97.62	97.43	97.24	96.35	96.18	95.41	95.41	95.27	95.71	96.18	96.52	96.87		
Heat l		meter (F		m²k			•		(40)m	- Average = _= (39)m ∸	Sum(39)1.	12 /12=	96.35	(39)
(40)m=	1.05	1.05	1.04	1.03	1.03	1.02	1.02	1.02	1.03	1.03	1.04	1.04	]	
(40)11-	1.00	1.00	1.04	1.00	1.00	1.02	1.02	1.02	1.00	Average =	Sum(40)	12/12=	1.03	(40)
Numb	er of day	/s in moi	nth (Tab	le 1a)		-				tionago –				
	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 hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
													1	
		ipancy, l o N – 1	N ⊥ 1 76 v	[1 - ovn	(_0 0003		-13 0	)2)] ± 0 (	)013 v /-	TEA _13	2.	67		(42)
if TF	A £ 13.	9, N = 1 9, N = 1	+ 1.70 X	[i - exp	(-0.0003	949 X (11	-A -13.9	)2)] + 0.(	JU13 X (	IFA - 13.	.9)			
Annua	l averag	e hot wa	ater usag	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		97	.51		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed t	to achieve	a water us	se target o	f		1	
ποι πιοι		nires per j	lerson per	day (all w	aler use, r					-	1		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	i able 1c x	(43)			1	1	1	
(44)m=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26		_
Energy	content of	hot water	used - cal	culated m	onthly - A	100 v Vd r	n v nm v F	)Tm / 3600	· kW/h/mor	Total = Su	m(44) <sub>112</sub> =	- c 1d)	1170.16	(44)
(45)m-	159.07	130.12	1/3 56	125.16	120 1	103.63	96.03	110.2	111 51	120.06	1/1 86	154.05	1	
(40)11-	100.07	100.12	140.00	120.10	120.1	100.00	50.05	110.2		Total – Su	m(45),	104.00	1534.26	(45)
lf instan	taneous w	vater heatii	ng at point	of use (no	hot water	<sup>r</sup> storage),	enter 0 in	boxes (46,	) to (61)			-	1004.20	()
(46)m=	23.86	20.87	21.53	18.77	18.01	15.55	14.4	16.53	16.73	19.49	21.28	23.11		(46)
Water	storage	loss:												
Storag	je volum	e (litres)	includir	ng any so	plar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	eating a	ind no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherv	vise if no	o stored	hot wate	er (this ir	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water	storage	loss: uror's de	aclarad I	oss fact	or ie kno	wp (k\//k	v(dav).					0	1	(40)
Tomp	anulaci	octor fro	m Toblo	255 Iduli 26			i/uay).					0		(48)
Tempe Example								(40) (40)				0		(49)
Energy b) If m	y lost fro nanufact	om water urer's de	storage	, KVVN/Ye sylinder l	ear oss fact	or is not	known.	(48) x (49)	=			0		(50)
Hot wa	ater stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If com	munity h	eating s	ee secti	on 4.3	`						L		I	. /
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)

Energ	y lost fro	om water	storage	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Wator			oulated.	for oach	month			((56)m - (	(55) v (41)	m		0		(55)
vvaler	sionage							((50)11 – (	(55) × (41)					(50)
(56)m=	0 er containe	0 e dedicate	0 d solar sto	0	0 = (56)m	0 x [(50) = (	0 H11)1 ÷ (5		0 = (56)		0 H11) is fro		iv H	(96)
				nage, (57) T	n – (50)n I	x [(30) – (	(5) 1	u), eise (J	7)iii = (30) 1		1111) IS IIO 1	п дрена		()
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Prima	ry circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Prima	ry circuit	loss cal	culated	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	)m		-1-1)			
(mo						solar wat	ter neatil	ng and a		r thermo		0		(59)
(00)11-								0	0	0	0	0		(00)
Comb	i loss ca	Iculated	for each	month (	(61)m =	(60) ÷ 30	65 × (41)	)m	1	i	i	i		(- · · )
(61)m=	50.96	46.03	50.69	47.13	46.71	43.28	44.72	46.71	47.13	50.69	49.32	50.96		(61)
Total	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=	210.03	185.15	194.25	172.29	166.81	146.91	140.75	156.91	158.64	180.64	191.18	205.01		(62)
Solar D	HW input o	calculated	using App	endix G o	r Appendix	KH (negati	ve quantity	v) (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 (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter											
(64)m=	210.03	185.15	194.25	172.29	166.81	146.91	140.75	156.91	158.64	180.64	191.18	205.01		_
								Outp	out from wa	ater heate	r (annual)₁	12	2108.57	(64)
Heat of	gains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	65.63	57.77	60.41	53.4	51.61	45.28	43.11	48.32	48.86	55.88	59.5	63.96		(65)
incl	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	Table 5	5 and 5a	):									
Metah	olic gain	s (Table	5) Wat	ts	,									
motac	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95		(66)
Liahtir	na aains	ı (calcula	ted in Ar		L. equat	ion L9 o	r L9a). a	lso see <sup>·</sup>	Table 5					
(67)m=	56.75	50.4	40.99	31.03	23.2	19.58	21.16	27.5	36.92	46.87	54.71	58.32		(67)
Applia	inces da	ins (calc	ulated ir	L Append	l dixlea	L Lation I	13 or I 1	3a) also	) see Tal	l ble 5	1	1		
(68)m=	365.17	368.96	359.41	339.09	313.42	289.31	273.19	269.4	278.95	299.28	324.94	349.06		(68)
Cooki		(calcula	I din A	nnendix		tion I 15	or I 15a		e Table	5				
(69)m=	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66		(69)
Pump	s and fai	ns dains	(Table !	1										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losse	sea ev	I vanoratio	n (nega	i tive valu	i es) (Tah	l Je 5)	I							
(71)m=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63		(71)
- <b>*</b>		I	I	I	ļ	I			ļ	I	I			
Water	heating	gains (T	able 5)											
Water (72)m=	heating 88.21	gains (T 85.96	able 5) 81.19	74.16	69.37	62.89	57.95	64.94	67.86	75.11	82.64	85.97		(72)
Water (72)m= Total	heating 88.21	gains (1 85.96 gains =	able 5) 81.19	74.16	69.37	62.89	57.95 m + (67)m	64.94 + (68)m -	67.86 + (69)m + (	75.11 (70)m + (7	82.64 1)m + (72)	85.97 m		(72)
Water (72)m= Total (73)m=	heating 88.21 internal 620.11	gains (T 85.96 gains = 615.3	able 5) 81.19 591.57	74.16	69.37 515.96	62.89 (66) 481.75	57.95 m + (67)m 462.28	64.94 + (68)m - 471.83	67.86 + (69)m + ( 493.71	75.11 (70)m + (7 531.25	82.64 1)m + (72) 572.27	85.97 m 603.33		(72)

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	2.24	×	11.28	×	0.7	×	0.76	] =	9.32	(75)
Northeast 0.9x	0.77	x	1.83	x	11.28	x	0.7	x	0.76	] =	7.61	(75)
Northeast 0.9x	0.77	x	2.24	x	11.28	x	0.7	x	0.76	] =	9.32	(75)
Northeast 0.9x	0.77	x	1.83	×	11.28	×	0.7	×	0.76	] =	7.61	(75)
Northeast 0.9x	0.77	x	2.24	x	22.97	x	0.7	x	0.76	] =	18.97	(75)
Northeast 0.9x	0.77	x	1.83	×	22.97	×	0.7	×	0.76	] =	15.5	(75)
Northeast 0.9x	0.77	x	2.24	x	22.97	x	0.7	x	0.76	] =	18.97	(75)
Northeast 0.9x	0.77	x	1.83	x	22.97	x	0.7	x	0.76	=	15.5	(75)
Northeast 0.9x	0.77	x	2.24	x	41.38	x	0.7	x	0.76	] =	34.17	(75)
Northeast 0.9x	0.77	x	1.83	x	41.38	×	0.7	x	0.76	] =	27.92	(75)
Northeast 0.9x	0.77	x	2.24	x	41.38	x	0.7	x	0.76	=	34.17	(75)
Northeast 0.9x	0.77	x	1.83	x	41.38	x	0.7	x	0.76	] =	27.92	(75)
Northeast 0.9x	0.77	x	2.24	x	67.96	x	0.7	x	0.76	] =	56.12	(75)
Northeast 0.9x	0.77	x	1.83	×	67.96	×	0.7	x	0.76	] =	45.85	(75)
Northeast 0.9x	0.77	x	2.24	×	67.96	×	0.7	×	0.76	=	56.12	(75)
Northeast 0.9x	0.77	x	1.83	×	67.96	×	0.7	×	0.76	=	45.85	(75)
Northeast 0.9x	0.77	x	2.24	×	91.35	×	0.7	x	0.76	] =	75.44	(75)
Northeast 0.9x	0.77	x	1.83	×	91.35	×	0.7	×	0.76	=	61.63	(75)
Northeast 0.9x	0.77	x	2.24	×	91.35	×	0.7	×	0.76	] =	75.44	(75)
Northeast 0.9x	0.77	x	1.83	×	91.35	×	0.7	×	0.76	] =	61.63	(75)
Northeast 0.9x	0.77	x	2.24	x	97.38	x	0.7	x	0.76	] =	80.42	(75)
Northeast 0.9x	0.77	x	1.83	x	97.38	x	0.7	x	0.76	] =	65.7	(75)
Northeast 0.9x	0.77	x	2.24	x	97.38	x	0.7	x	0.76	=	80.42	(75)
Northeast 0.9x	0.77	x	1.83	x	97.38	x	0.7	x	0.76	] =	65.7	(75)
Northeast 0.9x	0.77	x	2.24	x	91.1	x	0.7	x	0.76	=	75.23	(75)
Northeast 0.9x	0.77	x	1.83	x	91.1	x	0.7	x	0.76	=	61.46	(75)
Northeast 0.9x	0.77	x	2.24	x	91.1	x	0.7	x	0.76	] =	75.23	(75)
Northeast 0.9x	0.77	x	1.83	x	91.1	x	0.7	x	0.76	=	61.46	(75)
Northeast 0.9x	0.77	x	2.24	x	72.63	x	0.7	x	0.76	] =	59.98	(75)
Northeast 0.9x	0.77	x	1.83	x	72.63	x	0.7	x	0.76	] =	49	(75)
Northeast 0.9x	0.77	x	2.24	x	72.63	x	0.7	x	0.76	=	59.98	(75)
Northeast 0.9x	0.77	x	1.83	x	72.63	x	0.7	x	0.76	=	49	(75)
Northeast 0.9x	0.77	x	2.24	x	50.42	x	0.7	x	0.76	] =	41.64	(75)
Northeast 0.9x	0.77	x	1.83	x	50.42	x	0.7	x	0.76	=	34.02	(75)
Northeast 0.9x	0.77	x	2.24	x	50.42	x	0.7	x	0.76	] =	41.64	(75)
Northeast 0.9x	0.77	x	1.83	×	50.42	×	0.7	×	0.76	] =	34.02	(75)
Northeast 0.9x	0.77	x	2.24	×	28.07	×	0.7	×	0.76	] =	23.18	(75)
Northeast 0.9x	0.77	x	1.83	x	28.07	x	0.7	x	0.76	] =	18.94	(75)
Northeast 0.9x	0.77	x	2.24	×	28.07	x	0.7	x	0.76	] =	23.18	(75)

Northeast 0.9x	0.77	x	1.83	x	28.07	x	0.7	x	0.76	=	18.94	(75)
Northeast 0.9x	0.77	x	2.24	×	14.2	x	0.7	×	0.76	= -	11.72	(75)
Northeast 0.9x	0.77	x	1.83	×	14.2	x	0.7	×	0.76		9.58	(75)
Northeast 0.9x	0.77	x	2.24	x	14.2	x	0.7	×	0.76	<b>-</b>	11.72	(75)
Northeast 0.9x	0.77	x	1.83	×	14.2	x	0.7	×	0.76	= -	9.58	(75)
Northeast 0.9x	0.77	x	2.24	×	9.21	x	0.7	×	0.76		7.61	(75)
Northeast 0.9x	0.77	×	1.83	x	9.21	x	0.7	×	0.76	<b>-</b>   -	6.22	(75)
Northeast 0.9x	0.77	x	2.24	x	9.21	x	0.7	×	0.76	= [	7.61	(75)
Northeast 0.9x	0.77	x	1.83	x	9.21	x	0.7	×	0.76	<b>-</b>	6.22	(75)
Southwest0.9x	0.77	×	2.24	x	36.79	Ī	0.7	×	0.76	<b>-</b>   -	30.39	(79)
Southwest0.9x	0.77	x	2.24	x	62.67	Ī	0.7	×	0.76	= [	51.76	(79)
Southwest0.9x	0.77	×	2.24	x	85.75	Ī	0.7	×	0.76	<b>-</b>	70.82	(79)
Southwest0.9x	0.77	x	2.24	x	106.25	Ī	0.7	×	0.76	= [	87.75	(79)
Southwest0.9x	0.77	×	2.24	x	119.01	Ī	0.7	×	0.76	<b>¯</b> ] = [	98.28	(79)
Southwest0.9x	0.77	×	2.24	x	118.15	Ī	0.7	×	0.76	<b>-</b>	97.57	(79)
Southwest0.9x	0.77	×	2.24	x	113.91	Ī	0.7	×	0.76	=	94.07	(79)
Southwest0.9x	0.77	x	2.24	x	104.39	Ī	0.7	×	0.76	= F	86.21	(79)
Southwest0.9x	0.77	×	2.24	x	92.85	Ī	0.7	×	0.76	<b>-</b>	76.68	(79)
Southwest0.9x	0.77	×	2.24	x	69.27	Ī	0.7	×	0.76	=	57.2	(79)
Southwest0.9x	0.77	x	2.24	x	44.07	Ī	0.7	×	0.76	<b>−</b> = [	36.39	(79)
Southwest0.9x	0.77	x	2.24	x	31.49	Ī	0.7	×	0.76	<b>-</b>	26	(79)
Northwest 0.9x	0.77	x	3.52	x	11.28	x	0.7	×	0.76	<b>-</b>   =	14.64	(81)
Northwest 0.9x	0.77	x	3.52	x	22.97	x	0.7	×	0.76	= F	29.8	(81)
Northwest 0.9x	0.77	x	3.52	x	41.38	x	0.7	×	0.76	= -	53.7	(81)
Northwest 0.9x	0.77	x	3.52	x	67.96	x	0.7	×	0.76	<b>−</b>	88.19	(81)
Northwest 0.9x	0.77	x	3.52	x	91.35	x	0.7	×	0.76	=	118.54	(81)
Northwest 0.9x	0.77	x	3.52	x	97.38	x	0.7	×	0.76	] = [	126.38	(81)
Northwest 0.9x	0.77	x	3.52	x	91.1	x	0.7	×	0.76	<b>−</b>	118.23	(81)
Northwest 0.9x	0.77	x	3.52	×	72.63	x	0.7	×	0.76		94.25	(81)
Northwest 0.9x	0.77	x	3.52	×	50.42	x	0.7	×	0.76	 	65.43	(81)
Northwest 0.9x	0.77	×	3.52	X	28.07	] x	0.7	×	0.76	=   = [	36.42	(81)
Northwest 0.9x	0.77	x	3.52	x	14.2	x	0.7	×	0.76	=	18.42	(81)
Northwest 0.9x	0.77	×	3.52	<b>x</b>	9.21	] ×	0.7	×	0.76		11.96	(81)
Solar gains ir (83)m= 78.89 Total gains –	n watts, calcu 150.49 24	lated 8.69	for each mor 379.87 490.9 (84)m = (73)r	nth 16 נ 17 + (1	516.2 485.69 83)m , watts	<mark>(83)</mark> m 398	n = Sum(74)m .41 293.43	. <mark>(82)m</mark> 177.8	6 97.42	65.61		(83)

7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)

1006.92 997.96

Utilisation factor for gains for living area, h1,m (see Table 9a)

934.13

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

947.97

870.25

787.14

709.1

669.69

668.95

(84)m=

699

765.79

840.27

21

(84)

(85)

(86)m=	0.99	0.99	0.97	0.92	0.79	0.6	0.44	0.5	0.76	0.95	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	20.04	20.17	20.39	20.69	20.9	20.98	21	20.99	20.94	20.66	20.3	20.01		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
(88)m=	20.04	20.04	20.05	20.05	20.06	20.06	20.06	20.06	20.06	20.06	20.05	20.05		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.99	0.99	0.97	0.9	0.74	0.52	0.35	0.4	0.69	0.93	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to 7	7 in Tabl	le 9c)	-	-		
(90)m=	18.77	18.96	19.29	19.7	19.96	20.05	20.06	20.06	20.01	19.68	19.16	18.74		(90)
		-	-		_				f	fLA = Livin	g area ÷ (4	4) =	0.33	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.2	19.36	19.65	20.03	20.28	20.36	20.37	20.37	20.32	20.01	19.54	19.16		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate			I	
(93)m=	19.05	19.21	19.5	19.88	20.13	20.21	20.22	20.22	20.17	19.86	19.39	19.01		(93)
8. Spa	ace hea	ting requ	uirement		• - •	• • •							•	
Set Ti the ut	i to the i ilisation	nean int factor fo	ernal ter or gains	mperatur using Ta	re obtain Ible 9a	ied at ste	ep 11 of	Table 9	o, so tha	it Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	):	····cy	••••	••••		000	•••				
(94)m=	0.99	0.98	0.96	0.89	0.74	0.53	0.36	0.42	0.7	0.92	0.98	0.99		(94)
Usefu	Il gains,	hmGm	, W = (9	4)m x (84	4)m									
(95)m=	691.73	752.12	807.28	834.08	746.67	527.33	344.87	362.46	547.89	655.35	656.55	663.32		(95)
Month	nly aver	age exte	rnal terr	perature	e from Ta	able 8							1	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				(07)
(97)m=	1439.43	1394.37	1264.53	1057.71	810.36	535.47	345.71	364.19	581.15	890.32	1186.3	1434.81	I	(97)
Space	556 29	g require		161 02	10ntn, K		$\ln = 0.02$	24 X [(97]	)m – (95 	)mj x (4 <sup>-</sup>	1)M 381.42	573.98		
(50)11-	000.20	401.00	040.10	101.02	11.00	Ū	Ū	Tota		(k\\/b/year	= Sum(9)	8)	2666 7	(98)
Snoo	- hootin	a roquir		L\\/b/m2	lucor			Tota	i per yeur	(itteringedi	) = Oum(0	0)15,912 -		
Space	e nealin	g require	ementin	KVVII/III-	year								28.64	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Spac Fracti	e neatir on of sr	<b>ig:</b> bace hea	at from s	econdar	v/supple	mentarv	system						0	(201)
Fracti	on of sr	ace hea	at from m	nain svst	em(s)			(202) = 1 -	- (201) =				1	
Fracti	on of to	tal heati	na from	main sve	stem 1			(204) = (2)	02) x [1 -	(203)] =			1	(202)
Efficie		main enr	ng nom	ing syste	m 1			(201) - (2	0 <u>2</u> ) x [1	(200)] -			00.8	
Efficie		nain spa		amontor		aovotom	. 0/						90.8	
EIIICIE	ency or a	seconda	ry/suppi	ementar	y nearing	g system	1, %		-	_			0	(208)
0	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	556 20	g require	$\frac{1}{340.10}$		d above	)	0	0	0	174.82	381 / 2	573.08		
(011)									0	174.02	001.42	010.00		(044)
(211) <b>m</b>	1 = {[(98	)III X (20 475 32	(4)] } X 1	00 ÷ (20	52 10	0	0	0	Ο	192 53	420.07	632 14		(211)
	012.00	410.02		177.55	02.13			l Tota	l I (kWh/yea	I = Sum(2)	211),	=	2936 9	(211)
									1 - C	1 C C C C C C C C C C C C C C C C C C C	+ 15,1012		2000.0	P 7

Space heating fuel (secondary), kWh/month

$= \{[(98)m \times (201)]\} \times 100 \div (208)$										
(215)m= 0 0 0 0	0	0	0	0	0	0	0	0	]	
				Tota	l (kWh/yea	ar) =Sum(:	2 <b>15)</b> <sub>15,1012</sub>	<b>_</b>	0	(215)
Water heating										
Output from water heater (calculated 210.03 185.15 194.25 172.29	above) 166.81	146.91	140.75	156.91	158.64	180.64	191.18	205.01	1	
Efficiency of water heater	1 1								81.5	(216)
(217)m= 88.05 87.79 87.18 85.74	83.39	81.5	81.5	81.5	81.5	85.82	87.47	88.15		(217)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$									_	
(219)m= 238.54 210.9 222.8 200.94	200.03	180.26	172.7	192.53	194.65	210.48	218.57	232.56		_
				Tota	l = Sum(2	19a) <sub>112</sub> =			2474.97	(219)
Annual totals	n 1					k	Wh/year	•	kWh/year	1
Water heating fuel used									2930.9	」 ]
Electricity for pumps, fans and electri	c keep-hot									1
central heating pump:	·							30	]	(230c)
boiler with a fan-assisted flue								45	]	(230e)
Total electricity for the above, kWh/ye	ear			sum	of (230a).	(230g) =	:		75	(231)
Electricity for lighting									400.86	(232)
Electricity generated by PVs									-647.71	(233)
10a. Fuel costs - individual heating s	systems:									
		<b>Fu</b> kW	<b>el</b> /h/year			<b>Fuel P</b> (Table	<b>rice</b> 12)		<b>Fuel Cost</b> £/year	
Space heating - main system 1		(211	1) x			3.4	8	x 0.01 =	102.2	(240)
Space heating - main system 2		(213	3) x			C	)	x 0.01 =	0	(241)
Space heating - secondary		(218	5) x			13.	19	x 0.01 =	0	(242)
Water heating cost (other fuel)		(219	9)			3.4	18	x 0.01 =	86.13	(247)
Pumps, fans and electric keep-hot		(23)	1)			13.	19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to Energy for lighting	(230g) se	parately (232	y as app <sup>2)</sup>	licable a	nd apply	/ fuel pri 13.	<u>ce acc</u> or 19	ding to x 0.01 =	Table 12a 52.87	(250)
Additional standing charges (Table 12	2)								120	(251)
		one	of (233) to	o (235) x)		13.	19	x 0.01 =	0	- ](252)
Appendix Q items: repeat lines (253)	and (254)	as need	ded			L				-
Total energy cost	(245)(2	247) + (25	50)(254)	=					371.1	(255)
11a. SAP rating - individual heating	systems									
Energy cost deflator (Table 12)									0.42	(256)
Energy cost factor (ECF)	[(255) x (	(256)] ÷ [(	(4) + 45.0]	=					1.13	] (257)

SAP rating (Section 12)			84.26 (258)
12a. CO2 emissions – Individual heating systems	including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	634.37 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	534.59 (264)
Space and water heating	(261) + (262) + (263) + (26	64) =	1168.96 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	208.05 (268)
Energy saving/generation technologies Item 1		0.519 =	-336.16 (269)
Total CO2, kg/year		sum of (265)(271) =	1079.77 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	11.6 (273)
El rating (section 14)			90 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	3583.01 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	3019.46 (264)
Space and water heating	(261) + (262) + (263) + (26	64) =	6602.48 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25 (267)
Electricity for lighting	(232) x	0 =	1230.64 (268)
Energy saving/generation technologies Item 1		3.07 =	-1988.48 (269)
'Total Primary Energy		sum of (265)(271) =	6074.88 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =	65.25 (273)

Assessor Name:Anthony Wing-King Stroma FSAP 2012Stroma Number:STRO002972 Version:Software Name:Stroma FSAP 2012Software Version:Version:Version:Version:1.0.3.15Property Address: Flat 2Address:Address:Stroma Number:Version:Number of chimneysMain MeatingSecondary heatingOthertotalm³ per hourNumber of chimneys0+00+0=0x 4000+0=0x 2000+0=0x 1020ONumber of intermittent fans
Property Address: Flat 2Address :1. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)Ground floor $50.11$ $(1a) \times 2.7$ $(2a) =$ $135.3$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ $50.11$ $(4)$ $(3a)+(3c)+(3d)+(3e)+(3n) =$ $135.3$ $(5)$ Dwelling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = $135.3$ $(5)$ Othertotalmain meating heating heatingothertotalm³ per hourNumber of chimneys $0$ $+$ $0$ $=$ $0$ $x 40 =$ $0$ $(6a)$ Number of open flues $0$ $+$ $0$ $+$ $0$ $=$ $0$ $x 20 =$ $0$ $(6b)$ Number of intermittent fans $2$ $x 10 =$ $20$ $(7a)$
Address :1. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)Ground floor $50.11$ (1a) x $2.7$ (2a) = $135.3$ (3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $50.11$ (4) $50.11$ (4)Dwelling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =135.3(5)C Ventilation rate:Number of chimneys $0$ + $0$ = $0$ x 40 = $0$ (6a)Number of open flues $0$ + $0$ = $0$ x 20 = $0$ (6b)Number of intermittent fans $2$ x 10 = $20$ (7a)
1. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)Ground floor $50.11$ $(1a) \times 2.7$ $(2a) = 135.3$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ $50.11$ $(4)$ $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 135.3$ $(5)$ Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 135.3$ $(5)$ C. Ventilation rate: $m^3$ per hourNumber of chimneys $0$ $+$ $0$ $=$ $0$ $x \ 40 = 0$ $(6a)$ Number of open flues $0$ $+$ $0$ $=$ $0$ $x \ 20 = 0$ $(6b)$ Number of intermittent fans $2$ $x \ 10 = 20$ $(7a)$
Area(m²)Av. Height(m)Volume(m³)Ground floor $50.11$ (1a) x $2.7$ (2a) = $135.3$ (3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $50.11$ (4) $50.11$ (4)Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n)$ = $135.3$ (5)2. Ventilation rate:Number of chimneys $0$ + $0$ + $0$ = $0$ x 40 = $0$ (6a)Number of open flues $0$ + $0$ + $0$ = $0$ x 20 = $0$ (6b)Number of intermittent fans $2$ x 10 = $20$ (7a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 50.11(4)Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 135.3(5)2. Ventilation rate:Number of chimneys $0$ + $0$ = $0$ $x \ 40 =$ $0$ (6a)Number of open flues $0$ + $0$ = $0$ $x \ 40 =$ $0$ (6a)Number of intermittent fans $2$ $x \ 10 =$ $20$ $(7a)$
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+\dots(3n) =$ 135.3 (5)2. Ventilation rate:main heatingsecondary heatingother heatingtotalm³ per hourNumber of chimneys0+0=0x 40 =0(6a)Number of open flues0+0+0=0x 20 =0(6b)Number of intermittent fans2x 10 =20(7a)
2. Ventilation rate:Main heatingsecondary heatingother heatingtotal $m^3$ per hourNumber of chimneys0+0=0x 40 =0(6a)Number of open flues0+0+0=0x 20 =0(6b)Number of intermittent fans2x 10 =20(7a)
main heatingsecondary heatingothertotalm³ per hourNumber of chimneys $0$ $+$ $0$ $=$ $0$ $x 40 =$ $0$ (6a)Number of open flues $0$ $+$ $0$ $=$ $0$ $x 20 =$ $0$ (6b)Number of intermittent fans $2$ $x 10 =$ $20$ (7a)
Number of chimneys $0$ + $0$ = $0$ $x 40 =$ $0$ $(6a)$ Number of open flues $0$ + $0$ + $0$ = $0$ $x 20 =$ $0$ $(6b)$ Number of intermittent fans $2$ $x 10 =$ $20$ $(7a)$
Number of open flues $0$ + $0$ = $0$ $x 20 =$ $0$ $(6b)$ Number of intermittent fans $2$ $x 10 =$ $20$ $(7a)$
Number of intermittent fans $2 \times 10 = 20$ (7a)
Number of passive vents $0 \times 10 = 0$ (7b)
Number of flueless gas fires $0 \times 40 = 0$ (7c)
Air changes per hour
Infiltration due to chimneys flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20$
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)
Number of storeys in the dwelling (ns) 0 (9)
Additional infiltration $[(9)-1]x0.1 = 0$ (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)
If no draught lobby, enter 0.05, else enter 0 0 (13)
Percentage of windows and doors draught stripped 0 (14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.35 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used
Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.85$ (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$
Infiltration rate modified for monthly wind speed
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7
Wind Factor (22a)m = (22)m $\div$ 4
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

Adjust	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m				_	
<b>.</b> .	0.38	0.37	0.36	0.33	0.32	0.28	0.28	0.27	0.3	0.32	0.33	0.35		
Calcul If m	late ettec echanica	ctive air	change i ation:	rate for t	he appli	cable ca	se							(232)
lf ext	naust air he	eat pump	usina Appe	endix N. (2	(23a) = (23a	a) × Fmv (e	equation (N	N5)) . othe	rwise (23b	) = (23a)			0	(23b)
lf bal	anced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h	) =	, , ,				(23c)
a) If	balance	d mech	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	a)m = (22)	2b)m + ()	23b) x [′	1 – (23c)	 → 1001	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If	balance	d mech	anical ve	ntilation	without	heat rec	covery (N	и ЛV) (24b	)m = (22	2b)m + (2	23b)	I	1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If	whole h	ouse ex	tract ver	tilation of	or positiv	ve input v	ventilatio	n from c	outside			<b>!</b>		
	if (22b)m	ר < 0.5 <b>א</b>	(23b), t	hen (24	c) = (23b	); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	se positiv	/e input	ventilatio	on from I	oft	0 51				
(24d)m-	0.57	1 = 1, m	en (240)	111 = (221)			(40) m = 0	0.5 + [(2)	20)m² x	0.5	0.56	0.56	1	(24d)
Effo		change	rate - or	tor (24a	1  or  (24k)	(24)	c) or (24)	d) in hoy	(25)	0.00	0.00	0.00	J	()
(25)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	1	(25)
< - <b>/</b>													]	. ,
3. He	eat losse	s and he	eat loss p	Daramet	er:				_	A \/ 11		1 -1	_	
ELEN	MENI	area	ss (m²)	Openin	lgs 1 <sup>2</sup>	Net Ar A ,r	ea n²	U-vali W/m2	Je K	AXU (W/I	K)	kJ/m <sup>2</sup> ·l	e K	АХК kJ/K
Doors						2.3	x	1.4	= [	3.22				(26)
Windo	ws Type	e 1				1.78	x1,	/[1/( 1.1 )+	0.04] =	1.88	=			(27)
Windo	ws Type	2				2.24	x1,	/[1/( 1.1 )+	0.04] =	2.36	_			(27)
Windo	ws Type	3				0.77	x1,	/[1/( 1.1 )+	0.04] =	0.81				(27)
Windo	ws Type	e 4				0.77		/[1/( 1.1 )+	0.04] =	0.81				(27)
Floor						50.11	x	0.09		4.5099				(28)
Walls	Type1	16.3	33	4.02	2	12.31	x	0.13		1.6				(29)
Walls	Type2	22.4	11	1.54	 ↓	20.87	7 X	0.13		2.71			<b>-</b> -	(29)
Walls	ТуреЗ	13.	5	2.3		11.2	x	0.12	= [	1.32			$\dashv$	(29)
Total a	area of e	lements	, m²	L		102.3	5		`					(31)
* for wir ** includ	ndows and de the area	roof wind as on both	ows, use e sides of ir	effective wi nternal wal	indow U-va Is and part	alue calcul titions	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				19.2	2 (33)
Heat o	capacity	Cm = S	(A x k )						((28)	.(30) + (32	2) + (32a).	(32e) =	9435.	35 (34)
Therm	al mass	parame	eter (TMF	<sup>o</sup> = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	: Medium		250	(35)
For des can be	ign assess used instea	ments wh ad of a de	ere the de tailed calci	tails of the ulation.	construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						9.49	) (36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)			(00)	(26)				
Vootil	ablic nea	at loss	alculator	monthly					(33) +	- 0 22 ** (	25)m v (F)		28.7	1 (37)
venula		Ech	Mar			lun	lul	Δυσ	(Job)m Son	$= 0.33 \times ($	20)III X (5)		1	
	Jan	160			Intay	Jun		l Aug	l Och				J	

(38)m=	25.5	25.37	25.25	24.69	24.58	24.09	24.09	23.99	24.28	24.58	24.79	25.02		(38)
Heat tra	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	54.2	54.08	53.96	53.39	53.28	52.79	52.79	52.7	52.98	53.28	53.5	53.72		
Heat lo	iss nara	meter (l		/m²K					(40)m	Average = - (39)m ÷	Sum(39)1.	12 /12=	53.39	(39)
(40)m=	1.08	1.08	1.08	1.07	1.06	1.05	1.05	1.05	1.06	1.06	1.07	1.07		
· /									· · · · · ·	Average =	Sum(40)1.	<sub>12</sub> /12=	1.07	(40)
Numbe	er of day	/s in mo	nth (Tab	le 1a)										
1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assum if TF	ed occu A > 13.9	upancy, 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	- A -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.	1. .9)	69		(42)
if TF.	A £ 13.9	9, N = 1						(05 ··· NI)	. 00		-			
Reduce	averag the annua that 125	e not wa al average litres per	hot water	ge in litre usage by r day (all w	es per da 5% if the a	ly va,av Iwelling is	erage = designed t Id)	(25 X N) to achieve	+ 36 a water us	se target o	f 74	.42		(43)
									0		N.			
Hot wate	Jan er usage i	⊢eb n litres per	Mar r day for ea	Apr ach month	Vd.m = fa	ctor from T	JUI Table 1c x	Aug (43)	Sep	Oct	NOV	Dec		
(44)m=	81.86	78.88	75.91	72.93	69.95	66.98	66.98	69.95	72 93	75 91	78 88	81.86		
(++)///-	01.00	70.00	70.01	12.00	00.00	00.00	00.00	00.00	12.00	Total = Su	m(44) <sub>1,12</sub> =	01.00	893	(44)
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x C	0Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	121.39	106.17	109.56	95.52	91.65	79.09	73.29	84.1	85.1	99.18	108.26	117.56		
lf instant	aneous w	ater heati	ng at point	of use (no	o hot water	· storage),	enter 0 in	boxes (46	) to (61)	Total = Su	m(45) <sub>112</sub> =	-	1170.87	(45)
(46)m=	18.21	15.93	16.43	14.33	13.75	11.86	10.99	12.61	12.77	14.88	16.24	17.63		(46)
Water	storage	loss:	!	!			I	!		!				
Storage	e volum	e (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47) mbi boil	ara) ant	or (0) in (	47)			
Water	storage	loss:	not wate	er (uns ii	iciuues i	nstantai	ieous co		ers) erne		47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				,	0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m watei	r storage	, kWh/ye	ear			(48) x (49)	) =			0		(50)
b) If m	anufact	urer's d	eclared of	cylinder l	oss fact	or is not	known:							(= ()
Hot wa	iter stora nunity h	age loss leating s	ee secti	om Tabi on 4.3	e z (kvv	n/litre/da	iy)					0		(51)
Volume	e factor	from Ta	ble 2a	011 1.0								0		(52)
Tempe	rature f	actor fro	m Table	2b								0		(53)
Energy	lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter	(50) or (	(54) in (8	55)									0		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
It cylinde	er contains	s dedicate	a solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	u), else (5	/ )m = (56)	m where (	H11) is fro	m Appendi	хH	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)

Primar	y circuit	loss (ar	nnual) fro	om Table	e 3			0		(58)				
Primar	y circuit	loss cal	culated	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(mod	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	er heati	ng and a	cylinde	r thermo	stat)		1	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	ĺ	(59)
Combi	loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41	)m						
(61)m=	41.71	36.31	38.68	35.96	35.65	33.03	34.13	35.65	35.96	38.68	38.9	41.71		(61)
Total h	eat requ	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=	163.11	142.48	148.24	131.48	127.3	112.12	107.42	119.74	121.07	137.86	147.16	159.28		(62)
Solar DH	HW input of	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)	1	
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix C	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter	•								•	I	
(64)m=	163.11	142.48	148.24	131.48	127.3	112.12	107.42	119.74	121.07	137.86	147.16	159.28		
								Outp	out from w	ater heate	r (annual)₁	12	1617.24	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	-
(65)m=	50.79	44.38	46.1	40.75	39.39	34.55	32.9	36.87	37.29	42.65	45.72	49.52	ĺ	(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	vlinder i	s in the o	dwelling	or hot w	ater is fr	om com	n munity h	eating	
5. Int	ernal ga	ains (see	e Table 5	5 and 5a	):	,		5				,	5	
Motab		c (Toble	5) Wat	to										
Melabo	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
(66)m=	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6		(66)
Liahtin	u dains	r (calcula	L ted in Ar	n Dendix	L equat	ion I 9 o	rl9a)a	lso see <sup>-</sup>	I Table 5				1	
(67)m=	36.46	32.39	26.34	19.94	14.91	12.58	13.6	17.67	23.72	30.12	35.15	37.48	l	(67)
Annlia		ins (calc	L ulated ir	L Annena	l dix l ea	L	L 13 or I 1	I 3a) also	l . see Ta	L ble 5			ł	
(68)m=	220.18	222.46	216.71	204.45	188.98	174.43	164.72	162.43	168.19	180.45	195.92	210.46	I	(68)
Cookin		(calcula	I din A	nnendiv		ion   15	or   15a		 	5			i	. ,
(69)m-	46 85	46.85	46 85	46 85	26 85	46.85	46 85	46 85	46.85	46.85	46 85	46 85	I	(69)
Dumps	and for		(Table /	50)	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	i	()
(70)m-				$\frac{3}{3}$	3	3	3	3	3	3	3	3	1	(70)
							5	5	5	J	J	5	i	(10)
Losses	s e.g. ev		n (nega		es) (Tab		67 72	67.72	67 72	67 72	67 72	67 72	1	(71)
(71)m=	-07.73	-07.73	-07.73	-07.73	-07.73	-07.73	-07.73	-07.73	-07.73	-07.73	-07.73	-07.73	i	(71)
vvater	heating	gains (1	able 5)										1	(70)
(72)m=	68.27	66.04	61.96	56.6	52.94	47.99	44.22	49.56	51.79	57.32	63.5	66.56	i	(72)
Total i	nternal	gains =	: 			(66)	m + (67)m I	ו + (68)m + ד	⊦ (69)m + i	(70)m + (7 I	1)m + (72) I	m	1	
(73)m=	408.63	404.61	388.72	364.71	340.54	318.73	306.26	313.39	327.42	351.61	378.3	398.22		(73)
6. Sol	ar gains			e fluxe france	Table Cr	and accest	intend and	tiono to co	nuont ta ili	o opeliast		ion		
Solar g	ains are d		using sola		i adie 6a a		iateo equa	mons to co	anvert to th	e applicat	re orientat	ion.	Coinc	
Unenta	alion: A		actor	Area			X	-	<u>g_</u>	-			Gains	

	Та	ble 6d		m²		Table 6a		Table 6b		Table 6c		(W)	
East	0.9x	1	x	1.78	x	19.64	×	0.7	×	0.76	=	12.89	(76)
East	0.9x	1	x	2.24	x	19.64	×	0.7	×	0.76	=	16.22	(76)

East	0.9x	1	x	1.78	x	38.42	x	0.7	x	0.76	] =	25.21	(76)
East	0.9x	1	x	2.24	x	38.42	x	0.7	x	0.76	=	31.73	(76)
East	0.9x	1	x	1.78	x	63.27	x	0.7	x	0.76	=	41.52	(76)
East	0.9x	1	x	2.24	x	63.27	x	0.7	x	0.76	=	52.25	(76)
East	0.9x	1	x	1.78	x	92.28	x	0.7	x	0.76	=	60.56	(76)
East	0.9x	1	x	2.24	x	92.28	x	0.7	x	0.76	=	76.21	(76)
East	0.9x	1	x	1.78	×	113.09	x	0.7	x	0.76	] =	74.22	(76)
East	0.9x	1	x	2.24	×	113.09	x	0.7	x	0.76	=	93.4	(76)
East	0.9x	1	x	1.78	×	115.77	x	0.7	x	0.76	] =	75.97	(76)
East	0.9x	1	×	2.24	×	115.77	x	0.7	x	0.76	] =	95.61	(76)
East	0.9x	1	x	1.78	x	110.22	x	0.7	x	0.76	=	72.33	(76)
East	0.9x	1	x	2.24	x	110.22	x	0.7	x	0.76	=	91.02	(76)
East	0.9x	1	x	1.78	x	94.68	x	0.7	x	0.76	] =	62.13	(76)
East	0.9x	1	x	2.24	x	94.68	x	0.7	x	0.76	=	78.19	(76)
East	0.9x	1	x	1.78	×	73.59	x	0.7	x	0.76	] =	48.29	(76)
East	0.9x	1	x	2.24	x	73.59	x	0.7	x	0.76	=	60.77	(76)
East	0.9x	1	x	1.78	x	45.59	x	0.7	x	0.76	=	29.92	(76)
East	0.9x	1	×	2.24	×	45.59	x	0.7	x	0.76	=	37.65	(76)
East	0.9x	1	x	1.78	x	24.49	x	0.7	x	0.76	] =	16.07	(76)
East	0.9x	1	x	2.24	x	24.49	x	0.7	x	0.76	] =	20.22	(76)
East	0.9x	1	x	1.78	x	16.15	x	0.7	x	0.76	] =	10.6	(76)
East	0.9x	1	x	2.24	×	16.15	x	0.7	x	0.76	] =	13.34	(76)
South	0.9x	0.77	x	0.77	x	46.75	x	0.7	x	0.76	=	13.27	(78)
South	0.9x	0.77	x	0.77	x	46.75	x	0.7	x	0.76	=	13.27	(78)
South	0.9x	0.77	x	0.77	×	76.57	x	0.7	x	0.76	=	21.74	(78)
South	0.9x	0.77	x	0.77	x	76.57	x	0.7	x	0.76	=	21.74	(78)
South	0.9x	0.77	x	0.77	x	97.53	x	0.7	x	0.76	=	27.69	(78)
South	0.9x	0.77	x	0.77	x	97.53	x	0.7	x	0.76	=	27.69	(78)
South	0.9x	0.77	x	0.77	x	110.23	x	0.7	x	0.76	=	31.29	(78)
South	0.9x	0.77	x	0.77	x	110.23	x	0.7	x	0.76	=	31.29	(78)
South	0.9x	0.77	x	0.77	x	114.87	x	0.7	x	0.76	=	32.61	(78)
South	0.9x	0.77	x	0.77	x	114.87	x	0.7	x	0.76	=	32.61	(78)
South	0.9x	0.77	x	0.77	x	110.55	x	0.7	x	0.76	=	31.38	(78)
South	0.9x	0.77	x	0.77	×	110.55	x	0.7	x	0.76	=	31.38	(78)
South	0.9x	0.77	x	0.77	x	108.01	x	0.7	x	0.76	=	30.66	(78)
South	0.9x	0.77	x	0.77	×	108.01	x	0.7	x	0.76	=	30.66	(78)
South	0.9x	0.77	×	0.77	×	104.89	×	0.7	x	0.76	=	29.78	(78)
South	0.9x	0.77	×	0.77	×	104.89	×	0.7	x	0.76	=	29.78	(78)
South	0.9x	0.77	×	0.77	×	101.89	x	0.7	x	0.76	] =	28.92	(78)
South	0.9x	0.77	×	0.77	×	101.89	×	0.7	x	0.76	=	28.92	(78)
South	0.9x	0.77	x	0.77	×	82.59	x	0.7	x	0.76	] =	23.44	(78)

South	0.9x	0.77	×	0.	77	x	6	32.59	x	0.7	×	0.76	=	23.44	(78)
South	0.9x	0.77	×	0.	77	x	5	55.42	x [	0.7		0.76	=	15.73	(78)
South	0.9x	0.77	×	0.	77	x	5	55.42	×	0.7		0.76	=	15.73	(78)
South	0.9x	0.77	×	0.	77	x		40.4	x	0.7		0.76	=	11.47	(78)
South	0.9x	0.77	×	0.	77	x		40.4	x	0.7	= × F	0.76	= =	11.47	(78)
	L														
Solar g	gains in	watts, ca	alculate	d for eac	h montl	า			(83)m = S	um(74)m .	(82)m			_	
(83)m=	55.65	100.41	149.15	199.35	232.83	2	34.35	224.68	199.87	166.91	114.46	67.76	46.87		(83)
Total g	jains – i	nternal a	ind sola	r (84)m :	= (73)m	+ (	83)m	, watts							
(84)m=	464.28	505.02	537.88	564.06	573.37	5	53.08	530.93	513.26	494.33	466.07	446.06	445.09		(84)
7. Me	an inter	nal temp	erature	(heating	seaso	n)									
Temp	erature	during h	eating	periods i	n the liv	ing	area	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living ar	ea, h1,r	n (s	ee Ta	able 9a)							
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.95	0.89	0.78		0.59	0.43	0.47	0.7	0.91	0.97	0.99		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (1	follo	w ste	ps 3 to 7	7 in Tabl	e 9c)	-	-	-		
(87)m=	20.15	20.28	20.49	20.73	20.9	2	20.98	21	21	20.96	20.75	20.41	20.12		(87)
Tomr		during h	eating	Deriode i	n rest o	f du	Alling	i from Ta	и ыла 0 Т	h2 (የር)					
(88)m=	20.02	20.02	20.02	20.03	20.03		20.04	20.04	20.04	20.04	20.03	20.03	20.02		(88)
1.14:12-2									0>						
Utilisa		1000	ains for		weiling,	nz, T	,m (se		9a)	0.61	0.97	0.06	0.08		(89)
(03)11-	0.30	0.57	0.34	0.00	0.72		0.01	0.54	0.57	0.01	0.07	0.30	0.30		(00)
Mean	interna	l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)			l	(00)
(90)m=	18.91	19.1	19.4	19.73	19.94		20.03	20.04	20.04	20.01	19.76	19.3	18.88		(90)
										l		iy alea - (	+) =	0.44	(91)
Mean	interna	l temper	ature (fe	or the wh	ole dwe	ellin	g) = f	LA × T1	+ (1 – fL	A) × T2		i		1	
(92)m=	19.45	19.62	19.87	20.17	20.36	2	20.44	20.46	20.46	20.42	20.19	19.78	19.42		(92)
Apply	adjustr	nent to t	he mea	n interna	I tempe	ratu	ire fro	m Table	4e, whe	ere appro	opriate	40.00	40.07		(02)
(93)m=	19.3	19.47	19.72	20.02	20.21		20.29	20.31	20.31	20.27	20.04	19.63	19.27		(93)
o. Sp Sot T	ace nea i to thou	ning requ moon int	arnal to	l mooratu	ro obtoi	nod		on 11 of	Table 0	h co tha	t Ti m_(	76)m an	d ro, colo	vulato	
the ut	tilisation	factor fo	or gains	using Ta	able 9a	neu	ai 50	epiioi	Table 9	0, 50 118	u 11,111=(	r ojin an	u ie-cai	Juiale	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hn	n:											
(94)m=	0.98	0.96	0.93	0.86	0.73		0.53	0.37	0.4	0.64	0.87	0.96	0.98		(94)
Usefu	ıl gains,	hmGm	W = (9	4)m x (8	4)m				i	1	1	ı	1		
(95)m=	453.64	486.66	502.24	486.81	418.68	2	295.4	195.14	205.01	314.09	406.9	427.71	436.58		(95)
Month	nly aver	age exte	rnal ten	nperature	e from T	[abl	e 8	r	1	1	1	r	1	I	(00)
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for means		hai temp	erature,	Lm	1, VV =	=[(39)m	x [(93)m	– (96)m	502.02	670 57	000.00	l	(07)
(97)III= Space	$\frac{013.27}{0.000}$		$\frac{13.45}{1000000000000000000000000000000000000$	$\int \frac{\partial 9 \partial D}{\partial r} = \partial 9 \partial $	453.57	1 3 ///h	/mon	$1^{190.7}$	200.9 A v [/07	$m^{321.01}$	$\frac{503.22}{1001 \times 14}$	1)m	009.62		(37)
(98)m=	267.56	202.43	157 14	76.85	25.96		0	0.02		0	71.66	174.85	277.55		
(30)113					L_0.00		~	Ľ	Tota	l per vear	(kWh/vea	I = Sum(9)	(8)1 50 40 =	1254 01	(98)
0	o bosti :			L/A/L-/	24.00-				1010		,yoa	., canto	- /1		
Shace	e neatin	y require	ementi	i KVVN/M	year									25.03	(99)

9a. En	erav rea	uiremer	nts – Ind	ividual h	eating sv	vstems i	ncluding	micro-C	HP)					
Spac	e heatii	ng:				,			/					
Fract	ion of sp	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)
Fract	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fract	on of to	tal heatii	∩g from	main sys	stem 1			(204) = (20	02) × [1 – (	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								90.8	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ır
Spac	e heatin	g require	ement (c	alculate	d above)	)	·	·			i	i	1	
	267.56	202.43	157.14	76.85	25.96	0	0	0	0	71.66	174.85	277.55		
(211)m	$1 = \{[(98)]$	)m x (20	4)] } x 1	$\frac{00 \div (20)}{100 + 0.00}$	)6)	0				70.00	400 57	005.07	1	(211)
	294.67	222.94	173.06	84.64	28.59	0	0	0 Tota	0 L (k\Wb/vea	78.92	192.57	305.67	1281.06	<b>1</b> (211)
Snac	a hoatin	a fuel (e	econdar	x $k$	month			Tota	r (kwr#yoc	(2) –Oum(2		2	1381.00	
3paci = {[(98	)m x (20	)1)] } x 1	00 ÷ (20	y), kvvii/ )8)	monun									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215) <sub>15,1012</sub> =												0	(215)	
Water	heating	)												_
Output	from w	ater hea	ter (calc	ulated al	bove)	112 12	107.42	110 74	121.07	127.96	147.16	150.28	]	
Efficie	ncv of w	ater hea	140.24	131.40	127.5	112.12	107.42	119.74	121.07	137.00	147.10	139.20	81.5	<b>1</b> (216)
(217)m=	87.04	86.71	86.03	84.7	82.94	81.5	81.5	81.5	81.5	84.46	86.3	87.17	01.0	(217)
Fuel fo	r water	L heating,	kWh/mo	L onth									l	
(219)m	<u>n = (64)</u>	<u>m x 100</u>	) ÷ (217)	m	1		1			1	1	1	1	
(219)m=	187.4	164.31	172.3	155.23	153.48	137.57	131.8	146.92 Tota	148.55	163.23	170.52	182.71		
٨٥٩٠٠	l totala							TOLA	1 = 3um(2	19a) <sub>112</sub> =	Mhhaar		1914.03	(219)
Space	heating	fuel use	ed, main	system	1					N,	wii/yeai		1381.06	1
Water	heating	fuel use	d	-									1914.03	i I
Flectri	city for r	oumos fa	ans and	electric	keep-ho	t								J
centr	al hoatir					•						20	1	(230c)
boilor		ig pump.	tod fluo									30		(2200)
	with a l	an-assis	ited live						- ( (000 - )	(000 -)		45		(230e) T
l otal e	electricit	y for the	above, I	<wh td="" yea<=""><td>ır</td><td></td><td></td><td>sum</td><td>of (230a).</td><td>(230g) =</td><td></td><td></td><td>75</td><td>(231)</td></wh>	ır			sum	of (230a).	(230g) =			75	(231)
Electri	city for l	ighting											257.58	(232)
Electri	city gen	erated by	y PVs										-647.71	(233)
10a. I	-uel cos	sts - indiv	idual he	eating sy	stems:									
						<b>Fu</b> kW	<b>el</b> /h/year			<b>Fuel P</b> (Table	<b>rice</b> 12)		<b>Fuel Cost</b> £/year	
Space	Fuel kWh/yearFuel Price (Table 12)ce heating - main system 1(211) ×3.48× 0.01 = 4												48.06	(240)

(213) x

(215) x

Space heating - main system 2

Space heating - secondary

0

0

(241)

(242)

x 0.01 =

x 0.01 =

0

13.19

Water heating cost (other fuel)	(219)	3.48 × 0.01 =	66.61 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	9.89 (249)
(if off-peak tariff, list each of (230a) to (230g)	) separately as applicable and a	apply fuel price according to	Table 12a
Energy for lighting	(232)	13.19 × 0.01 =	33.97 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 x 0.01 =	-85.43 (252)
Appendix Q items: repeat lines (253) and (25 Total energy cost (245	54) as needed i)(247) + (250)(254) =		193.1 (255)
11a. SAP rating - individual heating system	S		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255	5) x (256)] ÷ [(4) + 45.0] =		0.85 (257)
SAP rating (Section 12)			88.1 (258)
12a. CO2 emissions – Individual heating sy	stems including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	298.31 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	413.43 (264)
Space and water heating	(261) + (262) + (263) + (264)	=	711.74 (265)
Electricity for pumps, fans and electric keep-	hot (231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	133.68 (268)
Energy saving/generation technologies Item 1		0.519 =	-336.16 (269)
Total CO2, kg/year	s	sum of (265)(271) =	548.18 (272)
CO2 emissions per m <sup>2</sup>	(	272) ÷ (4) =	10.94 (273)
El rating (section 14)			92 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	1684.9 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2335.11 (264)
Space and water heating	(261) + (262) + (263) + (264)	=	4020.01 (265)
Electricity for pumps, fans and electric keep-	hot (231) x	3.07 =	230.25 (267)
Electricity for lighting	(232) x	0 =	790.76 (268)
Energy saving/generation technologies Item 1		3.07 =	-1988.48 (269)

'Total Primary Energy Primary energy kWh/m²/year sum of (265)...(271) =

(272) ÷ (4) =

	3052.54	(272)
Γ	60.92	(273)

Assessor Name: Anthony Wing-King Stroma Number: STRO002972 Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.3.15 Property Address: Flat 3 Address : 1. Overall dwelling dimensions: Ground floor TEA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $54.43$ (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d$		User Details: Ssessor Name: Anthony Wing-King Stroma Number: STRO002972													
Software Name:         Stroma FSAP 2012         Software Version:         Version:         1.0.3.15           Property Address: Flat 3           Address:           Address:	Assessor Name:	Anthony Wing	g-King		Stroma	a Num	ber:		STRO	002972					
Property Address: Fial 3         Address:         Address:         Ground floor       Volume(m?)         Ground floor       Volume(m?)         Ground floor       Volume(m?)         Colspan="2">Volume(m?)         State (main problem)         Colspan="2">Volume(m?)         Colspan="2">Volume(m?)         Volume(m)         Secondary       Other       Volume(m?)         Volumber of chimneys       main presenting       o       Volume(m2)         Number of passive vents       O       × 40 =       O       O         Number of passive vents       O       × 40 =       O       Volume(m2)         Number of passive vents       O       × 40 =       O       Air changes per hour         Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c) =       20       + (6) =       O       Air changes per hour	Software Name:	Stroma FSAP	2012		Softwa	re Ver	sion:		Versio	n: 1.0.3.15					
Address :1. Coverall dwolling dimensions:Area(m <sup>2</sup> )Av. Height(m)Volume(m <sup>2</sup> )Ground floorStata(1a) × 2.7(2a) = 146.96(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)54.43(1a) × 2.7(2a) = 146.96(5)Overhields on area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)54.43(a) + (3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+			P	roperty /	Address:	Flat 3									
Area(m?)Av. Height(m)Volume(m?)Ground floor $54.43$ (to) x $2.7$ (co) = $146.96$ (so)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $54.43$ (4) $146.96$ (so)Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n)$ = $146.96$ (so) <b>2. Ventilation rate:</b> main heating $0$ + $0$ + $0$ = $0$ x 40 = $0$ (feb)Number of chimneys $0$ + $0$ + $0$ = $0$ x 40 = $0$ (feb)Number of open flues $0$ + $0$ + $0$ = $0$ x 40 = $0$ (feb)Number of passive vents $0$ x 10 = $0$ (ro)Number of flueless gas fires $0$ x 40 = $0$ (ro)Number of flueless gas fires $0$ x 40 = $0$ (ro)Number of the torek in the wake corresponding to the graver will area (after deducing areas of apaning); it equal user 0.35 $160 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 +$	Address :														
Ground floor $(12)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $(13)$ $($		1510115.		Aros	a(m²)			iaht(m)		Volume(m <sup>3</sup> )	\ \				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)       54.43       (4)         Dwelling volume       (3a)+(3b)+(3c)+(3d)+(3e)+(3n) =       146.96       (5)         2. Ventilation rate:       main       main       secondary       other       total       m <sup>3</sup> per hour       (6a)         Number of chimneys       0       +       0       =       0       x40 =       0       (6a)         Number of open flues       0       +       0       =       0       x40 =       0       (6a)         Number of open flues       0       +       0       =       0       x40 =       0       (6b)         Number of passive vents       2       x10 =       20       (7c)       x10 =       0       (7c)         Number of flueless gas fires       0       (7c)       x10 =       0       (7c)         Additional infituration       0.25 for steel or is intended, proceed to (17), otherwise continue from (9) to (16)       0       (14)         Number of storeys in the dwelling (ns)       Additional infituration       (19)-19:0.1 =       0       (10)         Structural infituration:       0.25 for steel or timber frame or 0.35 for masony construction       (11)       16)       114       0       (12)       16)	Ground floor			5	4.43	(1a) x	2	2.7	(2a) =	146.96	(3a)				
Duelling volume(3a)+(3b)+(3c)+(3d)+(3c)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d	Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)	)+(1e)+(1n	) 5	4.43	(4)									
2. Ventilation rate:       main heating       other       total       m³ per hour         Number of chimneys       0       +       0       =       0       x40 =       0       (6a)         Number of open flues       0       +       0       =       0       x40 =       0       (6a)         Number of open flues       0       +       0       =       0       x40 =       0       (6b)         Number of intermittent fans       0       x10 =       20       (7b)       0       x40 =       0       (7c)         Number of flueless gas fires       0       x40 =       0       (7c)        Add =       0       (7c)         Number of storeys in the dwelling (ns)       1       a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)       Additional infiltration       (9)       (9)       (10)       0       (11)       10       (11)       10       (12)       1       0       (11)       10       (11)       10       (12)       (11)       10       (11)       10       (12)       (11)       10       (12)       (11)       10       (12)       (11)       11       10       (11)       11       1	Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	146.96	(5)				
main heatingsecondary heatingothertotalm³ per hourNumber of chimneys $0$ $+$ $0$ $=$ $0$ $x40 =$ $0$ $(6a)$ Number of open flues $0$ $+$ $0$ $=$ $0$ $x40 =$ $0$ $(6b)$ Number of open flues $0$ $+$ $0$ $=$ $0$ $x20 =$ $0$ $(6b)$ Number of intermittent fans $2$ $x10 =$ $20$ $(7a)$ Number of passive vents $0$ $x40 =$ $0$ $(7c)$ Number of flueless gas fires $0$ $x40 =$ $0$ $(7c)$ Air changes per hour $0$ $x40 =$ $0$ $(7c)$ Additional infiltration $(9)$ $x40 =$ $0$ $(9)$ Additional infiltration: $0.5$ $10 + (7c) =$ $20$ $+ (6) =$ $0.14$ Structural infiltration: $0.5$ $10 + (7c) + (7c) =$ $20$ $+ (6) =$ $0.14$ Additional infiltration: $0.5$ $10 + (2c) + (7c) + (7c) =$ $20$ $+ (5) =$ $0.14$ If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 $0$ $112$ Percentage of windows and doors draught stripped $0$ $140$ Window infiltration $0.25 + (0.2 \times (14) + 100] =$ $0$ $110$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ $117$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ $117$ Air permeability va	2. Ventilation rate:	-	-				_								
Number of chimneys $0$ $+$ $0$ $+$ $0$ $=$ $0$ $x40$ $=$ $0$ $(6a)$ Number of open flues $0$ $+$ $0$ $+$ $0$ $=$ $0$ $x20$ $=$ $0$ $(6b)$ Number of intermittent fans $x$ $0$ $x$ $10$ $=$ $0$ $(7a)$ Number of passive vents $0$ $x$ $10$ $0$ $7(a)$ $x$ $10$ $0$ $7(a)$ Number of flueless gas fires $0$ $x$ $0$ $x$ $0$ $x$ $0$ $7(a)$ Number of storeys in the dwelling (ns) $x$ $0$ $x$ $0$ $(16)$ $(17)$ Additional infiltration $0$ $(17)$ $10$ $0$ $(19)$ $10$ $0$ $(10)$ Structural infiltration: $0.25$ for steel or timber frame or 0.35 for masonry construction $1$ $0$ $(11)$ $10$ $0$ $(12)$ If on draught lobby, enter 0.05, else enter 0 $0$ $0$ $(12)$ $0$ $(13)$ $0$ $0$ $(14)$ Percentage of windows and doors draught stripped $0$ $0$ $0$ $(15)$ $0$ $0$ $(15)$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ $(17)$ $160$ $0.34$ $160$ Air permeability value apties if a pressurisation test has been done or a degree air permeability is being used $0$ $1(4)$ $0$ $1(4)$ Air permeability value apties if a pressurisation test has been done or a deg		main heating	secondar heating	у	other		total			m <sup>3</sup> per hou	r				
Number of open flues $0$ + $0$ + $0$ = $0$ × 20 = $0$ (6b) Number of intermittent fans $2 \times 10 = 20$ (7a) Number of passive vents $2 \times 10 = 20$ (7b) Number of flueless gas fires $2 \times 10 = 0$ (7c) Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b) = $20$ + (5) = $0.14$ (6) I = a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (0) to (16) Number of storeys in the dwelling (ns) Additional infiltration (19)-1(b0.1 = $0$ (10) Structural infiltration 0.25 for steel or timber frame or 0.35 for masonry construction <i>if</i> both pass of valia are present, use the value corresponding to the greater wall area (after deducting areas of openings); <i>if</i> equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration $0.25 \cdot [0.2 \times (14) + 100] =$ 0  (15) 0  (16) 0  (16)	Number of chimneys	0	+ 0	+	0	] = [	0	X 4	40 =	0	(6a)				
Number of intermittent fans $2$ x 10 = $20$ (7a) Number of passive vents $0$ x 10 = $0$ (7b) Number of flueless gas fires $0$ x 40 = $0$ (7c) Air changes per hour Infiltration due to chimneys, flues and fans = (5a)+(5b)+(7a)+(7b) = $20$ + (5) = $0.14$ (6) t a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration (9) - 1(b0.1 = $0$ (10) Structural infiltration .0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 0 (12) 0 (13) Percentage of windows and doors draught stripped Window infiltration $0.25 \cdot [0.2 \times (14) + 100] =$ 0 (15) Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 (16) 0 (16) 0 (16) 0 (16) Mumber of sides sheltered Number of sides sheltered $0$ (20) = 1 - [0.075 \times (19]] = 0.34 (18) 10 permeability value, qb50, expressed in cubic metres per hour per square metre of envelope area 4 (17) $0$ (20) = 1 - [0.075 \times (19]] = 0.35 (20) Infiltration rate incorporating shelter factor (20) = 1 - [0.075 \times (19]] = 0.35 (20) Infiltration rate incorporating shelter factor (21) = (18) \times (20) = 0.29 (21) Infiltration rate modified for monthly wind speed 1 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div 4$ (22)m $1$ $1.7$ $1.25$ $1.23$ $1.1$ $1.08$ $0.95$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	Number of open flues	0	+ 0	<u> </u> + [	0	] = [	0	x2	20 =	0	(6b)				
Number of passive vents $0$ $x10 =$ $0$ $(7c)$ Number of flueless gas fires $0$ $x40 =$ $0$ $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)=$ $20$ $+(5) =$ $0.14$ $(8)$ If a pressurisation test has been carried out or is intended, proceed to $(17)$ , otherwise continue from $(9)$ to $(16)$ $0$ $(9)$ Number of storeys in the dwelling (ns) $0$ $0$ $(9)$ $0$ $(10)$ Additional infiltration $(25)$ for steel or timber frame or $0.35$ for masonry construction $(9)$ $0$ $(11)$ If output are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user $0.35$ $0.25 \cdot [0.2 \times (14) + 100] =$ $0$ $(12)$ If no draught lobby, enter $0.05$ , else enter $0$ $0$ $0$ $(13)$ Percentage of windows and doors draught strippedWindow infiltration $0.25 \cdot [0.2 \times (14) + 100] =$ $0$ $(15)$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value apples if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shellered $20 \pm (-10.075 \times (19)] =$ Air permeability value apples if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shellered $20 \pm (-10.075 \times (19)] =$ $2$	Number of intermittent far	าร				, L	2	x ′	0 =	20	(7a)				
Number of flueless gas fires $ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Number of passive vents					Γ	0	x ^	0 =	0	(7b)				
Air changes per hourInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =20+ (6) =0.14(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)Q+ (6) =0.14(8)Additional infiltration((9)-1)×0.1 =Q(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0QIf no draught lobby, enter 0.05, else enter 0QQ(14)Window infiltration0.25 - [0.2 x (14) ± 100] =O(14)Window infiltration0.25 - [0.2 x (14) ± 100] =O(14)Window infiltration0.25 - [0.2 x (14) ± 100] =O(14)Window infiltration0.25 - [0.2 x (14) ± 100] =If no draught lobby, enter 0.05, else enter 0If if a pressurisation test has been done or a degree air permeability va	Number of flueless gas fir	es					0	x 4	40 =	0	(7c)				
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $20$ + (5) = $0.14$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration [{9}-1]x0.1 = $0$ (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 Percentage of windows and doors draught stripped Window infiltration ate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) $\pm 20$ ]+(8), otherwise (18) = (16) Air permeability value, applies if a pressuisation test has been done or a degree in permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = $0.29$ (21) Infiltration rate modified for monthly wind speed Lan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\pm 4$ (22)m $1.27$ $1.25$ $1.23$ $1.1$ $1.08$ $0.95$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$									Air ch	anges per ho	ur				
Initiation due to channeys, most and rais a test (c)	Infiltration due to chimnes	e flues and fans	- (6a)+(6b)+(7	a)+(7b)+(	7c) =	Г			· (E)	0.44					
Number of storeys in the dwelling (ns) Additional infiltration $(9)^{-1}\times 0.1 = 0$ (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i> 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 Percentage of windows and doors draught stripped Window infiltration $0.25 \cdot [0.2 \times (14) + 100] = 0$ (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 If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = 2 (19) Infiltration rate modified for monthly wind speed Infiltration rate modified for monthly wind speed Monthly average wind speed from Table 7 (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m ÷ 4 (22a)m= $1.27$ $1.25$ $1.23$ $1.1$ $1.08$ $0.95$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	If a pressurisation test has be	en carried out or is i	ntended, proceed	d to (17), c	otherwise c	ontinue fro	20 om (9) to (	(16)	- (5) =	0.14	(0)				
Additional infiltration([9)-1]x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(11)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 · [0.2 x (14) + 100] =0Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used0.34Number of sides sheltered2(19)Shelter factor(20) = 1 - [0.075 x (19)] =0.85Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.29Infiltration rate modified for monthly wind speed0(21)Monthly average wind speed from Table 7(22) = 1 - [0.075 x (19)] =0.85(22)m=5.154.94.44.33.83.744.34.5Wind Factor (22a)m = (22)m ÷ 4(22)m ÷ 4(22)m ÷ 11.081.121.18	Number of storeys in th	e dwelling (ns)		( )/				,		0	(9)				
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 0Percentage of windows and doors draught strippedWindow infiltration0.25 - [0.2 x (14) $\pm$ 100] =0011)Infiltration rate(8) $\pm$ (10) $\pm$ (11) $\pm$ (12) $\pm$ (13) $\pm$ (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area441011based on air permeability value, then (18) = [(17) $\pm$ 20] $\pm$ (8), otherwise (18) = (16)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered210)Shelter factor(21) = (10.075 x (19)] =10,3411111111211311411511711811911911911101111111111111111111111111111111111111111111111111111111111111111111111111111111 <t< td=""><td>Additional infiltration</td><td></td><td></td><td></td><td></td><td></td><td></td><td>[(9)-</td><td>1]x0.1 =</td><td>0</td><td>(10)</td></t<>	Additional infiltration							[(9)-	1]x0.1 =	0	(10)				
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 $0$ (12) If no draught lobby, enter 0.05, else enter 0 $0$ (13) Percentage of windows and doors draught stripped $0$ (14) Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ (15) Infiltration rate $(8) \div (10) \div (11) \div (12) \div (13) \div (15) =$ (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ (17) If based on air permeability value, then (18) = [(17) \div 20] \div (8), otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Number of sides sheltered $2$ (19) Shelter factor (20) = 1 - [0.075 \times (19)] = (0.29) (21) Infiltration rate modified for monthly wind speed $2$ (19) Shelter factor (21) = (18) \times (20) = (22) m = (22) m = (5.1     5     4.9     4.4     4.3     3.8     3.8     3.7     4     4.3     4.5     4.7 Wind Factor (22a) m = (22) m ÷ 4 (22a) m = (1.27     1.25     1.23     1.1     1.08     0.95     0.95     0.92     1     1.08     1.12     1.18	Structural infiltration: 0.	25 for steel or tin	nber frame or	0.35 for	masonr	y constr	uction			0	(11)				
Control of the second of the	if both types of wall are pro-	esent, use the value	corresponding to	the greate	er wall area	a (after									
If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate modified for monthly wind speed Infiltration rate modified for monthly wind speed Monthly average wind speed from Table 7 (22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ (22a)m = 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	If suspended wooden fl	oor, enter 0.2 (ur	s nsealed) or 0.	1 (seale	d), else	enter 0				0	(12)				
Percentage of windows and doors draught stripped0Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.34Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0Number of sides sheltered2(19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.29Infiltration rate modified for monthly wind speed00.21)Monthly average wind speed from Table 701.08(22)m= $5.1$ $5$ $4.9$ $4.4$ 4.3 $3.8$ $3.7$ $4$ $4.3$ 4.3 $4.5$ $4.7$	If no draught lobby, ent	er 0.05, else ente	er O	,	,.					0	(13)				
Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ 0(15)Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4(17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.34(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0(19)Number of sides sheltered(20) = 1 - [0.075 x (19)] =0.85(20)Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.29(21)Infiltration rate modified for monthly wind speed $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Monthly average wind speed from Table 7 $(22)m =$ $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div 4$ $(22a)m =$ $1.27$ $1.25$ $1.23$ $1.1$ $1.08$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	Percentage of windows	and doors draug	ght stripped							0	(14)				
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 area4(17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.34(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.34(18)Number of sides sheltered2(19)0.85(20)Shelter factor(20) = 1 - [0.075 x (19)] =0.85(20)Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.29(21)Infiltration rate modified for monthly wind speed0.290.29(21)Monthly average wind speed from Table 7(22)m=5.154.94.44.33.83.744.34.54.7Wind Factor (22a)m = (22)m ÷ 4(22a)m=1.271.251.231.11.080.950.9211.081.121.18	Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)				
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4(17)If based on air permeability value, then $(18) = [(17) \div 20] \div (8)$ , otherwise $(18) = (16)$ 0.34(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.34(18)Number of sides sheltered2(19)0.85(20)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.29(21)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.29(21)Infiltration rate modified for monthly wind speed0.343.83.83.744.34.54.7Monthly average wind speed from Table 75.154.94.44.33.83.83.744.34.54.7Wind Factor (22a)m = (22)m ÷ 41.271.251.231.11.080.950.9211.081.121.18	Infiltration rate				(8) + (10) ·	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)				
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$ 0.34(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered2(19)Shelter factor(20) = 1 - [0.075 x (19)] =0.29(19)0.85(20)Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.29(21)Infiltration rate modified for monthly wind speedMar Apr May Jun Jul Aug Sep Oct Nov DecMonthly average wind speed from Table 7(22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div 4$ (22a)m= $1.27$ $1.23$ $1.1$ $1.08$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	Air permeability value,	q50, expressed ii	n cubic metre	s per ho	our per so	quare m	etre of e	nvelope	area	4	(17)				
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered $2$ (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed $0.29$ JanFebMarAprMayJunJulAugSepOctNovDecMonthly average wind speed from Table 7(22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.3$ $4.5$ $4.7$	If based on air permeabili	ty value, then (18	) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (	16)				0.34	(18)				
Number of sides shellered       2       (19)         Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $0.85$ (20)         Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $0.29$ (21)         Infiltration rate modified for monthly wind speed $11 + (18) \times (20) =$ $0.29$ (21)         Monthly average wind speed from Table 7 $(22)m =$ $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div 4$ $(22)m \div 4$ $1.27$ $1.25$ $1.23$ $1.1$ $1.08$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	Air permeability value applies	s if a pressurisation te	est has been don	e or a deg	ree air pei	meability i	is being u	sed		-					
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Monthly average wind speed from Table 7       (22)m=       5.1       5       4.9       4.4       4.3       3.8       3.7       4       4.3       4.5       4.7          (22a)m=       1.25       1.23       1.1       1.08       0.95       0.92       1       1.08       1.12       1.18	Shelter factor	u			(20) = 1 - [	0.075 x (1	9)] =			0.85	(19)				
Infiltration rate modified for monthly wind speed $\begin{array}{c c c c c c c c c c c c c c c c c c c $	Infiltration rate incorporati	ng shelter factor			(21) = (18)	x (20) =				0.00	$(21)^{(-3)}$				
Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Monthly average wind speed from Table 7	Infiltration rate modified for	or monthly wind s	peed						I	0.20					
Monthly average wind speed from Table 7         (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m ÷ 4       (22a)m = $1.27$ $1.25$ $1.23$ $1.1$ $1.08$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	Jan Feb	Mar Apr I	May Jun	Jul	Aug	Sep	Oct	Nov	Dec						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Monthly average wind spe	eed from Table 7													
Wind Factor (22a)m = (22)m ÷ 4         (22a)m=       1.27       1.25       1.23       1.1       1.08       0.95       0.92       1       1.08       1.12       1.18	(22)m= 5.1 5	4.9 4.4 4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7						
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	Wind Factor $(22a)m = (22a)m$	2)m ÷ 4	· · ·												
	(22a)m= 1.27 1.25	, 1.23 1.1 1	.08 0.95	0.95	0.92	1	1.08	1.12	1.18						

Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	elter an	d wind s	speed) =	: (21a) x	(22a)m					
	0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.29	0.31	0.32	0.34		
Calcula If me	ate ettec chanica	tive air I ventila	change i ation:	rate for t	he appli	cable ca	se					Г	0	(23a)
lf exh	aust air he	at pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	o) = (23a)		L	0	(23b)
lf bala	anced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =	, , ,		L L	0	(23c)
a) If	balance	d mech	anical ve	entilation	with he	at recov	erv (MV	HR) (24a	a)m = (2	2b)m + (	23b) x [ <sup>*</sup>	L 1 – (23c)	÷ 100]	(200)
(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 red	covery (I	и VIV) (24t	)m = (2	1 2b)m + (	23b)	I		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole ho	ouse ex	tract ver	tilation o	or positiv	/e input v	ventilatio	on from o	outside					
i	f (22b)m	ı < 0.5 <b>&gt;</b>	< (23b), t	hen (240	c) = (23b	o); other	wise (24	c) = (22	b) m + 0	.5 × (23k	o)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf i	natural \ f (22b)m	ventilation = 1, the	on or wh en (24d)	ole hous m = (22	e positiv b)m othe	ve input erwise (2	ventilati 24d)m =	on from 0.5 + [(2	loft 2b)m² x	0.5]				
(24d)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	ld) in bo	x (25)					
(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
3. He	at losses	s and he	eat loss p	paramete	er:									
ELEN	IENT	Gros area	ss (m²)	Openin m	gs ²	Net Ar A ,r	rea m²	U-val W/m2	ue 2K	A X U (W/	K)	k-value kJ/m²·K	(	A X k kJ/K
Doors						2.3	x	1.4	=	3.22				(26)
Windo	ws Type	1				1.79		/[1/( 1.1 )+	0.04] =	1.89	=			(27)
Windo	ws Type	2				7.05		/[1/( 1.1 )+	0.04] =	7.43	=			(27)
Windo	ws Type	3				1.79		/[1/( 1.1 )+	0.04] =	1.89	=			(27)
Windo	ws Type	4				1.79		/[1/( 1.1 )+	0.04] =	1.89				(27)
Floor						54.43	3 X	0.09	=	4.8987	 / [			(28)
Walls -	Гуре1	11.6	61	3.58		8.03	×	0.13		1.04	ז ר		- -	(29)
Walls -	Гуре2	24.	3	1.79		22.51	ı x	0.13		2.93	ז ר		- -	(29)
Walls -	ГуреЗ	27.6	67	7.05		20.62	2 X	0.13	=	2.68	F i		$\neg$	(29)
Walls <sup>-</sup>	Гуре4	27.4	11	2.3		25.11	1 X	0.12	=	2.95	i F			(29)
Total a	rea of el	ements	s, m²			145.4	2	L						(31)
* for win	dows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	lated using	g formula 1	1/[(1/U-valu	ue)+0.04] a	as given in	paragraph	3.2	
** includ	e the area	s on both	sides of in	nternal wal	s and par	titions		(00) (00	) . (22)			г		
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30	) + (32) =	(00) (0	o) (00 )		30.81	(33)
Heat C		Sm = S(	(AXK)			- k 1/m21/			((28).	(30) + (3)	2) + (32a).	(32e) = [	15579.9	(34)
For doci		parame		r = CM +	- IFA) If	I KJ/M <sup>2</sup> K	t known n	racisaly the	indicativ			ahla 1f	250	(35)
can be u	used instea	nd of a de	tailed calc	ulation.	Construct	ion ale 110	ι πιοντι ρι	COSCIY UI		s values Ol	TIVIE III Të	udie 11		
Therm	al bridge	s : S (L	x Y) cal	culated u	using Ap	pendix l	K					[	18.21	(36)
if details	of therma	l bridging	are not kn	own (36) =	= 0.15 x (3	1)						-		
Total fa	abric hea	at loss							(33) +	+ (36) =			49.02	(37)

Ventila	tion hea	at loss ca	alculated	d monthl	у				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	27.47	27.34	27.22	26.64	26.54	26.03	26.03	25.94	26.23	26.54	26.75	26.98		(38)
Heat ti	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	76.48	76.36	76.24	75.66	75.55	75.05	75.05	74.96	75.24	75.55	75.77	76		
Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	Average = = (39)m ÷	Sum(39)₁. · (4)	12 /12=	75.66	(39)
(40)m=	1.41	1.4	1.4	1.39	1.39	1.38	1.38	1.38	1.38	1.39	1.39	1.4		
Numbe	er of day	rs in mo	nth (Tab	le 1a)						Average =	Sum(40) <sub>1.</sub>	12 /12=	1.39	(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)
				Į										
4. Wa	ater heat	ina ene	rav reau	irement:								kWh/ve	ear:	
Assum if TF if TF Annua <i>Reduce</i>	A > 13.9 A > 13.9 A £ 13.9 I averag the annua	ipancy,   9, N = 1 9, N = 1 e hot wa al average	N + 1.76 > ater usa	< [1 - exp ge in litre ∵usage by	(-0.0003 es per da 5% if the d	349 x (TF ay Vd,av Iwelling is	FA -13.9 erage = designed :	)2)] + 0.( (25 x N) to achieve	)013 x (` + 36 a water us	TFA -13. se target o	.9) .77	.44		(42) (43)
not mor	e that 125	litres per	person pe	r day (all w	vater use, l	hot and co	ld)			0				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage ii	n litres pei	r day for e	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	85.18	82.09	78.99	75.89	72.79	69.7	69.7	72.79	75.89	78.99	82.09	85.18		_
Energy	content of	hot water	used - ca	lculated m	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	Total = Su hth (see Ta	m(44) <sub>112</sub> = ables 1b, 1	= c, 1d)	929.28	(44)
(45)m=	126.33	110.49	114.01	99.4	95.37	82.3	76.26	87.51	88.56	103.21	112.66	122.34		
lf instan	taneous w	ater heati	ng at poin	t of use (no	o hot water	r storage),	enter 0 in	boxes (46	) to (61)	Total = Su	m(45) <sub>112</sub> =	-	1218.44	(45)
(46)m=	18.95	16.57	17.1	14.91	14.31	12.35	11.44	13.13	13.28	15.48	16.9	18.35		(46)
Water	storage	loss:		•										
Storag	e volum	e (litres)	) includii	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel	(	0		(47)
If com Otherv Water	munity h vise if no storage	eating a stored	nd no ta hot wate	ank in dw er (this ir	velling, e ncludes i	nter 110 nstantar	) litres in neous co	n (47) ombi boil	ers) ente	er '0' in (	(47)			
a) If m	nanufact	urer's de	eclared	loss fact	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	e 2b		,	• /					0		(49)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear loss fact	or is not	known <sup>.</sup>	(48) x (49)	) =			0		(50)
Hot wa	ater stora	age loss	factor f	rom Tab	le 2 (kW	h/litre/da	ay)					0		(51)
If com	munity h	eating s	ee secti	on 4.3			• •							
Volum	e factor	from Ta	ble 2a								(	0		(52)
Tempe	erature f	actor fro	m Table	e 2b								0		(53)
Energy	/ lost fro	m water	storage	e, kWh/y	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter	(50) or (	54) in (5	o5)									0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m 				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)

If cylinde	er contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (57	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)	-		
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	43.41	37.78	40.25	37.43	37.09	34.37	35.52	37.09	37.43	40.25	40.48	43.41		(61)
Total h	eat requ	uired for	water h	eating ca	alculatec	for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	169.73	148.27	154.26	136.82	132.47	116.67	111.78	124.61	125.98	143.46	153.14	165.75		(62)
Solar DH	W 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 G	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	169.73	148.27	154.26	136.82	132.47	116.67	111.78	124.61	125.98	143.46	153.14	165.75		
								Outp	out from wa	ater heate	r (annual)₁	12	1682.95	(64)
Heat g	ains fro	m water	heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	52.86	46.18	47.97	42.41	40.99	35.96	34.24	38.37	38.8	44.38	47.58	51.53		(65)
inclu	ide (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	ernal ga	ains (see	e Table 5	5 and 5a	):									
Metabo	olic gain	s (Table	.5) Wat	ts	/									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	109.24	109.24	109.24	109.24	109.24	109.24	109.24	109.24	109.24	109.24	109.24	109.24		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 oi	r L9a), a	lso see <sup>-</sup>	Table 5					
(67)m=	35.37	31.42	25.55	19.34	14.46	12.21	13.19	17.15	23.01	29.22	34.1	36.36		(67)
Applia	nces da	ins (calc	ulated ir	n Append	dix L. ea	uation L	13 or L1	3a), also	see Ta	ble 5	1			
(68)m=	236.89	239.35	233.15	219.97	203.32	187.67	177.22	174.76	180.96	194.14	210.79	226.44		(68)
Cookin	u dains	(calcula	uted in A	ı ppendix	L. equat	ion L15	or L15a`	, also se	e Table	5				
(69)m=	47.74	47.74	47.74	47.74	47.74	47.74	47.74	47.74	47.74	47.74	47.74	47.74		(69)
Pumps	and fai	l ns dains	(Table !	1 5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
			n (nega	tive valu	es) (Tab	le 5)	_	_	-	_		_		
(71)m=	-72.83	-72.83	-72.83	-72.83	-72.83	-72.83	-72.83	-72.83	-72.83	-72.83	-72.83	-72.83		(71)
Water	heating	nains (T	able 5)											
(72)m=	71.04	68.72	64.48	58.9	55.09	49.94	46.02	51.58	53.89	59.65	66.08	69.26		(72)
Total i	nternal	gains =	I			(66)	m + (67)m	n + (68)m +	- (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	430.46	426.65	410.34	385.36	360.02	336.98	323.59	330.64	345.02	370.17	398.14	419.21		(73)
6. <u>So</u> l	lar gains	S:												
Solar g	ains are o	alculated	using sola	r flux from	Table 6a	and associ	ated equa	tions to co	nvert to th	e applicab	ole orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	x		a		FF		Gains	

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

North	0.9x	0.77	x	1.79	x	10.63	x	0.76	x	0.7	=	7.02	(74)
North	0.9x	0.77	x	1.79	x	10.63	x	0.76	x	0.7	] =	7.02	(74)
North	0.9x	0.77	x	1.79	x	20.32	x	0.76	x	0.7	] =	13.41	(74)
North	0.9x	0.77	x	1.79	x	20.32	x	0.76	x	0.7	] =	13.41	(74)
North	0.9x	0.77	x	1.79	x	34.53	x	0.76	x	0.7	] =	22.79	(74)
North	0.9x	0.77	x	1.79	x	34.53	x	0.76	x	0.7	] =	22.79	(74)
North	0.9x	0.77	x	1.79	x	55.46	x	0.76	x	0.7	] =	36.6	(74)
North	0.9x	0.77	x	1.79	x	55.46	x	0.76	x	0.7	] =	36.6	(74)
North	0.9x	0.77	x	1.79	x	74.72	x	0.76	x	0.7	=	49.31	(74)
North	0.9x	0.77	x	1.79	x	74.72	x	0.76	x	0.7	=	49.31	(74)
North	0.9x	0.77	x	1.79	x	79.99	x	0.76	x	0.7	=	52.78	(74)
North	0.9x	0.77	x	1.79	x	79.99	x	0.76	x	0.7	=	52.78	(74)
North	0.9x	0.77	x	1.79	x	74.68	x	0.76	x	0.7	=	49.28	(74)
North	0.9x	0.77	x	1.79	x	74.68	x	0.76	x	0.7	=	49.28	(74)
North	0.9x	0.77	x	1.79	x	59.25	x	0.76	x	0.7	=	39.1	(74)
North	0.9x	0.77	x	1.79	x	59.25	x	0.76	x	0.7	] =	39.1	(74)
North	0.9x	0.77	x	1.79	x	41.52	x	0.76	x	0.7	=	27.4	(74)
North	0.9x	0.77	x	1.79	x	41.52	x	0.76	x	0.7	=	27.4	(74)
North	0.9x	0.77	x	1.79	x	24.19	x	0.76	x	0.7	=	15.96	(74)
North	0.9x	0.77	x	1.79	x	24.19	x	0.76	x	0.7	=	15.96	(74)
North	0.9x	0.77	x	1.79	x	13.12	x	0.76	x	0.7	=	8.66	(74)
North	0.9x	0.77	x	1.79	x	13.12	x	0.76	x	0.7	=	8.66	(74)
North	0.9x	0.77	x	1.79	x	8.86	x	0.76	x	0.7	=	5.85	(74)
North	0.9x	0.77	x	1.79	x	8.86	x	0.76	x	0.7	=	5.85	(74)
South	0.9x	0.77	x	7.05	x	46.75	x	0.76	x	0.7	] =	121.52	(78)
South	0.9x	0.77	x	7.05	x	76.57	x	0.76	x	0.7	] =	199.01	(78)
South	0.9x	0.77	x	7.05	x	97.53	x	0.76	x	0.7	] =	253.51	(78)
South	0.9x	0.77	x	7.05	x	110.23	x	0.76	x	0.7	] =	286.52	(78)
South	0.9x	0.77	x	7.05	x	114.87	x	0.76	x	0.7	] =	298.57	(78)
South	0.9x	0.77	x	7.05	x	110.55	x	0.76	x	0.7	=	287.33	(78)
South	0.9x	0.77	x	7.05	x	108.01	x	0.76	x	0.7	] =	280.74	(78)
South	0.9x	0.77	x	7.05	x	104.89	x	0.76	x	0.7	=	272.64	(78)
South	0.9x	0.77	x	7.05	x	101.89	x	0.76	x	0.7	=	264.82	(78)
South	0.9x	0.77	x	7.05	x	82.59	x	0.76	x	0.7	=	214.65	(78)
South	0.9x	0.77	x	7.05	x	55.42	x	0.76	x	0.7	=	144.04	(78)
South	0.9x	0.77	x	7.05	x	40.4	x	0.76	x	0.7	=	105	(78)
West	0.9x	0.77	x	1.79	x	19.64	x	0.76	x	0.7	=	12.96	(80)
West	0.9x	0.77	x	1.79	x	38.42	x	0.76	x	0.7	=	25.35	(80)
West	0.9x	0.77	x	1.79	×	63.27	x	0.76	×	0.7	] =	41.76	(80)
West	0.9x	0.77	×	1.79	×	92.28	x	0.76	x	0.7	=	60.9	(80)
West	0.9x	0.77	x	1.79	x	113.09	x	0.76	x	0.7	=	74.63	(80)

West	0.9x	0.77	;	<	1.79	×	1	15.77	x		0.76		×	0.7		=	76.4	(80)
West	0.9x	0.77	;	۰	1.79	] ×	1	10.22	x		0.76		×Ē	0.7		=	72.74	(80)
West	0.9x	0.77	,	(	1.79	] ×		94.68	x		0.76		×Г	0.7		=	62.48	(80)
West	0.9x	0.77	;	(	1.79	j ×		73.59	x		0.76		×Г	0.7		=	48.56	(80)
West	0.9x	0.77	;	(	1.79	j ×	4	45.59	x		0.76	Ē	×Г	0.7		=	30.09	(80)
West	0.9x	0.77	;	(	1.79	j ×		24.49	x		0.76		×Г	0.7		=	16.16	(80)
West	0.9x	0.77	;	(	1.79	j ×		16.15	x		0.76		×Г	0.7		=	10.66	(80)
	L					4							_					
Solar	gains in	watts, ca	alculate	d for ea	ch mon	th			(83)m	i = Si	um(74)m .	(82	?)m					
(83)m=	148.51	251.19	340.84	420.6	2 471.8	2	469.3	452.04	413.	.31	368.18	27	6.67	177.51	127	.36	1	(83)
Total g	gains – i	nternal a	and sola	ar (84)n	n = (73)n	n + (	(83)m	, watts										
(84)m=	578.97	677.83	751.18	805.9	9 831.8	4 8	306.28	775.63	743.	.96	713.2	64	6.84	575.65	546	.57	1	(84)
7. Me	ean intei	rnal temp	perature	e (heati	ng seaso	on)												
Tem	oerature	during h	neating	periods	in the li	ving	area	from Tab	ole 9,	Th	1 (°C)						21	(85)
Utilis	ation fac	ctor for g	ains for	living a	area, h1,	m (s	see Ta	able 9a)										
	Jan	Feb	Mar	Арі	Ma	y İ	Jun	Jul	A	ug	Sep		Oct	Nov	D	ес	1	
(86)m=	0.98	0.96	0.93	0.86	0.74		0.57	0.42	0.4	5	0.67	0.	88	0.97	0.9	99	1	(86)
Mear		l temper	ature ir		area T1	(foll	nw ste	$\frac{1}{2}$	Tin T	able	- 9c)							
(87)m=	19.83	20.05	20.33	20.63	20.85	5	20.96	20.99	20.9	99	20.93	20	.64	20.18	19.	78	1	(87)
Tam		du via a b			in reat									ļ				
				10 77		, T				9, 11 78	12 (°C) 10 78	10	77	19.77	10	77	1	(88)
(00)11-	13.70	13.70	10.70	10.77	10.11		13.70	13.70	10.1	/0	15.70			13.77	13.			(00)
Utilis	ation fac	ctor for g	ains for	rest of	dwelling	g, h2	2,m (se	e Table	9a)				<u> </u>				1	(00)
(89)m=	0.98	0.95	0.91	0.82	0.67		0.47	0.31	0.3	4	0.57	0.	.84	0.95	0.9	98		(69)
Mear	n interna	l temper	ature ir	the re	st of dwe	elling	g T2 (f	ollow ste	eps 3	to 7	in Tabl	le 90	c)		1		1	
(90)m=	18.27	18.58	18.97	19.38	19.65	5	19.76	19.78	19.7	78	19.73	19	.41	18.77	18	.2		(90)
											f	fLA =	: Livir	ng area ÷ (4	4) =		0.59	(91)
Mear	n interna	l temper	ature (f	or the v	vhole dw	vellir	ng) = f	LA x T1	+ (1	– fL	A) × T2	_		-	_			
(92)m=	19.2	19.45	19.78	20.13	20.36	5	20.48	20.5	20.	.5	20.44	20	).14	19.61	19.	14	I	(92)
Appl	y adjustr	ment to t	he mea	n interr	al temp	erat	ure fro	m Table	e 4e, v	whe	re appro	opria	ate		1		1	
(93)m=	19.05	19.3	19.63	19.98	20.21		20.33	20.35	20.3	35	20.29	19	.99	19.46	18.	99		(93)
8. Sp	ace hea	ating requ	uiremer	nt			• • •							>			•	
Set 1	i to the tilisation	mean int	ernal te	empera Susing	ure obta Table 9a	aine	d at st	ep 11 of	Tabl	e 9b	o, so tha	at Ti,	m=(	76)m an	d re-	calc	ulate	
	Jan	Feb	Mar		Ma	v T	Jun	Jul	A	ua	Sep		Oct	Nov	П	ec	1	
Utilis	ation fac	ctor for g	ains, hr	<u>n:</u>	1		••••	••••		<u>.</u>	000			1				
(94)m=	0.97	0.95	0.91	0.83	0.7		0.52	0.36	0.3	9	0.61	0.	.85	0.95	0.9	98	1	(94)
Usef	ul gains,	hmGm	, W = (§	94)m x	(84)m	-								Į				
(95)m=	562.42	642.69	681.51	667.2	4 579.1	6 4	416.33	279.26	292.	.71	437.66	548	8.66	546.43	533	.79	1	(95)
Mont	hly aver	age exte	ernal ter	nperatu	ire from	Tab	le 8	-						-				
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.	.4	14.1	1(	0.6	7.1	4.	2	I	(96)
Heat	loss rat	e for mea	an inter	nal tem	perature	e, Lr	n,W	=[(39)m	x [(93	3)m-	– (96)m	]			- -		1	
(97)m=	1127.94	1099.88	1000.87	837.9	643.2	7 4	429.72	281.43	295.	.93	465.93	70	9.72	936.43	1124	4.05		(97)
Spac	e heatin	g require	ement f	or each	month,	kW	n/mon	th = 0.02	24 x [ T	(97)	m – (95	i)m] T	x (4	1)m			1	
(98)m=	420.75	307.23	237.61	122.9	2   47.69	)	0	0	0		0	119	9.83	280.8	439	.15		

								Tota	l per year	(kWh/yeai	<sup>.</sup> ) = Sum(9	8)15,912 =	1975.99	(98)
Space	e heatir	ng require	ement in	n kWh/m²	/year								36.3	(99)
9a. En	ergy re	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heati	ng:	the second s			m o o to m	a stan					ſ		
Fracti	ion of s		at from n		y/supple	mentary	system	(202) - 1	- (201) -				0	$\begin{bmatrix} (201) \\ (202) \end{bmatrix}$
Fracti	ion of to	vace nea	ng from		em(s)			$(202) = 1^{-2}$	- (201) - 02) × [1 -	(203)] -			1	
Efficie				ind evet				(204) - (2	02) ~ [1	(200)] –		l	00.8	(204)
Efficie		nain spa		omontor	v bootin	a cyctor	0/					l	90.8	
EIICIE					Max		1, 70	A	Can	Oct	Nev			
Space	Jan e heatir		ement (c	Apr Calculate	d above	Jun	Jui	Aug	Sep	Oct	INOV	Dec	kvvn/yea	ar
Opuo	420.75	307.23	237.61	122.92	47.69	0	0	0	0	119.83	280.8	439.15		
(211)m	י 1 = {[(98	3)m x (20	)4)]}x1	1 100 ÷ (20	)6)									(211)
· · ·	463.38	338.36	261.68	135.38	52.53	0	0	0	0	131.97	309.25	483.65		
		-	-	•				Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	-	2176.2	(211)
Space	e heatir	ng fuel (s	econdar	y), kWh/	month									
= {[(98	)m x (20	01)] } x 1	00 ÷ (20	)8)		0	0		0	0				
(215)m=	0	0	0	0	0	0	0	U Tota	U I (kWh/vea	0 ar) =Sum(2	215)	- 0	0	7(215)
Water	heatin	n									- 15,1012		0	
Output	from w	ater hea	ter (calc	ulated a	bove)						-			
	169.73	148.27	154.26	136.82	132.47	116.67	111.78	124.61	125.98	143.46	153.14	165.75		-
Efficier	ncy of w	ater hea	ater										81.5	(216)
(217)m=	87.92	87.55	86.9	85.65	83.77	81.5	81.5	81.5	81.5	85.48	87.29	88.05		(217)
Fuel to (219)m	or water n = (64)	heating, m x 100)	kWh/m ) ÷ (217)	onth )m										
(219)m=	193.06	169.36	177.52	159.74	158.13	143.16	137.15	152.89	154.58	167.82	175.45	188.25		
								Tota	I = Sum(2	19a) <sub>112</sub> =			1977.12	(219)
Annua	l totals	5 	ad maain	a vata m	4					k'	Wh/year	Г	kWh/year	7
Space	neating	j luei use	a, main	system	1								2176.2	
Water	heating	fuel use	ed										1977.12	
Electric	city for p	oumps, f	ans and	electric	keep-ho	t								
centra	al heatir	ng pump	:									30		(230c)
boiler	with a	fan-assis	sted flue									45		(230e)
Total e	electricit	y for the	above,	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electric	city for I	ighting										ĺ	249.89	(232)
Electric	city gen	erated b	y PVs									[	-647.71	(233)
1 <u>0a.</u> I	-uel cos	sts <u>- indi</u> v	vidual he	eating sv	stems:_							l		́ L
						_								
						Fu kW	<b>eı</b> /h/year			Fuel P (Table	12)		Fuel Cost £/year	

Space heating - main system 1	(211) x	3.48 × 0.01 =	75.73	(240)
Space heating - main system 2	(213) x	0 × 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19 × 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.48 × 0.01 =	68.8	(247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to (230g) Energy for lighting	) separately as applicable and ap (232)	pply fuel price according to $13.19$ x 0.01 =	Table 12a 32.96	(250)
Additional standing charges (Table 12)			120	(251)
	one of (233) to (235) x)	13.19 x 0.01 =	-85.43	(252)
Appendix Q items: repeat lines (253) and (25	54) as needed			_
Total energy cost(245)	i)(247) + (250)(254) =		221.95	(255)
11a. SAP rating - individual heating system	S			
Energy cost deflator (Table 12)			0.42	(256)
Energy cost factor (ECF) [(25	5) x (256)] ÷ [(4) + 45.0] =		0.94	(257)
SAP rating (Section 12)			86.92	(258)
12a. CO2 emissions – Individual heating sy	vstems including micro-CHP			
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/yea	ar
Space heating (main system 1)	(211) x	0.216 =	470.06	(261)
Space heating (main system 1) Space heating (secondary)	(211) x (215) x	0.216 =	470.06 0	(261) (263)
Space heating (main system 1) Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216 = 0.519 = 0.216 =	470.06 0 427.06	(261) (263) (264)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216     =       0.519     =       0.216     =	470.06 0 427.06 897.12	(261) (263) (264) (265)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x	0.216       =         0.519       =         0.216       =         0.519       =	470.06 0 427.06 897.12 38.93	(261) (263) (264) (265) (267)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep- Electricity for lighting	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	$\begin{array}{c} 0.216 \\ = \\ 0.519 \\ = \\ 0.216 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ \end{array}$	470.06 0 427.06 897.12 38.93 129.69	](261) ](263) ](264) ](265) ](267) ](268)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep- Electricity for lighting Energy saving/generation technologies Item 1	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	$\begin{array}{c} 0.216 \\ = \\ 0.519 \\ = \\ 0.216 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ \end{array}$	470.06 0 427.06 897.12 38.93 129.69 -336.16	](261) ](263) ](264) ](265) ](267) ](268) ](269)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep- Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	$\begin{array}{c} 0.216 \\ = \\ 0.519 \\ = \\ 0.216 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ m \text{ of } (265)(271) = \\ \end{array}$	470.06 0 427.06 897.12 38.93 129.69 -336.16 729.57	](261) ](263) ](264) ](265) ](267) ](268) ](269) ](269)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep- Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year <b>CO2 emissions per m<sup>2</sup></b>	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x (232) x (27)	$\begin{array}{c} 0.216 \\ = \\ 0.519 \\ = \\ 0.216 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 72) \div (4) = \end{array}$	470.06 0 427.06 897.12 38.93 129.69 -336.16 729.57 13.4	](261) ](263) ](264) ](265) ](267) ](268) ](269) ](272) ](273)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep- Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year <b>CO2 emissions per m<sup>2</sup></b> El rating (section 14)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x suitable (231) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (232) (2	$\begin{array}{c} 0.216 \\ = \\ 0.519 \\ = \\ 0.216 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 100000000000000000000000000000000$	470.06 0 427.06 897.12 38.93 129.69 -336.16 729.57 13.4 90	](261) ](263) ](264) ](265) ](267) ](268) ](269) ](272) ](273) ](274)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep- Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year <b>CO2 emissions per m<sup>2</sup></b> El rating (section 14) <b>13a. Primary Energy</b>	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x (232) x (27)	$\begin{array}{c} 0.216 \\ = \\ 0.519 \\ = \\ 0.216 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ m \text{ of } (265)(271) = \\ 72) \div (4) = \end{array}$	470.06 0 427.06 897.12 38.93 129.69 -336.16 729.57 13.4 90	](261) ](263) ](264) ](265) ](267) ](268) ](269) ](272) ](272) ](273) ](274)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep- Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year <b>CO2 emissions per m<sup>2</sup></b> El rating (section 14) <b>13a. Primary Energy</b>	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (232) x (232) x su (27) Energy kWh/year	$\begin{array}{c} 0.216 \\ = \\ 0.519 \\ = \\ 0.216 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\$	470.06 0 427.06 897.12 38.93 129.69 -336.16 729.57 13.4 90 <b>P. Energy</b> kWh/year	](261) ](263) ](264) ](265) ](267) ](268) ](269) ](272) ](273) ](274)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep- Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year <b>CO2 emissions per m<sup>2</sup></b> El rating (section 14) <b>13a. Primary Energy</b> Space heating (main system 1)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (232) x (232) x (232) x (27) Energy kWh/year (211) x	$\begin{array}{c} 0.216 \\ = \\ 0.519 \\ = \\ 0.216 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 72) \div (4) = \\ \end{array}$	470.06 0 427.06 897.12 38.93 129.69 -336.16 729.57 13.4 90 <b>P. Energy</b> kWh/year 2654.96	](261) ](263) ](264) ](265) ](267) ](268) ](269) ](272) ](273) ](274)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep- Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year <b>CO2 emissions per m<sup>2</sup></b> El rating (section 14) <b>13a. Primary Energy</b> Space heating (main system 1) Space heating (secondary)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (232) x (232)	$\begin{array}{c} 0.216 \\ = \\ 0.519 \\ = \\ 0.216 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 72) \div (4) = \\ \end{array}$	470.06 0 427.06 897.12 38.93 129.69 -336.16 729.57 13.4 90 <b>P. Energy</b> kWh/year 2654.96 0	](261) ](263) ](264) ](265) ](267) ](268) ](269) ](272) ](273) ](274) ](261) ](263)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep- Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year <b>CO2 emissions per m²</b> El rating (section 14) <b>13a. Primary Energy</b> Space heating (main system 1) Space heating (secondary) Energy for water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (232) x (232) x (232) x (232) x (217) Energy kWh/year (211) x (215) x (219) x	$\begin{array}{c} 0.216 \\ = \\ 0.519 \\ = \\ 0.216 \\ = \\ 0.216 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 0.519 \\ = \\ 72) \div (4) = \\ \end{array}$	470.06 0 427.06 897.12 38.93 129.69 -336.16 729.57 13.4 90 <b>P. Energy</b> kWh/year 2654.96 0 2412.09	](261) ](263) ](264) ](265) ](267) ](268) ](269) ](272) ](273) ](274) ](261) ](263) ](264)

Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	230.25	(267)
Electricity for lighting	(232)	X		0	=	767.15	(268)
Energy saving/generation technologies Item 1				3.07	=	-1988.48	(269)
'Total Primary Energy			sum of (265	5)(271) =		4075.96	(272)
Primary energy kWh/m²/year			(272) ÷ (4) :	=		74.88	(273)

Assessor Name: Anthony Wing-King Stroma Number: STRO002972 Software Varsion: Version: 1.0.3.15 Property Address: Flat Address : 1. Overall dwelling dimensions: Ground floor $\begin{array}{c} 4 \\ 94.62 \\ 11 \\ 2.7 \\ 2.7 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.7 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.8 \\ 2.$
Property Address: Flat 4Address :1. Overall dwelling dimensions:Area(m <sup>2</sup> )Av. Height(m)Volume(m <sup>3</sup> )Ground floor94.62(1a) ×2.7(2a) =Volume(m <sup>3</sup> )Ground floor94.62(1a) ×2.7(2a) =Volume(m <sup>3</sup> )On the floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)94.62(1a) ×2.7(2a) =Volume(m <sup>3</sup> )On the floor area TFA = (1a)+(1b)+(1c)+(1e)+(1e)+(1n)94.62(1a) ×2.7(2a) =Volume(m <sup>3</sup> )On the floor area TFA = (1a)+(1b)+(1c)+(1e)+(1e)+(1n)94.62(a)Dwelling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =255.47(5)2. Ventilation rate:main main mean mean mean mean mean mean mean mea
Address :1. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m²)Ground floor $94.62$ $(1a) \times$ $2.7$ $(2a) =$ $255.47$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ $94.62$ $(4)$ $2.7$ $(2a) =$ $255.47$ $(3a)$ Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d$
Accertal dwelling dimensions:       Area(m?)       Av. Height(m)       Volume(m?)         Ground floor $94.62$ (1a) × $2.7$ (2a) = $255.47$ (3a)         Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $94.62$ (1a) × $2.7$ (2a) = $255.47$ (3a)         Dwelling volume       (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = $255.47$ (5)         2. Ventilation rate:       main       secondary       other       total       m³ per hour         Number of chimneys $0$ $+$ $0$ $=$ $0$ $x40 =$ $0$ (6a)         Number of passive vents $0$ $+$ $0$ $=$ $0$ $x40 =$ $0$ (7c)         Number of flueless gas fires $0$ $x10 =$ $0$ $(7c)$ $Air$ changes per hour         Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c) = $40$ $+$ $0$ $0$ $(7c)$ Number of storeys in the dwelling (ns) $Additional infiltration       (g) a(g)
Area(m?)Av. Height(m)Volume(m³)Ground floor $94.62$ $(1a) \times 2.7$ $(2a) = 255.47$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ $94.62$ $(4)$ $(4)$ Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 255.47$ $(5)$ <b>2. Ventilation rate:</b> $(3a)+(3b)+(3c)+(3d)+(3e)+(3e)+(3e)+(3e)+(3e)+(3e)+(3e)+(3e$
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 94.62 (4) Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 255.47 (5) <b>2. Ventilation rate:</b> Number of chimneys 0 + 0 total m <sup>3</sup> per hour Number of open flues 0 + 0 + 0 = 0 x 40 = 0 (6a) Number of intermittent fans 4 x 10 = 40 (7a) Number of passive vents 0 x 10 = 0 (7b) Number of flueless gas fires 0 x 40 = 0 (7c) Number of flueless gas fires 0 x 40 = 0 (7c) Number of storeys in the dwelling (ns) Additional infiltration (9) to tis) intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration (9) to 25 for steel or timber frame or 0.35 for masonry construction if both types of well are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12) If no draught lobby, enter 0.05, else enter 0 (12) Mindow infiltration 0 (12) (14) Window infiltration 0 (14) Window infiltration 0 (14) Window infiltration 0 (14) Window infiltration 0 (15)
Dwelling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 255.47 (5)2. Ventilation rate:main heatingtotalm³ per hourNumber of chimneys0+0=0x 40 =0(6a)Number of open flues0+0=0x 20 =0(6b)Number of intermittent fans4x 10 =40(7a)Number of passive vents0x 10 =0(7c)Number of flueless gas fires0x 40 =0(7c)Number of flueless gas fires0x 40 =0(7c)Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c) =40+ (5) =0.16Number of storeys in the dwelling (ns)(9)(10)(9)(10)Additional infiltration(9)(11)0(11)If both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of opening); if equal user 0.35(9)(12)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If on draught lobby, enter 0.05, else enter 00(12)Percentage of windows and doors draught stripped0(14)0Window infiltration0.25 - [0.2 x (14) + 100] =0(15)
2. Ventilation rate:       main heating heating       secondary heating       other       total       m³ per hour         Number of chimneys       0       +       0       =       0       × 40 =       0       (6a)         Number of open flues       0       +       0       =       0       × 40 =       0       (6b)         Number of intermittent fans       4       × 10 =       40       (7a)         Number of passive vents       0       × 10 =       0       (7b)         Number of flueless gas fires       0       × 40 =       0       (7c)         Number of storeys in the dwelling (ns)       × 40 =       0       (7c)         Additional infiltration       0       × 40 =       0       (7c)         Number of storeys in the dwelling (ns)       (6a)       × 10 =       0       (7c)         Number of storeys in the dwelling (ns)       (6a)       (10)       (9)       (10)         Structural infiltration       0.25 for steel or timber frame or 0.35 for masonry construction       (9)       (11)       0       (11)         if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35       0       (12)       0       (12)       <
main heating heatingsecondary heatingothertotalm³ per hourNumber of chimneys $0$ $+$ $0$ $=$ $0$ $x40 =$ $0$ (6a)Number of open flues $0$ $+$ $0$ $=$ $0$ $x20 =$ $0$ (6b)Number of intermittent fans $4$ $x10 =$ $40$ (7a)Number of passive vents $0$ $x10 =$ $0$ (7c)Number of flueless gas fires $0$ $x40 =$ $0$ (7c)Number of flueless gas fires $0$ $x40 =$ $0$ (7c)Infiltration due to chimneys, flues and fans = $(6a)+(7a)+(7c) =$ $40$ $+$ $(5) =$ $0.16$ (8)Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ $40$ $+$ $(5) =$ $0.16$ (9)Additional infiltration $(6a)+(7a)+(7c)+(7c) =$ $40$ $+$ $(5) =$ $0.16$ (8)Number of storeys in the dwelling (ns) $0$ $(17)$ , otherwise continue from (9) to (16) $0$ (11)If both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 $0$ $(14)$ If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 $0$ $(12)$ If no draught lobby, enter 0.05, else enter 0 $0$ $0$ $(14)$ Percentage of windows and doors draught stripped $0$ $0$ $(14)$ Window infiltration $0.25 - [0.2 \times (14) + 100] =$ $0$ $(15)$
Number of chimneys $0$ $+$ $0$ $+$ $0$ $=$ $0$ $\times 40$ $=$ $0$ $(6a)$ Number of open flues $0$ $+$ $0$ $+$ $0$ $=$ $0$ $\times 20$ $0$ $(6b)$ Number of intermittent fans $4$ $\times 10$ $4$ $\times 10$ $4$ $(7a)$ Number of passive vents $0$ $\times 10$ $0$ $(7c)$ Number of flueless gas fires $0$ $\times 40$ $0$ $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ $40$ $\div$ $(5)$ $0.16$ If a pressurisation test has been carried out or is intended, proceed to $(17)$ , otherwise continue from $(9)$ to $(16)$ $0$ $(9)$ Number of storeys in the dwelling (ns) $0$ $(9)$ $(14)$ Additional infiltration $(9)$ $(9)$ $(11)$ $(9)$ Structural infiltration: $0.25$ for steel or timber frame or 0.35 for masonry construction $0$ $(12)$ If both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 $0$ $(14)$ If no draught lobby, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 $0$ $(12)$ If no draught lobby, enter 0.05, else enter 0 $0$ $(14)$ Percentage of windows and doors draught stripped $0$ $(14)$ Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ $0$ $(15)$
Number of open flues $0$ $+$ $0$ $=$ $0$ $x 20 =$ $0$ $(6b)$ Number of intermittent fans $4$ $x 10 =$ $40$ $(7a)$ Number of passive vents $0$ $x 10 =$ $0$ $(7b)$ Number of flueless gas fires $0$ $x 40 =$ $0$ $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ $40$ $+$ (5) = $0.16$ $(8)$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) $0$ $(9)$ $(9)$ Additional infiltration $(9)$ $(10)$ $(9)$ $(11)$ $0$ $(11)$ if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 $(9)$ $(12)$ If no draught lobby, enter 0.05, else enter 0 $0$ $(13)$ $0$ $(14)$ Percentage of windows and doors draught stripped $0$ $(14)$ $0$ $(14)$ Window infiltration $0.25 - [0.2 \times (14) + 100] =$ $0$ $(15)$
Number of intermittent fans4 $x 10 =$ 40(7a)Number of passive vents0 $x 10 =$ 0(7b)Number of flueless gas fires0 $x 40 =$ 0(7c)Number of flueless gas fires0 $x 40 =$ 0(7c)Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 40 $\div (5) =$ 0.16(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)(9)(9)Number of storeys in the dwelling (ns)0(9)(10)Additional infiltration[(9)-1]x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(12)If no draught lobby, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) $\div 100$ ] =0(15)
Number of passive vents $0$ $x 10 =$ $0$ $(7b)$ Number of flueless gas fires $0$ $x 40 =$ $0$ $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $40$ $\div$ $(5) =$ $0.16$ In filtration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $40$ $\div$ $(5) =$ $0.16$ Number of storeys in the dwelling (ns)Additional infiltration(9)Additional infiltrationStructural infiltration:0(9)Structural infiltration:(9)(10)Structural infiltration: $0.25$ for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00000(12)Min down infiltration000(12)If no draught lobby, enter 0.05, else enter 00(13)Percen
Number of flueless gas fires $0$ $x \ 40 =$ $0$ $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ $40$ $\div (5) =$ $0.16$ $(8)$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) $\div (5) =$ $0.16$ $(8)$ Number of storeys in the dwelling (ns) $0$ $(9)$ $(9)$ $(9)$ $(10)$ Additional infiltration $(9)-1]x0.1 =$ $0$ $(10)$ Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 $0$ $(12)$ If no draught lobby, enter 0.05, else enter 0 $0$ $(13)$ Percentage of windows and doors draught stripped $0$ $(14)$ Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ $0$
Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 40 $\div$ (5) =0.16(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) $\div$ (5) =0.16(8)Number of storeys in the dwelling (ns)0(9)(10)Additional infiltration[(9)-1]x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0(11) <i>ib th types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i> 0(12)If no draught lobby, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(14)Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0(15)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 40 $\div$ (5) =0.16(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$
If a pressurisation dee to channeys, notes and rans = (d)
Number of storeys in the dwelling (ns) $0$ $(9)$ Additional infiltration $[(9)-1]\times 0.1 =$ $0$ Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 $0$ If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 $0$ $(12)$ If no draught lobby, enter 0.05, else enter 0 $0$ $(13)$ Percentage of windows and doors draught stripped $0$ $(14)$ Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ $0$
Additional infiltration       [(9)-1]x0.1 =       0       (10)         Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction       0       (11)         if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35       0       (12)         If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0       0       (12)         If no draught lobby, enter 0.05, else enter 0       0       (13)         Percentage of windows and doors draught stripped       0       (14)         Window infiltration       0.25 - [0.2 x (14) ÷ 100] =       0       (15)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction       0       (11)         if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35       0       (12)         If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), 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)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35         If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0       0       (12)         If no draught lobby, enter 0.05, else enter 0       0       (13)         Percentage of windows and doors draught stripped       0       (14)         Window infiltration       0.25 - [0.2 x (14) ÷ 100] =       0       (15)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0       0       (12)         If no draught lobby, enter 0.05, else enter 0       0       (13)         Percentage of windows and doors draught stripped       0       (14)         Window infiltration       0.25 - [0.2 x (14) ÷ 100] =       0       (15)
If no draught lobby, enter 0.05, else enter 0 $0$ (13)Percentage of windows and doors draught stripped $0$ (14)Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ $0$ (15)
Percentage of windows and doors draught stripped0Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0(15)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0       (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.36 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used
Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.85$ (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$
Infiltration rate modified for monthly wind speed
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7
Wind Factor (22a)m = (22)m ÷ 4
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

/ ///	ed infiltra	tion rate	(allowir	ng for sh	elter an	d wind s	peed) =	: (21a) x	(22a)m			-		
	0.39	0.38	0.37	0.33	0.33	0.29	0.29	0.28	0.3	0.33	0.34	0.36		
Calcula	ate effect	tive air ch	nange r	ate for t	he appli	cable cas	se					Г		(22.5)
lf exha	aust air hea	at numn usi	na Appe	ndix N (2	3b) = (23a	) x Fmv (e	quation (	N5)) other	wise (23h	) = (23a)		l r	0	(238)
lf hala	unced with I	heat recove	rv: effici	ency in %	allowing f	or in-use fa	actor (fror	n Table 4h	) –	) = (200)		l	0	(230)
a) If I					with ho				(2)	2b)m i ('	22h) v [/	 1 (22a)	0 · 1001	(230)
(24a)m-					with hea				(2)	$\frac{2}{10}$	230) X [	$\frac{1}{230}$	÷ 100]	(24a)
(240)II-				ntilation	without	boot roo			m = (2)		) 22h)	Ů		(=)
(24b)m_					without				$\int 0$		230)			(24b)
(240)///				tilation			vontilati	on from o	utoido	Ŭ	U	Ů		(= .~)
c) ii	f (22b)m	$< 0.5 \times (2)$	23b), th	nen (240	(23b) = (23b)	): otherw	vise (24	c) = (22b)	m + 0	.5 x (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If i	natural v	entilation	or who	ole hous	e positiv	Le input v	ventilati	on from l	oft			II		
il	f (22b)m	= 1, then	n (24d)r	n = (22k	o)m othe	erwise (24	4d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0.57	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 c	hange ra	ate - en	ter (24a	) or (24b	o) or (24c	c) or (24	ld) in box	(25)					
(25)m=	0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
3 Hea	at losses	and heat	t lass n	aramete	٥r.									
FI FM		Gross	(1000 p	Openin	as	Net Are	a	U-valı	le	AXU		k-value	•	AXk
		area (n	n²)	m	2	A ,n	יי 1 <sup>2</sup>	W/m2	K	(W/ł	<)	kJ/m²-k	K	kJ/K
Doors						2.3	x	1.3	=	2.99				(26)
Windov	ws Type	1				1.41	x1	/[1/( 1.1 )+	0.04] =	1.49				(27)
\ \ <i>\</i> \														
vvindov	ws Type	2				1.79	x1	/[1/( 1.1 )+	0.04] =	1.89				(27)
Windov	ws Type : ws Type :	2 3				1.79 1.41	x1	/[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] =	1.89 1.49				(27) (27)
Windov Windov Windov	ws Type : ws Type : ws Type :	2 3 4				1.79 1.41 3.52	x1 x1 x1	/[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] = 0.04] =	1.89 1.49 3.71				(27) (27) (27)
Windov Windov Windov Windov	ws Type : ws Type : ws Type : ws Type :	2 3 4 5				1.79 1.41 3.52 1.79	x1 x1 x1 x1 x1	/[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] = 0.04] = 0.04] =	1.89 1.49 3.71 1.89				(27) (27) (27) (27)
Windov Windov Windov Windov Windov	ws Type : ws Type : ws Type : ws Type : ws Type :	2 3 4 5 6				1.79 1.41 3.52 1.79 1.79	x1 x1 x1 x1 x1 x1 x1 x1	/[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] = 0.04] = 0.04] =	1.89 1.49 3.71 1.89 1.89				(27) (27) (27) (27) (27)
Windov Windov Windov Windov Windov	ws Type : ws Type : ws Type : ws Type : ws Type : ws Type :	2 3 4 5 6 7				1.79 1.41 3.52 1.79 1.79 2.19	x1 x1 x1 x1 x1 x1 x1 x1 x1	/[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	1.89 1.49 3.71 1.89 1.89 2.31				(27) (27) (27) (27) (27) (27)
Windov Windov Windov Windov Windov Windov	ws Type ws Type ws Type ws Type ws Type ws Type ws Type	2 3 4 5 6 7 8				1.79           1.41           3.52           1.79           1.79           2.19           0.97	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	/[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	1.89 1.49 3.71 1.89 1.89 2.31				(27) (27) (27) (27) (27) (27) (27)
Windov Windov Windov Windov Windov Windov	ws Type ws Type ws Type ws Type ws Type ws Type ws Type	2 3 4 5 6 7 8 9				1.79           1.41           3.52           1.79           1.79           2.19           0.97		/[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	1.89 1.49 3.71 1.89 1.89 2.31 1.02				<ul> <li>(27)</li> </ul>
Window Window Window Window Window Window Eloor	ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type	2 3 4 5 6 7 8 9				1.79           1.41           3.52           1.79           1.79           2.19           0.97           0.97	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	/[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	1.89 1.49 3.71 1.89 2.31 1.02 1.02				(27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Floor	ws Type : ws Type : ws Type : ws Type : ws Type : ws Type : ws Type :	2 3 4 5 6 7 8 9		- 402		1.79           1.41           3.52           1.79           1.79           2.19           0.97           0.566	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	/[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	1.89 1.49 3.71 1.89 1.89 2.31 1.02 1.02 0.05094				(27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Floor Walls T	ws Type ws Type ws Type ws Type ws Type ws Type ws Type	2 3 4 5 6 7 8 9 19.98		4.93		1.79           1.41           3.52           1.79           1.79           2.19           0.97           0.566           15.05		/[1/( 1.1 )+ /[1/( 1.1 )+ 0.09 0.13	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	1.89 1.49 3.71 1.89 1.89 2.31 1.02 1.02 0.05094 1.96				(27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Floor Walls T Walls T	ws Type ws Type ws Type ws Type ws Type ws Type ws Type fype1 fype2	2 3 4 5 6 7 8 9 19.98 42.88		4.93		1.79           1.41           3.52           1.79           2.19           0.97           0.97           0.566           15.05           38.71		/[1/( 1.1 )+ /[1/( 1.1 )+ 0.09 0.13 0.13	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = =	1.89 1.49 3.71 1.89 2.31 1.02 1.02 0.05094 1.96 5.03				(27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Floor Walls T Walls T	ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type fype1 fype2 fype3	2 3 4 5 6 7 8 9 19.98 42.88 23.35		4.93 4.17 5.77		1.79           1.41           3.52           1.79           1.79           2.19           0.97           0.566           15.05           38.71           17.58		/[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	1.89 1.49 3.71 1.89 2.31 1.02 1.02 0.05094 1.96 5.03 2.29				(27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Floor Walls T Walls T Walls T	ws Type ws Type ws Type ws Type ws Type ws Type ws Type fype1 fype2 fype3 fype4	2 3 4 5 6 7 8 9 19.98 42.88 23.35 42.66		4.93 4.17 5.77 2.3		1.79           1.41           3.52           1.79           1.79           2.19           0.97           0.566           15.05           38.71           17.58           40.36		/[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] =	1.89 1.49 3.71 1.89 2.31 1.02 1.02 0.05094 1.96 5.03 2.29 4.74				(27) (27) (27) (27) (27) (27) (27) (27)
Windov Windov Windov Windov Windov Windov Floor Walls T Walls T Walls T Walls T	ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type fype1 fype2 fype3 fype4 fype5	2 3 4 5 6 7 8 9 19.98 42.88 23.35 42.66 0.99		4.93 4.17 5.77 2.3 0.97		1.79           1.41           3.52           1.79           2.19           0.97           0.97           0.566           15.05           38.71           17.58           40.36		/[1/( 1.1 )+ /[1/( 1.1 )+	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] = = 0.04] = 0.04] = 0	1.89           1.49           3.71           1.89           1.89           2.31           1.02           1.02           1.02           2.31           1.02           1.02           1.96           5.03           2.29           4.74           0				(27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Floor Walls T Walls T Walls T Walls T Walls T Roof T	ws Type ws Type ws Type ws Type ws Type ws Type ws Type ys Type ype1 ype2 ype3 ype4 ype5 ype1	2 3 4 5 6 7 8 9 19.98 42.88 23.35 42.66 0.99 6.5		4.93 4.17 5.77 2.3 0.97 0		1.79           1.41           3.52           1.79           1.79           2.19           0.97           0.97           0.566           15.05           38.71           17.58           40.36           0.02           6.5		/[1/( 1.1 )+ /[1/( 1.1 )+	0.04] = 0.04] =	1.89 1.49 3.71 1.89 2.31 1.02 1.02 0.05094 1.96 5.03 2.29 4.74 0 0.65				(27) (27) (27) (27) (27) (27) (27) (27)
Windov Windov Windov Windov Windov Windov Windov Floor Walls T Walls T Walls T Walls T Roof T Roof T	ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ype1 ype2 ype3 ype4 ype5 ype1 ype2	2 3 4 5 6 7 8 9 19.98 42.88 23.35 42.66 0.99 6.5 0.57		4.93 4.17 5.77 2.3 0.97 0 0		1.79           1.41           3.52           1.79           1.79           2.19           0.97           0.97           0.566           15.05           38.71           17.58           40.36           0.02           6.5           0.57		$ \begin{array}{c} \left( 1 / (1,1) + \\ 0.09 \right) \\ \hline 0.13 \\ \hline 0.13 \\ \hline 0.13 \\ \hline 0.13 \\ \hline 0.11 \\ \hline 0.1 \\ \hline 0.1 \\ \hline \end{array} \right) $	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = 0.04] = = = = = = = =	1.89           1.49           3.71           1.89           1.89           2.31           1.02           1.02           0.05094           1.96           5.03           2.29           4.74           0           0.65           0.06				(27) (27) (27) (27) (27) (27) (27) (27)

* for win ** inclua	dows and le the area	l roof winde as on both	ows, use e sides of ir	effective wi nternal wal	indow U-va Is and part	alue calcui titions	lated using	formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =			Г	34.46	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (3	2) + (32a).	(32e) =	21332.65	(34)
Therm	al mass	parame	ter (TMF		÷ TFA) ir	ו kJ/m²K	,		Indica	tive Value	: Medium	ľ	250	(35)
For desi can be ι	ign asses used inste	· sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are no	t known pr	ecisely the	indicative	values of	f TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	K					ſ	10.62	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =		[	45.08	(37)
Ventila	tion hea	at loss ca	alculated	monthl	у	-		-	(38)m	= 0.33 × (	(25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	48.45	48.2	47.96	46.84	46.63	45.65	45.65	45.47	46.03	46.63	47.05	47.5		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	93.53	93.28	93.04	91.92	91.71	90.73	90.73	90.55	91.1	91.71	92.13	92.58		
Heat lo	oss para	ameter (H	HLP), W/	/m²K			•		(40)m	Average = = (39)m ÷	Sum(39)₁. - (4)	12 /12=	91.92	(39)
(40)m=	0.99	0.99	0.98	0.97	0.97	0.96	0.96	0.96	0.96	0.97	0.97	0.98		
Numb	ar of do		oth (Toh			-	-			Average =	Sum(40)1	12 /12=	0.97	(40)
NUMDE	er of day		ntn (Tab Mor		May	lun	1.1	Aug	Son	Oct	Nov	Dec		
(41)m -	21	20	21	20	1VIA y	20	21	7.uy	30 30	21	30	21		(41)
(+1)11-	01	20	51					51	50	51		51		()
4. Wa	ater hea	ting enei	rgy requ	irement:								kWh/ye	ar:	
Assum if TF	ied occu A > 13.	upancy, l 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	)013 x (	TFA -13	2. .9)	68		(42)
יו וו Annua	l averac	9, 11 = 1 the hot wa	ater usad	ne in litre	es per da	av Vd.av	erade =	(25 x N)	+ 36		97	94		(43)
Reduce	the annu	al average	hot water	usage by	5% if the a	welling is	designed	to achieve	a water us	se target o	of Of	.04		(10)
not more	e that 125	litres per p	person pei	r day (all w	ater use, l	hot and co	ld)			-	-			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	_	-	-			
(44)m=	107.74	103.82	99.9	95.98	92.06	88.15	88.15	92.06	95.98	99.9	103.82	107.74		
_										Total = Su	ım(44) <sub>112</sub> =	=	1175.29	(44)
Energy	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x D	0Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	159.77	139.73	144.19	125.71	120.62	104.09	96.45	110.68	112	130.53	142.48	154.73		_
lf instan	taneous v	vater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46	) to (61)	Total = Su	112 <b>=</b>	• [	1540.99	(45)
(46)m =	23.97	20.96	21.63	18.86	18.09	15.61	14 47	16.6	16.8	19.58	21.37	23.21		(46)
Water	storage	loss:	21.00	10.00	10.00	10.01		10.0	10.0	10.00	21.07	20.21		( - )
Storag	e volum	ne (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
lf comi	munity h	neating a	ind no ta	nk in dw	velling, e	nter 110	) litres in	(47)						
Otherv	vise if n	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water	storage	loss:												
a) If m	nanufac	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Τ	aratura f	actor fro	m Table	2b								0		(49)

b) If m	y lost fro	m water	storage	e, kWh/ye cylinder	ear loss fact	or is not	known.	(48) x (49)	) =			0		(50)
Hot wa	ater stor munity h	age loss leating s	factor fr	rom Tab on 4.3	le 2 (kW	h/litre/da	ay)					0		(51)
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	y lost fro	m water	storage	e, kWh/y	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter	(50) or	(54) in (5	55)									0		(55)
Water	storage	loss cal	culated t	for each	month			((56)m = (	55) × (41)	m •				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	olar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41	)m						
(61)m=	50.96	46.03	50.91	47.33	46.92	43.47	44.92	46.92	47.33	50.91	49.32	50.96		(61)
Total h	neat reg	L Lired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 x	(45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m=	210.73	185.76	195.1	173.04	167.54	147.56	141.37	157.6	159.34	181.44	191.8	205.69		(62)
Solar DI	L HW input (	calculated	L usina App	l endix G o	r Appendix	H (negati	I ve quantitv	l/) (enter '0	l ' if no sola	r contribut	l ion to wate	I 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	ı ter	ļ	1							I		
(64)m=	210.73	185.76	195.1	173.04	167.54	147.56	141.37	157.6	159.34	181.44	191.8	205.69		
Heat o								Out	ut from w	ater heater	r (annual)₁	12	2116.95	(64)
	iains tro	m water	heating	kWh/m	onth 0 2!	5 ′ [0 85	x (45)m	Outr + (61)m	but from w 1 + 0.8	ater heater	r (annual)₁ + (57)m		2116.95 1	(64)
(65)m=	65.86	m water	heating, 60.67	, kWh/m	onth 0.2	5 ´ [0.85 45.48	× (45)m	Outr + (61)m 48.53	1 out from w 1] + 0.8 2 49.07	ater heater ( [(46)m	r (annual)₁ + (57)m 59.7	+ (59)m	2116.95 ]	(64)
(65)m=	65.86	m water 57.97	heating, 60.67	, kWh/m 53.63	onth 0.2	5 ´ [0.85 45.48	× (45)m 43.3	Outr + (61)m 48.53	1 + 0.8 1 + 0.8 49.07	ater heater ((46)m 56.13	r (annual)₁ + (57)m 59.7	+ (59)m 64.19	2116.95 ]	(64) (65)
(65)m= inclu	65.86 de (57)	m water 57.97 m in calo	heating, 60.67 culation	, kWh/m 53.63 of (65)m	onth 0.29 51.84 only if c	5 ´ [0.85 45.48 ylinder is	× (45)m 43.3 s in the c	Outp + (61)m 48.53 dwelling	but from w n] + 0.8 3 49.07 or hot w	ater heater k [(46)m 56.13 rater is fr	r (annual)₁ + (57)m 59.7 rom com	+ (59)m 64.19 munity h	2116.95 ] leating	)(64) (65)
(65)m= inclu 5. Int	ains fro 65.86 ude (57) ternal ga	m water 57.97 m in calo ains (see	heating, 60.67 culation Table 5	, kWh/m 53.63 of (65)m 5 and 5a	onth 0.28 51.84 only if c	5 ´ [0.85 45.48 ylinder is	× (45)m 43.3 s in the d	Outr + (61)m 48.53 dwelling	out from w n] + 0.8 x 49.07 or hot w	ater heater ((46)m 56.13 rater is fr	r (annual)₁ + (57)m 59.7 om com	+ (59)m 64.19 munity h	2116.95 ] leating	)(64) (65)
(65)m= inclu 5. Int Metab	ains fro 65.86 ude (57) ternal ga olic gair	m water 57.97 m in calo ains (see s (Table	heating, 60.67 culation Table 5 5), Wat	, kWh/m 53.63 of (65)m 5 and 5a	onth 0.25 51.84 only if c	5 ´ [0.85 45.48 ylinder is	× (45)m 43.3 s in the c	Outp + (61)m 48.53 dwelling	out from w n] + 0.8 x 49.07 or hot w	ater heater ((46)m 56.13 rater is fr	r (annual), + (57)m 59.7 om com	+ (59)m 64.19 munity h	2116.95 ] neating	)(64) (65)
(65)m= inclu 5. Int Metab	iains fro 65.86 ide (57) ternal ga olic gair Jan	m water 57.97 m in calo ains (see s (Table Feb	heating, 60.67 culation Table 5 5), Wat Mar	, kWh/m 53.63 of (65)m 5 and 5a tts Apr	onth 0.2 51.84 only if c ): May	5 ´ [0.85 45.48 ylinder is Jun	× (45)m 43.3 s in the o Jul	Out; + (61)m 48.53 dwelling Aug	but from w 1] + 0.8 x 49.07 or hot w Sep	ater heater x [(46)m 56.13 rater is fr Oct	r (annual) <sub>1</sub> + (57)m 59.7 om com Nov	+ (59)m 64.19 munity h	2116.95 ] leating	(65)
(65)m= inclu 5. Int Metab	iains fro 65.86 ude (57) ternal ga olic gair Jan 161.03	m water 57.97 m in calo ains (see s (Table Feb 161.03	heating, 60.67 culation ( Table 5 5), Wat Mar 161.03	, kWh/m 53.63 of (65)m 5 and 5a tts Apr 161.03	onth 0.25 51.84 only if c ): May 161.03	5 ´ [0.85 45.48 ylinder is Jun 161.03	× (45)m 43.3 s in the o Jul 161.03	Out; + (61)m 48.53 dwelling Aug 161.03	out from w 1] + 0.8 x 49.07 or hot w Sep 161.03	ater heater ( [(46)m 56.13 vater is fr Oct 161.03	r (annual), + (57)m 59.7 om com Nov 161.03	+ (59)m 64.19 munity h Dec 161.03	2116.95 ] heating	)(64) (65) (66)
(65)m= inclu 5. Inf Metab (66)m= Lightin	iains fro 65.86 ude (57) ternal ga olic gair Jan 161.03 ug gains	m water 57.97 m in calo ains (see s (Table Feb 161.03 (calcula	heating, 60.67 culation ( Table 5 5), Wat 65), Wat 161.03 ted in Ap	, kWh/m 53.63 of (65)m 5 and 5a tts Apr 161.03 opendix	onth 0.25 51.84 only if c ): May 161.03 L, equat	5 ´ [0.85 45.48 ylinder is Jun 161.03 on L9 o	× (45)m 43.3 s in the o Jul 161.03 r L9a), a	Out; + (61)m 48.53 dwelling Aug 161.03 lso see	Sep 161.03 161.03	ater heater ((46)m 56.13 rater is fr Oct 161.03	r (annual), + (57)m 59.7 om com Nov 161.03	+ (59)m 64.19 munity h Dec 161.03	2116.95 ] leating	(64) (65) (66)
(65)m= inclu 5. Int Metab (66)m= Lightin (67)m=	idins fro 65.86 ude (57) ternal ga olic gain Jan 161.03 ug gains 57.01	m water 57.97 m in calo ains (see s (Table Feb 161.03 (calcula 50.64	heating, 60.67 culation ( Table 5 5), Wat 65), Wat 161.03 ted in Ap 41.18	, kWh/m 53.63 of (65)m 5 and 5a tts Apr 161.03 opendix 31.18	onth 0.25 51.84 only if c ): May 161.03 L, equati 23.31	5 ´ [0.85 45.48 ylinder is Jun 161.03 on L9 of 19.68	× (45)m 43.3 s in the o Jul 161.03 r L9a), a 21.26	Out; + (61)m 48.53 dwelling dwelling 161.03 Iso see 27.63	but from w         but from w         49.07         or hot w         Sep         161.03         Table 5         37.09	Atter heater           x [(46)m           56.13           vater is fr           Oct           161.03           47.1	r (annual), + (57)m 59.7 om com 0m com 161.03 54.97	+ (59)m 64.19 munity h Dec 161.03 58.6	2116.95 ] leating	(64) (65) (66) (67)
(65)m= inclu 5. Int Metab (66)m= Lightin (67)m= Applia	iains fro 65.86 ude (57) ternal ga olic gair Jan 161.03 ug gains 57.01 nces ga	m water 57.97 m in calo s (Table Feb 161.03 (calcula 50.64 ins (calc	heating, 60.67 culation ( Table 5 5), Wat 65), Wat 161.03 ted in Ap 41.18 ulated ir	, kWh/m 53.63 of (65)m 5 and 5a tts Apr 161.03 opendix 31.18	onth 0.25 51.84 only if c ): May 161.03 L, equati 23.31 dix L, eq	5 ´ [0.85 45.48 ylinder is Jun 161.03 ion L9 o 19.68 uation L	× (45)m 43.3 s in the o Jul 161.03 r L9a), a 21.26 13 or L1	Out; + (61)m 48.53 dwelling dwelling 161.03 lso see 27.63 3a), also	but from w         a) + 0.8 x         49.07         or hot w         Sep         161.03         Table 5         37.09         o see Ta	ater heater ((46)m 56.13 rater is fr Oct 161.03 47.1 ble 5	r (annual), + (57)m 59.7 om com 0m com 161.03 54.97	+ (59)m 64.19 munity h Dec 161.03 58.6	2116.95 ] neating	(64) (65) (66) (67)
(65)m= inclu 5. Int Metab (66)m= Lightin (67)m= Applia (68)m=	ains fro 65.86 ude (57) ternal ga olic gair Jan 161.03 ug gains 57.01 nces ga 369.14	m water 57.97 m in calo ains (see s (Table Feb 161.03 (calcula 50.64 ins (calc 372.97	heating, 60.67 culation ( Table 5 5), Wat 161.03 ted in Ap 41.18 ulated ir 363.32	, kWh/m 53.63 of (65)m 5 and 5a tts Apr 161.03 opendix 31.18 n Append 342.77	onth 0.25 51.84 only if c ): May 161.03 L, equati 23.31 dix L, eq 316.83	5 ´ [0.85 45.48 ylinder is Jun 161.03 on L9 of 19.68 uation L 292.45	× (45)m 43.3 s in the o Jul 161.03 r L9a), a 21.26 13 or L1 276.16	Out; + (61)m 48.53 dwelling 4welling 161.03 lso see 27.63 3a), also 272.33	but from w         a] + 0.8 x         49.07         or hot w         Sep         161.03         Table 5         37.09         o see Ta         281.98	Atter heater           x [(46)m           56.13           rater is fr           Oct           161.03           47.1           ble 5           302.53	r (annual), + (57)m 59.7 om com 0m com 161.03 54.97 328.47	+ (59)m 64.19 munity h Dec 161.03 58.6	2116.95 ] leating	)(64) (65) (66) (67) (68)
(65)m= inclu 5. Inf Metab (66)m= Lightin (67)m= Applia (68)m= Cookir	idins fro 65.86 ude (57) ternal ga olic gair Jan 161.03 ig gains 57.01 nces ga 369.14 ing gains	m water 57.97 m in calo ains (see s (Table Feb 161.03 (calcula 50.64 ins (calc 372.97 (calcula	heating, 60.67 culation ( <b>Table 5</b> 5), Wat 65), Wat 161.03 ted in Ap 41.18 ulated ir 363.32 tted in A	, kWh/m 53.63 of (65)m 5 and 5a tts Apr 161.03 opendix 31.18 Append 342.77 ppendix	onth 0.25 51.84 only if c ): May 161.03 L, equati 23.31 dix L, eq 316.83 L, equat	5 ´ [0.85 45.48 ylinder is Jun 161.03 on L9 o 19.68 uation L 292.45 ion L15	× (45)m 43.3 s in the o Jul 161.03 r L9a), a 21.26 13 or L1 276.16 or L15a)	Out; + (61)m 48.53 dwelling dwelling 161.03 lso see 27.63 3a), also 272.33 ), also se	but from w         but from w         49.07         or hot w         Sep         161.03         Table 5         37.09         see Ta         281.98         see Table	ater heater         c [(46)m         56.13         vater is fr         Oct         161.03         47.1         ble 5         302.53         5	r (annual), + (57)m 59.7 om com 0m com 161.03 54.97 328.47	+ (59)m 64.19 munity h Dec 161.03 58.6 352.86	2116.95 ] neating	(64) (65) (66) (67) (68)
(65)m= inclu 5. Inf Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	ains fro 65.86 ude (57) ternal ga olic gair Jan 161.03 og gains 57.01 nces ga 369.14 ng gains 53.79	m water 57.97 m in calo s (Table Feb 161.03 (calcula 50.64 ins (calc 372.97 (calcula 53.79	heating, 60.67 culation ( <b>Table 5</b> 5), Wat 161.03 ted in Ap 41.18 ulated ir 363.32 ted in A 53.79	, kWh/m 53.63 of (65)m 5 and 5a tts Apr 161.03 opendix 31.18 n Append 342.77 ppendix 53.79	onth 0.25 51.84 only if c ): May 161.03 L, equati 23.31 dix L, eq 316.83 L, equat 53.79	5 ´ [0.85 45.48 ylinder is Jun 161.03 on L9 o 19.68 uation L 292.45 ion L15 53.79	× (45)m 43.3 s in the o Jul 161.03 r L9a), a 21.26 13 or L1 276.16 or L15a 53.79	Out; + (61)m 48.53 dwelling dwelling 161.03 Iso see 27.63 3a), also 272.33 ), also se 53.79	but from w         but from w         49.07         or hot w         Sep         161.03         Table 5         37.09         o see Ta         281.98         se Table         53.79	ater heater         x [(46)m         56.13         rater is fr         Oct         161.03         47.1         ble 5         302.53         5         53.79	r (annual), + (57)m 59.7 om com 0m com 161.03 54.97 328.47 53.79	+ (59)m 64.19 munity h Dec 161.03 58.6 352.86 53.79	2116.95 ] leating	(64) (65) (66) (67) (68) (69)
(65)m= inclu 5. Int Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps	ains fro 65.86 ude (57) ternal ga olic gair Jan 161.03 ug gains 57.01 nces ga 369.14 ng gains 53.79 s and fa	m water 57.97 m in calo ains (see s (Table Feb 161.03 (calcula 50.64 ins (calc 372.97 (calcula 53.79 ns gains	heating, 60.67 culation ( 5), Wat 65), Wat 161.03 ted in Ap 41.18 culated in 363.32 ted in A 53.79 (Table \$	, kWh/m 53.63 of (65)m 5 and 5a tts Apr 161.03 opendix 31.18 Appendix 342.77 ppendix 53.79 5a)	onth 0.25 51.84 only if c ): May 161.03 L, equati 23.31 dix L, eq 316.83 L, equat 53.79	5 ´ [0.85 45.48 ylinder is Jun 161.03 on L9 of 19.68 uation L 292.45 ion L15 53.79	× (45)m 43.3 s in the o Jul 161.03 r L9a), a 21.26 13 or L1 276.16 or L15a 53.79	Out; + (61)m 48.53 dwelling dwelling 161.03 lso see 27.63 3a), also 272.33 ), also se 53.79	but from w         a)         49.07         or hot w         Sep         161.03         Table 5         37.09         o see Ta         281.98         se Table         53.79	ater heater         ( [(46)m         56.13         vater is fr         vater is fr         0ct         161.03         47.1         ble 5         302.53         5         53.79	r (annual), + (57)m 59.7 om com Nov 161.03 54.97 328.47 53.79	+ (59)m 64.19 munity h Dec 161.03 58.6 352.86	2116.95 ] leating	(64) (65) (66) (67) (68) (69)
(65)m= inclu 5. Inf Metab (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	ains fro 65.86 ude (57) ternal ga olic gair Jan 161.03 og gains 57.01 nces ga 369.14 ng gains 53.79 s and fa 3	m water 57.97 m in calo s (Table Feb 161.03 (calcula 50.64 ins (calc 372.97 (calcula 53.79 ns gains 3	heating, 60.67 culation ( 5), Wat 65), Wat 161.03 ted in Ap 41.18 ulated in 363.32 ted in A 53.79 (Table \$ 3	, kWh/m 53.63 of (65)m 5 and 5a tts Apr 161.03 opendix 31.18 n Appendix 342.77 ppendix 53.79 5a) 3	onth 0.25 51.84 only if c ): May 161.03 L, equati 23.31 dix L, equati 316.83 L, equati 53.79	5 ´ [0.85 45.48 ylinder is Jun 161.03 ion L9 o 19.68 uation L 292.45 ion L15 53.79	× (45)m 43.3 s in the o Jul 161.03 r L9a), a 21.26 13 or L1 276.16 or L15a) 53.79	Out; + (61)m 48.53 dwelling dwelling 161.03 lso see 27.63 3a), also 272.33 ), also se 53.79	but from w         a) + 0.8 x         49.07         or hot w         Sep         161.03         Table 5         37.09         o see Ta         281.98         see Table         53.79         3	ater heater ( [(46)m 56.13 rater is fr Oct 161.03 47.1 ble 5 302.53 5 53.79 3	r (annual), + (57)m 59.7 om com 0m com 161.03 54.97 328.47 53.79	+ (59)m 64.19 munity h Dec 161.03 58.6 352.86 53.79	2116.95 ] leating	(64) (65) (66) (67) (68) (69) (70)
<ul> <li>(65)m=</li> <li>inclu</li> <li>5. Int</li> <li>Metabox</li> <li>(66)m=</li> <li>Lightin</li> <li>(67)m=</li> <li>Applia</li> <li>(68)m=</li> <li>Cookir</li> <li>(69)m=</li> <li>Pumps</li> <li>(70)m=</li> <li>Losses</li> </ul>	ains fro 65.86 ude (57) ternal ga olic gair Jan 161.03 ug gains 57.01 nces ga 369.14 ng gains 53.79 s and fai 3 s e.g. ev	m water 57.97 m in calo ains (see s (Table Feb 161.03 (calcula 50.64 ins (calc 372.97 (calcula 53.79 ns gains 3 aporatic	heating, 60.67 culation ( <b>Table 5</b> 5), Wat Mar 161.03 ted in Ap 41.18 culated in 363.32 ted in A 53.79 (Table 5 3 on (nega	, kWh/m 53.63 of (65)m 5 and 5a tts Apr 161.03 opendix 31.18 n Append 342.77 ppendix 53.79 5a) 3 tive valu	onth 0.25 51.84 only if c ): May 161.03 L, equat 23.31 dix L, equat 316.83 L, equat 53.79 3 es) (Tab	5 ´ [0.85 45.48 ylinder is Jun 161.03 ion L9 of 19.68 uation L 292.45 ion L15 53.79 3 le 5)	× (45)m 43.3 s in the o Jul 161.03 r L9a), a 21.26 13 or L1 276.16 or L15a 53.79	Out; 48.53 dwelling 48.53 dwelling 161.03 lso see 27.63 3a), also 272.33 ), also se 53.79	out from w         a) + 0.8 x         49.07         or hot w         Sep         161.03         Table 5         37.09         o see Ta         281.98         see Table         53.79         3	ater heater         ( [(46)m         56.13         rater is fr         Oct         161.03         47.1         ble 5         302.53         5         53.79         3	r (annual), + (57)m 59.7 om com 0m com 161.03 54.97 328.47 53.79 3	+ (59)m 64.19 munity h Dec 161.03 58.6 352.86 53.79 3	2116.95 ] leating	(64) (65) (66) (67) (68) (69) (70)

Water	heating	gains (T	able 5	)												_	
(72)m=	88.52	86.26	81.55		74.49	69.67	6	63.16	58.2	65.2	23	68.16	75.44	82.92	86.27		(72)
Total i	interna	l gains =						(66)	m + (67)m	ı + (68	3)m +	(69)m + (	70)m +	(71)m + (72)	m		
(73)m=	625.14	620.34	596.51		558.9	520.27	7 4	85.75	466.08	475	.66	497.7	535.5	3 576.83	608.19	]	(73)
6. So	lar gain	s:															
Solar (	gains are	calculated u	using so	lar	flux from	Table 6	a anc	lassoc	iated equa	tions	to con	vert to th	e applic	able orientat	ion.		
Orient	ation:	Access F Table 6d	actor		Area			Flu Tal	X hla 6a		Та	g_ bla 6b		FF Table 6c		Gains	
N I o utilo	1						l						_			(**)	
North	0.9x	0.77		x	1.7	9	X		0.63	X		0.76	_ ×	0.7	=	7.02	(74)
North	0.9x	0.77		x	1.4	1	x		0.63	x		0.76		0.7		5.53	(74)
North	0.9x	0.77		x	0.9	/	x		0.63	x		0.76		0.7	=	3.8	(74)
North	0.9X	0.77		x	1.7	9	x		20.32	x		0.76		0.7		13.41	(74)
North	0.9x	0.77		×	1.4	1			20.32			0.76	╡ Û	0.7	=	10.56	(74)
North	0.9x	0.77		× ~	0.9	/			20.32	×		0.76	╡Ĵ	0.7	=	1.21	(74)
North	0.9x	0.77		• •	1.7	9			94.53			0.76	╡Ĵ	0.7	$= \frac{1}{2}$	22.79	(74)
North	0.94	0.77		•   •	1.4	7			04.00			0.76	╡Û	0.7	=	12.25	(74)
North	0.94	0.77		•   •	0.9	/ 0			54.05			0.76	╡Ĵ	0.7	=	12.33	(74)
North	0.9x	0.77		^   x	1.7	9	Ŷ		5 46			0.76	╡Ĵ	0.7	=	29.92	(74)
North	0.9x	0.77		x	0.9	7	x		5 46	x		0.76	╡ Û	0.7	=	19.83	(74)
North	0.9x	0.77		x	1.7	, α	x		74 72	x		0.76	╡ Û	0.7	=	49.31	(74)
North	0.9x	0.77		x	1.7	1	x		74.72	x		0.76		0.7	╡_	38.84	(74)
North	0.9x	0.77		x	0.9	7	x		4.72	x		0.76		0.7	<b></b>	26.72	(74)
North	0.9x	0.77		x	1.7	9	x		79.99	x		0.76		0.7		52.78	(74)
North	0.9x	0.77		x	1.4	1	x		'9.99	x		0.76	۲×	0.7	=	41.58	(74)
North	0.9x	0.77	-	x	0.9	7	x	7	<b>'</b> 9.99	x		0.76	۲ × ۲	0.7		28.6	(74)
North	0.9x	0.77		x	1.7	9	x	7	4.68	x		0.76	× ٦	0.7	=	49.28	(74)
North	0.9x	0.77		x	1.4	1	x	7	4.68	x		0.76	×	0.7	=	38.82	(74)
North	0.9x	0.77		x	0.9	7	x	7	4.68	x		0.76	۲ × آ	0.7	= =	26.71	(74)
North	0.9x	0.77		x	1.7	9	x	5	59.25	x		0.76	×	0.7	= =	39.1	(74)
North	0.9x	0.77		x	1.4	1	x	5	59.25	x		0.76	×	0.7	=	30.8	(74)
North	0.9x	0.77		x	0.9	7	x	5	59.25	x		0.76	×	0.7	=	21.19	(74)
North	0.9x	0.77		x	1.7	9	x	4	1.52	x		0.76	×	0.7	=	27.4	(74)
North	0.9x	0.77		x	1.4	1	x	4	1.52	x		0.76	×	0.7	=	21.58	(74)
North	0.9x	0.77		x	0.9	7	x	4	1.52	x		0.76	x	0.7	=	14.85	(74)
North	0.9x	0.77		x	1.7	9	x	2	24.19	x		0.76	×	0.7	=	15.96	(74)
North	0.9x	0.77		x	1.4	1	x	2	24.19	x		0.76	x	0.7	=	12.57	(74)
North	0.9x	0.77		x	0.9	7	x	2	24.19	x		0.76	x	0.7	=	8.65	(74)
North	0.9x	0.77		x	1.7	9	x	1	3.12	x		0.76	×	0.7	=	8.66	(74)
North	0.9x	0.77		x	1.4	1	x	1	3.12	x		0.76	x	0.7	=	6.82	(74)

North	0.9x	0.77	x	0.97	x	13.12	x	0.76	x	0.7	=	4.69	(74)
North	0.9x	0.77	x	1.79	x	8.86	x	0.76	x	0.7	] =	5.85	(74)
North	0.9x	0.77	x	1.41	x	8.86	x	0.76	x	0.7	] =	4.61	(74)
North	0.9x	0.77	x	0.97	x	8.86	x	0.76	x	0.7	] =	3.17	(74)
East	0.9x	1	x	1.79	x	19.64	x	0.76	x	0.7	] =	12.96	(76)
East	0.9x	1	x	1.79	x	19.64	x	0.76	x	0.7	] =	12.96	(76)
East	0.9x	1	x	2.19	x	19.64	x	0.76	x	0.7	=	15.86	(76)
East	0.9x	1	x	1.79	×	38.42	x	0.76	x	0.7	] =	25.35	(76)
East	0.9x	1	x	1.79	x	38.42	x	0.76	x	0.7	] =	25.35	(76)
East	0.9x	1	x	2.19	×	38.42	x	0.76	x	0.7	=	31.02	(76)
East	0.9x	1	x	1.79	×	63.27	x	0.76	x	0.7	=	41.76	(76)
East	0.9x	1	x	1.79	x	63.27	x	0.76	x	0.7	=	41.76	(76)
East	0.9x	1	x	2.19	×	63.27	x	0.76	x	0.7	=	51.09	(76)
East	0.9x	1	x	1.79	x	92.28	x	0.76	x	0.7	=	60.9	(76)
East	0.9x	1	x	1.79	x	92.28	x	0.76	x	0.7	=	60.9	(76)
East	0.9x	1	x	2.19	x	92.28	x	0.76	x	0.7	=	74.51	(76)
East	0.9x	1	x	1.79	x	113.09	x	0.76	x	0.7	=	74.63	(76)
East	0.9x	1	x	1.79	×	113.09	x	0.76	x	0.7	] =	74.63	(76)
East	0.9x	1	x	2.19	x	113.09	x	0.76	x	0.7	=	91.31	(76)
East	0.9x	1	x	1.79	x	115.77	x	0.76	x	0.7	=	76.4	(76)
East	0.9x	1	x	1.79	×	115.77	x	0.76	x	0.7	] =	76.4	(76)
East	0.9x	1	x	2.19	x	115.77	x	0.76	x	0.7	=	93.47	(76)
East	0.9x	1	x	1.79	x	110.22	x	0.76	x	0.7	=	72.74	(76)
East	0.9x	1	x	1.79	x	110.22	x	0.76	x	0.7	=	72.74	(76)
East	0.9x	1	x	2.19	x	110.22	x	0.76	x	0.7	=	88.99	(76)
East	0.9x	1	x	1.79	x	94.68	x	0.76	x	0.7	=	62.48	(76)
East	0.9x	1	x	1.79	×	94.68	x	0.76	x	0.7	] =	62.48	(76)
East	0.9x	1	x	2.19	x	94.68	x	0.76	x	0.7	=	76.44	(76)
East	0.9x	1	x	1.79	x	73.59	x	0.76	x	0.7	=	48.56	(76)
East	0.9x	1	x	1.79	×	73.59	x	0.76	x	0.7	=	48.56	(76)
East	0.9x	1	x	2.19	x	73.59	x	0.76	x	0.7	=	59.42	(76)
East	0.9x	1	x	1.79	×	45.59	x	0.76	x	0.7	=	30.09	(76)
East	0.9x	1	x	1.79	x	45.59	x	0.76	x	0.7	=	30.09	(76)
East	0.9x	1	x	2.19	x	45.59	x	0.76	x	0.7	=	36.81	(76)
East	0.9x	1	x	1.79	×	24.49	x	0.76	x	0.7	] =	16.16	(76)
East	0.9x	1	x	1.79	x	24.49	x	0.76	x	0.7	=	16.16	(76)
East	0.9x	1	x	2.19	x	24.49	x	0.76	x	0.7	=	19.77	(76)
East	0.9x	1	×	1.79	×	16.15	<b>x</b>	0.76	x	0.7	=	10.66	(76)
East	0.9x	1	x	1.79	×	16.15	x	0.76	x	0.7	=	10.66	(76)
East	0.9x	1	x	2.19	x	16.15	x	0.76	x	0.7	] =	13.04	(76)
South	0.9x	0.77	x	0.97	×	46.75	x	0.76	x	0.7	=	16.72	(78)

South	0.9x	0.77	x	0.97	x	76.57	x	0.76	x	0.7	=	27.38	(78)
South	0.9x	0.77	×	0.97	] ×	97.53	x	0.76	×	0.7	=	34.88	(78)
South	0.9x	0.77	x	0.97	×	110.23	x	0.76	x	0.7	=	39.42	(78)
South	0.9x	0.77	×	0.97	] ×	114.87	x	0.76	x	0.7	=	41.08	(78)
South	0.9x	0.77	×	0.97	×	110.55	x	0.76	x	0.7	=	39.53	(78)
South	0.9x	0.77	x	0.97	X	108.01	x	0.76	×	0.7	=	38.63	(78)
South	0.9x	0.77	×	0.97	] ×	104.89	x	0.76	x	0.7	=	37.51	(78)
South	0.9x	0.77	×	0.97	] ×	101.89	x	0.76	×	0.7	=	36.44	(78)
South	0.9x	0.77	x	0.97	] ×	82.59	x	0.76	x	0.7	=	29.53	(78)
South	0.9x	0.77	×	0.97	x	55.42	x	0.76	×	0.7	=	19.82	(78)
South	0.9x	0.77	×	0.97	x	40.4	x	0.76	×	0.7	=	14.45	(78)
West	0.9x	0.77	×	1.41	x	19.64	x	0.76	x	0.7	=	10.21	(80)
West	0.9x	0.77	×	3.52	x	19.64	x	0.76	×	0.7	=	25.49	(80)
West	0.9x	0.77	×	1.41	x	38.42	x	0.76	×	0.7	=	19.97	(80)
West	0.9x	0.77	x	3.52	×	38.42	x	0.76	×	0.7	=	49.86	(80)
West	0.9x	0.77	x	1.41	x	63.27	x	0.76	×	0.7	=	32.89	(80)
West	0.9x	0.77	×	3.52	x	63.27	x	0.76	x	0.7	=	82.11	(80)
West	0.9x	0.77	x	1.41	×	92.28	x	0.76	x	0.7	=	47.97	(80)
West	0.9x	0.77	x	3.52	x	92.28	x	0.76	×	0.7	=	119.76	(80)
West	0.9x	0.77	x	1.41	×	113.09	x	0.76	x	0.7	=	58.79	(80)
West	0.9x	0.77	×	3.52	x	113.09	x	0.76	x	0.7	=	146.76	(80)
West	0.9x	0.77	x	1.41	x	115.77	x	0.76	x	0.7	=	60.18	(80)
West	0.9x	0.77	×	3.52	x	115.77	x	0.76	x	0.7	=	150.24	(80)
West	0.9x	0.77	x	1.41	x	110.22	x	0.76	x	0.7	=	57.3	(80)
West	0.9x	0.77	x	3.52	x	110.22	<b>x</b>	0.76	x	0.7	=	143.03	(80)
West	0.9x	0.77	x	1.41	x	94.68	x	0.76	x	0.7	=	49.22	(80)
West	0.9x	0.77	x	3.52	x	94.68	<b>x</b>	0.76	x	0.7	=	122.86	(80)
West	0.9x	0.77	x	1.41	x	73.59	x	0.76	x	0.7	=	38.25	(80)
West	0.9x	0.77	x	3.52	x	73.59	x	0.76	x	0.7	=	95.5	(80)
West	0.9x	0.77	x	1.41	x	45.59	x	0.76	×	0.7	=	23.7	(80)
West	0.9x	0.77	x	3.52	x	45.59	x	0.76	x	0.7	=	59.16	(80)
West	0.9x	0.77	x	1.41	x	24.49	x	0.76	x	0.7	=	12.73	(80)
West	0.9x	0.77	×	3.52	x	24.49	x	0.76	x	0.7	=	31.78	(80)
West	0.9x	0.77	x	1.41	x	16.15	x	0.76	×	0.7	=	8.4	(80)
West	0.9x	0.77	x	3.52	x	16.15	x	0.76	×	0.7	=	20.96	(80)
Solar	gains in	watts, calcu	lated	for each mon	ith		(83)m	n = Sum(74)m .	(82)m			l	
(83)m=	110.54	210.19 33	7.57	488.72 602.0	8 6	519.2 588.23	502	.08 390.56	246.5	6 136.59	91.79		(83)
I otal	gains – i	nternal and	solar	(84)m = (73)r	n + (	83)m, watts	677	70 000 00	700	740.40	000.00		(0.4)
(84)m=	735.69	830.52 93	4.08	1047.62 1122.3	35 11	104.95 1054.31	977	.73 888.26	782.1	713.42	699.98		(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
--	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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(85)

(86)m=	0.99	0.98	0.96	0.88	0.72	0.52	0.38	0.42	0.68	0.92	0.98	0.99		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)														
(87)m=	20.15	20.3	20.54	20.8	20.95	20.99	21	21	20.97	20.76	20.41	20.12		(87)
Temperature during heating periods in rest of dwelling from Table 9. Th2 (°C)														
(88)m=	20.09	20.1	20.1	20.11	20.11	20.12	20.12	20.12	20.11	20.11	20.11	20.1		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)														
(89)m=	0.99	0.98	0.95	0.84	0.66	0.45	0.3	0.34	0.6	0.89	0.98	0.99		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)														
(90)m=	18.97	19.19	19.53	19.89	20.06	20.11	20.12	20.12	20.09	19.85	19.35	18.93		(90)
			_	-	_		-		f	LA = Livin	g area ÷ (4	4) =	0.38	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.42	19.62	19.91	20.24	20.4	20.45	20.46	20.46	20.43	20.2	19.76	19.39		(92)
Apply	adjustn	nent to tl	he mear	internal	temper	ature fro	m Table	e 4e, whe	ere appro	opriate				
(93)m=	19.27	19.47	19.76	20.09	20.25	20.3	20.31	20.31	20.28	20.05	19.61	19.24		(93)
8. Spa	ace hea	ting requ	uirement		• • •					//				
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a														
uno ut	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.99	0.98	0.94	0.84	0.67	0.47	0.32	0.36	0.62	0.89	0.97	0.99		(94)
Usefu	l gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	726.57	810.22	879.33	884.46	751.78	514	335.99	353.16	547.91	697.98	695.52	693.15		(95)
Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8	·	1						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m : L	x [(93)m·	– (96)m	]	4450 50	4000.40		(07)
(97)m=	1400.55	1358.85	1234.17	1028.55	/84.5	517.32	336.28	353.76	563.21	866.69	1152.52	1392.42		(97)
(98)m=	501 44	368 68	264	103 75	24.35		n = 0.02	24 X [(97)	)m – (95 0	)III] X (4	329.04	520 25		
(00)=		000.00	201	100.10	21.00	Ŭ	Ů	Tota	l per vear	(kWb/year	-Sum(9)	8) =	2237.03	(98)
Seco	hootin	a roquire	montin	14\1/b/m2	2 hoor			Tota		(KWW/JCal	) – Oum(o	0)15,912 -	00.04	
Space	eneaun	y require		KVVII/III-	year								23.64	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)														
Space Fracti	e heatir on of sr	<b>ig:</b> bace hea	t from s	econdar	v/supple	mentarv	system						0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$										1	(202)			
Fraction of space field from main system(s) $(202) = 1 - (201) =$											1			
Fraction of total fleating norm finally system 1 $(204) = (202) \times [1 - (203)] =$											1	(204)		
Efficiency of main space neating system 1											90.8	(200)		
ETTICIE	ency of s	seconda	ry/suppi	ementar	y neating	g systerr I	1, % I	1					0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above		0			105 50	220.04	E20.25		
(044)	001.44	300.08	204	00 /07	24.30	U	0	0	U	120.02	329.04	520.25		(2.1.1)
(211)m	i = {[(98	)m x (20	4)] } x 1	$00 \div (20)$	)6) 26.94	0				120.00	262.20	E70.07		(211)
	002.25	400.04	290.75	114.20	20.01	U	U	U Tota	U l (kWh/ves	$\frac{130.23}{\text{ar}} = \frac{\text{Sum}}{2}$	302.38 211)	512.91	0460.00	(211)
								iud			15,1012		2463.69	(211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)										
(215)m= 0 0 0 0	0	0	0	0	0	0	0	0	]	
				Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	=	0	(215)
Water heating										
210.73 185.76 195.1 173.04	above) 167.54 1	47.56	141.37	157.6	159.34	181.44	191.8	205.69	1	
Efficiency of water heater	<u> </u>								81.5	(216)
(217)m= 87.83 87.46 86.6 84.75	82.57	81.5	81.5	81.5	81.5	85.06	87.14	87.96		」 (217)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$									_	
(219)m= 239.91 212.4 225.29 204.17	202.9 1	81.05	173.46	193.37	195.51	213.3	220.11	233.85		_
				Tota	I = Sum(2'	19a) <sub>112</sub> =			2495.32	(219)
Annual totals kWh/year										1
Water heating fuel used									2405.09	」 ]
Electricity for pumps, fans and electric	c keep-hot									1
central heating pump:								30	]	(230c)
boiler with a fan-assisted flue								45	j	(230e)
Total electricity for the above, kWh/year sum of (230a)(230g) =									75	(231)
Electricity for lighting									402.74	(232)
Electricity generated by PVs									-647.71	(233)
10a. Fuel costs - individual heating s	systems:									-
		<b>Fue</b> kW	<b>el</b> h/year			<b>Fuel P</b> (Table	<b>Price</b> 12)		<b>Fuel Cost</b> £/year	
Space heating - main system 1		(211	) x			3.4	8	x 0.01 =	85.74	(240)
Space heating - main system 2		(213	(213) x			0 × 0.01 =			0	(241)
Space heating - secondary		(215	) x			13.	19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219	)			3.4	8	x 0.01 =	86.84	(247)	
Pumps, fans and electric keep-hot		(231	)			13.	19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to Energy for lighting	(230g) sepa	arately (232	as app )	licable a	nd apply	fuel pri 13.	ce accor	ding to x 0.01 =	Table 12a 53.12	(250)
Additional standing charges (Table 12	2)								120	(251)
		one	of (233) to	o (235) x)		13.	19	x 0.01 =	-85.43	- ](252)
Appendix Q items: repeat lines (253)	and (254) a	s need	ed			·				-
Total energy cost	(245)(24	7) + (250	0)(254)	=					270.15	(255)
11a. SAP rating - individual heating	systems									
Energy cost deflator (Table 12)									0.42	(256)
Energy cost factor (ECF)	[(255) x (2	56)] ÷ [(4	4) + 45.0]	=					0.81	](257)

SAP rating (Section 12)			88.66 (258)							
12a. CO2 emissions – Individual heating systems	including micro-CHP									
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year							
Space heating (main system 1)	(211) x	0.216 =	532.16 (261)							
Space heating (secondary)	(215) x	0.519 =	0 (263)							
Water heating	(219) x	0.216 =	538.99 (264)							
Space and water heating	(261) + (262) + (263) + (26	1071.15 (265)								
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)							
Electricity for lighting	(232) x	0.519 =	209.02 (268)							
Energy saving/generation technologies Item 1		0.519 =	-336.16 (269)							
Total CO2, kg/year		sum of (265)(271) =	982.93 (272)							
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	10.39 (273)							
El rating (section 14)			91 (274)							
13a. Primary Energy										
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year							
Space heating (main system 1)	(211) x	1.22 =	3005.7 (261)							
Space heating (secondary)	(215) x	3.07 =	0 (263)							
Energy for water heating	(219) x	1.22 =	3044.29 (264)							
Space and water heating	(261) + (262) + (263) + (26	6050 (265)								
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25 (267)							
Electricity for lighting	(232) x	0 =	1236.42 (268)							
Energy saving/generation technologies Item 1		3.07 =	-1988.48 (269)							
'Total Primary Energy		sum of (265)(271) =	5528.18 (272)							
Primary energy kWh/m²/year		(272) ÷ (4) =	58.43 (273)							
			User D	etails:						
-------------------------------------------------------------	--------------------------------------------------	---------------------------------	-----------------------------	----------------------	-------------------------	-------------------	--------------------	----------------	------------------------	-------------------
Assessor Name: Software Name:	Anthony Wing- Stroma FSAP	King 2012		Stroma Softwa	a Num are Ver	ber: sion:		STRO Versio	002972 n: 1.0.3.15	
		Р	roperty /	Address:	Flat 5					
Address :										
1. Overall dwelling dimen	SIONS:		•	( )						
Ground floor				a(m²) 08.62	(1a) x	<b>AV. Hei</b>	<b>gnt(m)</b> 7	(2a) =	293.27	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+	-(1e)+(1r	n) 10	08.62	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	293.27	(5)
2. Ventilation rate:				- 41		1-1-1				
Number of chimneys Number of open flues	main heating 0 +	secondar heating	y ] + [_ ] + [_		] = [	0	x 4	40 = 20 =	m <sup>3</sup> per hou	r (6a) (6b)
Number of intermittent fan		-		-		4	x 1	0 =	40	$\Box$
Number of receive verte	0					4		IO -	40	
Number of passive vents					Ľ	0		10 =	0	(7b)
Number of flueless gas fire	es e					0	× 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimneys	s, flues and fans = en carried out or is int	= (6a)+(6b)+(7 ended. procee	'a)+(7b)+(7 d to (17). c	7c) = otherwise c	continue fro	40 om (9) to (	(16)	÷ (5) =	0.14	(8)
Number of storeys in the	e dwelling (ns)	, , .				(-) - (	-7		0	(9)
Additional infiltration							[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2	5 for steel or time	per frame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening	sent, use the value co s); if equal user 0.35	prresponding to	the greate	er wall area	a (after					_
If suspended wooden flo	or, enter 0.2 (un	sealed) or 0	.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter	0 							0	(13)
Window infiltration	and doors draugr	it stripped		0 25 - [0 2	$\mathbf{x}(14) \div 1$	001 -			0	
				(8) + (10) -	+ (11) + (1	2) + (13) +	+ (15) =		0	(15)
Air permeability value	50 expressed in	cubic metre	s ner ho	ur ner so	uare me	etre of e	nvelope	area	0	-1(10)
If based on air permeabilit	v value, then $(18)$	= [(17) ÷ 20]+(8	B), otherwi	se (18) = (	16)		nvelope	uluu	0 34	$= \frac{1}{18}$
Air permeability value applies	if a pressurisation tes	t has been dor	ne or a deg	ree air per	rmeability i	is being us	sed		0.01	
Number of sides sheltered									2	(19)
Shelter factor				(20) = 1 - [	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.29	(21)
Infiltration rate modified fo	r monthly wind sp	eed							I	
Jan Feb M	/lar Apr M	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	.9 4.4 4.3	3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (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		

Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.29	0.31	0.32	0.34		
Calculate effec	<i>tive air</i> ( I ventila	change i ition:	rate for t	he appli	cable ca	se						0	(23a)
If exhaust air he	at pump i	using Appe	endix N, (2	3b) = (23a	) × Fmv (e	equation (N	√5)), othei	rwise (23b	) = (23a)			0	(200)
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (from	n Table 4h)	) =				0	(23c)
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (	23b) × [*	1 – (23c)	) ÷ 100]	( /
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If balance	d mecha	anical ve	ntilation	without	heat rec	overy (N	/IV) (24b	)m = (22	2b)m + (i	23b)		•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If whole he	ouse ex	tract ver	tilation o	or positiv	e input v	entilatic	on from c	outside					
if (22b)m	ı < 0.5 ×	: (23b), t	hen (240	c) = (23b	); otherv	vise (24	c) = (22b	o) m + 0.	.5 × (23b	) 	1	1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural \ if (22b)m	entilation = 1 the	on or wh en (24d)	ole hous m = (22)	e positiv	e input v rwise (2)	ventilatio 4d)m = 0	on from l	oft 2h)m² x	0.51				
(24d)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	1	(24d)
Effective air	change	rate - er	nter (24a	) or (24b	) or (240	c) or (24	d) in boy	(25)				J	
(25)m= 0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	]	(25)
	and he		oromot	ori					•	1	1	1	
				तर वर	Not Ar	00	Havalı	10	ΔΥΠ		k-volue	<u> </u>	
	area	(m²)	r	95 1 <sup>2</sup>	A,n	n²	W/m2	K	(W/I	K)	kJ/m²·l	K	kJ/K
Doors													(00)
Windowo Tuno					2.3	X	1.4	=	3.22				(26)
windows Type	1				2.3 1.79	x x	1.4 /[1/( 1.1 )+	0.04] =	3.22 1.89				(26) (27)
Windows Type	1 2				2.3 1.79 3.52	x x1, x1, x1,	<u> </u>	0.04] = [ 0.04] = [	3.22 1.89 3.71				(26) (27) (27)
Windows Type Windows Type Windows Type	1 2 3				2.3 1.79 3.52 1.79	x x1/ x1/ x1/ x1/ x1/	<u> </u>	0.04] = 0.04] = 0.04] =	3.22 1.89 3.71 1.89				(26) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	1 2 3 4				2.3 1.79 3.52 1.79 1.1	x x1, x1, x1, x1, x1, x1, x1,	<u> </u>	$\begin{array}{c} 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	3.22 1.89 3.71 1.89 1.16				(26) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type	1 2 3 4 5				2.3 1.79 3.52 1.79 1.1 1.1	x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	<u> </u>	$\begin{array}{c} & = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	3.22 1.89 3.71 1.89 1.16 1.16				<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> </ul>
Windows Type Windows Type Windows Type Windows Type Windows Type	1 2 3 4 5 6				2.3 1.79 3.52 1.79 1.1 1.1 1.79	x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	<u> </u>	$\begin{array}{c} & = \\ 0.04] & = \\ 0.04] & = \\ 0.04] & = \\ 0.04] & = \\ 0.04] & = \\ 0.04] & = \\ \end{array}$	3.22 1.89 3.71 1.89 1.16 1.16 1.89				<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> </ul>
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	1 2 3 4 5 6 7				2.3 1.79 3.52 1.79 1.1 1.1 1.79 1.79 1.79	x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	$\begin{array}{c} 1.4 \\ \hline (1/(1.1)+) \end{array}$	$\begin{array}{c} & = \\ 0.04] & = \\ 0.04] & = \\ 0.04] & = \\ 0.04] & = \\ 0.04] & = \\ 0.04] & = \\ 0.04] & = \\ \end{array}$	3.22 1.89 3.71 1.89 1.16 1.16 1.89 1.89				<ul> <li>(26)</li> <li>(27)</li> </ul>
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	1 2 3 4 5 6 7 8				2.3 1.79 3.52 1.79 1.1 1.1 1.79 1.79 1.79 1.79	x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	$\begin{array}{c} 1.4 \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \end{array}$	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0$	3.22 1.89 3.71 1.89 1.16 1.16 1.89 1.89 1.89				<ul> <li>(26)</li> <li>(27)</li> </ul>
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	1 2 3 4 5 6 7 8 25.5	51	1.79		2.3 1.79 3.52 1.79 1.1 1.1 1.79 1.79 1.79 1.79 23.72	x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	$\begin{array}{c} 1.4 \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ 0.13 \end{array}$	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0$	3.22 1.89 3.71 1.89 1.16 1.16 1.89 1.89 1.89 3.08				(26) (27) (27) (27) (27) (27) (27) (27) (27
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type1 Walls Type2	1 2 3 4 5 6 7 8 <u>25.5</u> 49.4	i1 I1	1.79		2.3 1.79 3.52 1.79 1.1 1.1 1.79 1.79 1.79 23.72 43.69	$ \begin{array}{c c}                                    $	$\begin{array}{c} 1.4 \\ \hline 1.4 \\ \hline 1.7 \\ 1.7 \\ \hline 1$	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0$	3.22 1.89 3.71 1.89 1.16 1.16 1.89 1.89 1.89 3.08 5.68				(26) (27) (27) (27) (27) (27) (27) (27) (27
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3	1 2 3 4 5 6 7 8 25.5 49.4 20.7	51 11 79	1.79 5.72 5.37		2.3 1.79 3.52 1.79 1.1 1.1 1.79 1.79 1.79 23.72 43.69 15.42	x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	$\begin{array}{c} 1.4 \\ \hline 1.4 \\ \hline 1.7 \\ 1.7 \\ \hline 1$	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0$	3.22 1.89 3.71 1.89 1.16 1.16 1.89 1.89 1.89 3.08 5.68 2				(26) (27) (27) (27) (27) (27) (27) (27) (27
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4	1 2 3 4 5 6 7 8 25.5 49.4 20.7 29.3	51 11 79 3	1.79 5.72 5.37 2.3		2.3 1.79 3.52 1.79 1.1 1.1 1.79 1.79 1.79 1.79 2.3.72 43.69 15.42 27	x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	$\begin{array}{c} 1.4 \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ (1/(1.1)+) \\ 0.13 \\ 0.13 \\ 0.13 \\ 0.12 \\ \end{array}$	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0$	3.22 1.89 3.71 1.89 1.16 1.16 1.89 1.89 1.89 3.08 5.68 2 3.17				(26) (27) (27) (27) (27) (27) (27) (27) (27
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Walls Type5	1 2 3 4 5 6 7 8 25.5 8 20.7 29.3 6.34	51 1-1 79 3 4	1.79 5.72 5.37 2.3 1.79		2.3 1.79 3.52 1.79 1.1 1.1 1.1 1.79 1.79 1.79 23.72 43.69 15.42 27 4.55	x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	$\begin{array}{c} 1.4 \\ (1/(1.1)+ \\ (1/(1.1)+ \\ (1/(1.1)+ \\ (1/(1.1)+ \\ (1/(1.1)+ \\ (1/(1.1)+ \\ (1/(1.1)+ \\ (1/(1.1)+ \\ (1/(1.1)+ \\ (1/(1.1)+ \\ (1/(1.1)+ \\ 0.13 \\ 0.13 \\ 0.13 \\ 0.12 \\ 0.13 \end{array}$	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0$	3.22 1.89 3.71 1.89 1.16 1.16 1.89 1.89 1.89 3.08 5.68 2 3.17 0.59				(26) (27) (27) (27) (27) (27) (27) (27) (27
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type4 Walls Type5 Roof	1 2 3 4 5 6 7 8 25.5 8 25.5 20.7 29.3 6.3 13	i1 i1 '9 3 4	1.79 5.72 5.37 2.3 1.79 0		2.3 1.79 3.52 1.79 1.1 1.1 1.79 1.79 1.79 1.79 23.72 43.69 15.42 27 4.55 13	$ \begin{array}{c}                                     $	$\begin{array}{c} 1.4 \\ \hline 1.4 \\ \hline 1.7 \\ 1.7 \\ \hline 1$	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0$	3.22 1.89 3.71 1.89 1.16 1.16 1.89 1.89 1.89 3.08 5.68 2 3.17 0.59 1.3				(26) (27) (27) (27) (27) (27) (27) (27) (27
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Walls Type3 Walls Type5 Roof Total area of el	1 2 3 4 5 6 7 8 25.5 8 25.5 49.4 20.7 29.3 6.34 13 dements	i1 i1 i9 3 4 , m <sup>2</sup>	1.79 5.72 5.37 2.3 1.79 0		2.3 1.79 3.52 1.79 1.1 1.1 1.79 1.79 1.79 1.79 23.72 43.69 15.42 27 4.55 13	$ \begin{array}{c}                                     $	$\begin{array}{c} 1.4 \\ \hline 1.4 \\ \hline 1.7 \\ 1.7 \\ \hline 1$	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0$	3.22 1.89 3.71 1.89 1.16 1.16 1.89 1.89 1.89 3.08 5.68 2 3.17 0.59 1.3				(26) (27) (27) (27) (27) (27) (27) (27) (27

\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions

Fabric heat loss	$W/K = S(A \times U)$
------------------	-----------------------

Heat capacity  $Cm = S(A \times k)$ 

(26)...(30) + (32) =

((28)...(30) + (32) + (32a)...(32e) =

Indicative Value: Medium



Thermal mass parameter (TMP = Cm  $\div$  TFA) in kJ/m<sup>2</sup>K

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

can be i	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	əs : S (L	x Y) cal	culated u	using Ap	pendix ł	<						11.98	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			46.49	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	54.82	54.57	54.33	53.18	52.96	51.96	51.96	51.78	52.35	52.96	53.4	53.85		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	101.31	101.06	100.82	99.67	99.45	98.45	98.45	98.27	98.84	99.45	99.89	100.34		
									,	Average =	Sum(39)1.	12 /12=	99.67	(39)
Heat lo	oss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)		1	
(40)m=	0.93	0.93	0.93	0.92	0.92	0.91	0.91	0.9	0.91	0.92	0.92	0.92		_
Numb	er of day	/s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1.</sub>	12 /12=	0.92	(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)
A \\/:	ater hea	ting ener	av reau	rement:								k\Mh/ve	ar.	
- <b>t</b> . vvc	ater nea		gy requ	rement.								K V V I // y C	5ai.	
Assum	ned occu	ipancy, I	N								2.	81		(42)
if TF	A > 13.	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	649 x (TF	-A -13.9	)2)] + 0.0	)013 x (	TFA -13.	.9)			
Annua	l averac	e hot wa	ater usad	ne in litre	es per da	v Vd.av	erage =	(25 x N)	+ 36		100	1.85		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed t	to achieve	a water us	se target o	f I I I I	5.00		()
not mor	e that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)				-			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	110.93	106.9	102.87	98.83	94.8	90.76	90.76	94.8	98.83	102.87	106.9	110.93		
										Total = Su	m(44) <sub>112</sub> =	-	1210.19	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x C	0Tm / 3600	kWh/mor	nth (see Ta	ables 1b, 1 -	c, 1d)		
(45)m=	164.51	143.88	148.47	129.44	124.2	107.18	99.32	113.97	115.33	134.4	146.71	159.32		
										Total = Su	m(45) <sub>112</sub> =	=	1586.75	(45)
lt instan	taneous v	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,	to (61)				I	
(46)m=	24.68	21.58	22.27	19.42	18.63	16.08	14.9	17.1	17.3	20.16	22.01	23.9		(46)
vvater	storage	IOSS:	نه مار مانه	~ ~ ~ ~ ~ ~				with in an					I	
Siorag		e (intes)		ig any so			storage		ime ves	sei		0		(47)
If com	munity r	eating a	na no ta	nk in aw r (this in	elling, e Indes i	nter 110 netantar	iltres in	(47) mbi boili	are) onto	ar 'O' in (	(17)			
Water	storane		not wate	;i (ulis il	iciuues i	instantai					47)			
a) If n	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b		,	,					0		(49)
Enero	v lost fro	m water	storage	. kWh/v	ear			(48) x (49)	=			- 0		(50)
b) If n	nanufact	urer's de	eclared of	ylinder l	oss fact	or is not	known:	(10) x (10)				0		(00)
Hot wa	ater stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
If com	munity ł	eating s	ee secti	on 4.3										
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)

Energy lost from water storage, kWh/year Enter (50) or (54) in (55)							(47) x (51) x (52) x (53) = 0			0		(54) (55)		
Water	storage	loss cal	culated	for each	month			((56)m = (	(55) × (41)ı	m		•		()
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)	n = (56)m	x [(50) – (	[ [H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	. ,
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Drimo			l nucl) fr	I								0		(58)
Primar	v circuit	loss (al	culated	for each	month (	59)m = (	(58) ÷ 36	65 x (41)	m			0		(00)
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	a cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)	)m	-					
(61)m=	50.96	46.03	50.96	48.74	48.31	44.76	46.25	48.31	48.74	50.96	49.32	50.96		(61)
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=	215.47	189.91	199.43	178.18	172.51	151.94	145.57	162.28	164.07	185.36	196.03	210.28		(62)
Solar DI	-IW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	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=	215.47	189.91	199.43	178.18	172.51	151.94	145.57	162.28	164.07	185.36	196.03	210.28		_
								Outp	out from wa	ater heate	r (annual)₁	12	2171.04	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	67.44	59.35	62.11	55.22	53.38	46.83	44.59	49.97	50.53	57.43	61.11	65.71		(65)
inclu	ıde (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	s (Table	e 5), Wat	ts	_	_	_	-	-			-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	168.38	168.38	168.38	168.38	168.38	168.38	168.38	168.38	168.38	168.38	168.38	168.38		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5			-		
(67)m=	64.96	57.7	46.92	35.52	26.55	22.42	24.22	31.49	42.26	53.66	62.63	66.77		(67)
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=	402.33	406.5	395.98	373.58	345.31	318.74	300.99	296.81	307.33	329.73	358	384.57		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	), also se	ee Table	5				
(69)m=	54.64	54.64	54.64	54.64	54.64	54.64	54.64	54.64	54.64	54.64	54.64	54.64		(69)
Pumps	s and fai	ns gains	(Table &	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losse	s e.g. ev	aporatio	on (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-112.25	-112.25	-112.25	-112.25	-112.25	-112.25	-112.25	-112.25	-112.25	-112.25	-112.25	-112.25		(71)
Water	heating	gains (1	able 5)											
(72)m=	90.65	88.32	83.48	76.7	71.74	65.04	59.93	67.17	70.18	77.19	84.88	88.33		(72)
Total i	nternal	gains =				(66)	)m + (67)m	n + (68)m -	+ (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	671.7	666.28	640.15	599.58	557.38	519.96	498.91	509.24	533.55	574.35	619.28	653.44		(73)
6. So	lar gains	s:												

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

Orienta	ition:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.79	×	10.63	×	0.76	×	0.7	] =	7.02	(74)
North	0.9x	0.77	x	1.79	x	20.32	x	0.76	x	0.7	] =	13.41	(74)
North	0.9x	0.77	x	1.79	x	34.53	x	0.76	x	0.7	] =	22.79	(74)
North	0.9x	0.77	x	1.79	x	55.46	x	0.76	x	0.7	] =	36.6	(74)
North	0.9x	0.77	x	1.79	x	74.72	x	0.76	x	0.7	] =	49.31	(74)
North	0.9x	0.77	x	1.79	x	79.99	<b>x</b>	0.76	x	0.7	] =	52.78	(74)
North	0.9x	0.77	x	1.79	x	74.68	x	0.76	x	0.7	] =	49.28	(74)
North	0.9x	0.77	x	1.79	x	59.25	x	0.76	x	0.7	=	39.1	(74)
North	0.9x	0.77	x	1.79	x	41.52	x	0.76	x	0.7	] =	27.4	(74)
North	0.9x	0.77	x	1.79	x	24.19	x	0.76	x	0.7	] =	15.96	(74)
North	0.9x	0.77	x	1.79	x	13.12	x	0.76	x	0.7	=	8.66	(74)
North	0.9x	0.77	x	1.79	x	8.86	x	0.76	x	0.7	=	5.85	(74)
East	0.9x	1	x	1.79	x	19.64	x	0.76	x	0.7	] =	12.96	(76)
East	0.9x	1	x	1.79	x	19.64	x	0.76	x	0.7	=	12.96	(76)
East	0.9x	1	x	1.79	x	19.64	x	0.76	x	0.7	] =	12.96	(76)
East	0.9x	1	x	1.79	x	38.42	x	0.76	x	0.7	=	25.35	(76)
East	0.9x	1	x	1.79	x	38.42	x	0.76	x	0.7	=	25.35	(76)
East	0.9x	1	x	1.79	x	38.42	x	0.76	x	0.7	] =	25.35	(76)
East	0.9x	1	x	1.79	x	63.27	x	0.76	x	0.7	=	41.76	(76)
East	0.9x	1	x	1.79	x	63.27	x	0.76	x	0.7	=	41.76	(76)
East	0.9x	1	x	1.79	x	63.27	<b>x</b>	0.76	x	0.7	] =	41.76	(76)
East	0.9x	1	x	1.79	x	92.28	x	0.76	x	0.7	=	60.9	(76)
East	0.9x	1	x	1.79	x	92.28	x	0.76	x	0.7	=	60.9	(76)
East	0.9x	1	x	1.79	x	92.28	x	0.76	x	0.7	=	60.9	(76)
East	0.9x	1	x	1.79	x	113.09	x	0.76	x	0.7	=	74.63	(76)
East	0.9x	1	x	1.79	x	113.09	x	0.76	x	0.7	=	74.63	(76)
East	0.9x	1	x	1.79	x	113.09	x	0.76	x	0.7	=	74.63	(76)
East	0.9x	1	x	1.79	x	115.77	x	0.76	x	0.7	=	76.4	(76)
East	0.9x	1	x	1.79	x	115.77	x	0.76	x	0.7	] =	76.4	(76)
East	0.9x	1	x	1.79	x	115.77	x	0.76	x	0.7	=	76.4	(76)
East	0.9x	1	x	1.79	x	110.22	x	0.76	x	0.7	] =	72.74	(76)
East	0.9x	1	x	1.79	x	110.22	x	0.76	x	0.7	] =	72.74	(76)
East	0.9x	1	x	1.79	x	110.22	x	0.76	x	0.7	=	72.74	(76)
East	0.9x	1	x	1.79	x	94.68	x	0.76	x	0.7	=	62.48	(76)
East	0.9x	1	x	1.79	x	94.68	x	0.76	x	0.7	=	62.48	(76)
East	0.9x	1	x	1.79	x	94.68	x	0.76	x	0.7	=	62.48	(76)
East	0.9x	1	x	1.79	x	73.59	x	0.76	x	0.7	=	48.56	(76)
East	0.9x	1	x	1.79	x	73.59	x	0.76	x	0.7	=	48.56	(76)
East	0.9x	1	x	1.79	x	73.59	x	0.76	x	0.7	] =	48.56	(76)

East	0.9x	1	x	1.79	×	45.59	×	0.76	×	0.7	] =	30.09	(76)
East	0.9x	1	x	1.79	×	45.59	×	0.76	×	0.7	] =	30.09	(76)
East	0.9x	1	x	1.79	x	45.59	×	0.76	x	0.7	] =	30.09	(76)
East	0.9x	1	x	1.79	x	24.49	x	0.76	x	0.7	=	16.16	(76)
East	0.9x	1	x	1.79	x	24.49	×	0.76	x	0.7	] =	16.16	(76)
East	0.9x	1	x	1.79	x	24.49	x	0.76	x	0.7	=	16.16	(76)
East	0.9x	1	x	1.79	x	16.15	x	0.76	x	0.7	=	10.66	(76)
East	0.9x	1	x	1.79	x	16.15	x	0.76	x	0.7	=	10.66	(76)
East	0.9x	1	x	1.79	x	16.15	x	0.76	x	0.7	=	10.66	(76)
South	0.9x	0.77	x	3.52	×	46.75	×	0.76	×	0.7	] =	60.67	(78)
South	0.9x	0.77	x	1.1	x	46.75	x	0.76	x	0.7	=	18.96	(78)
South	0.9x	0.77	x	1.1	x	46.75	x	0.76	x	0.7	=	18.96	(78)
South	0.9x	0.77	x	3.52	x	76.57	x	0.76	x	0.7	=	99.37	(78)
South	0.9x	0.77	x	1.1	x	76.57	x	0.76	x	0.7	=	31.05	(78)
South	0.9x	0.77	x	1.1	x	76.57	x	0.76	x	0.7	=	31.05	(78)
South	0.9x	0.77	x	3.52	x	97.53	x	0.76	x	0.7	=	126.57	(78)
South	0.9x	0.77	x	1.1	x	97.53	x	0.76	x	0.7	=	39.55	(78)
South	0.9x	0.77	x	1.1	x	97.53	x	0.76	x	0.7	=	39.55	(78)
South	0.9x	0.77	x	3.52	x	110.23	x	0.76	x	0.7	=	143.06	(78)
South	0.9x	0.77	x	1.1	x	110.23	x	0.76	x	0.7	=	44.7	(78)
South	0.9x	0.77	x	1.1	x	110.23	x	0.76	x	0.7	=	44.7	(78)
South	0.9x	0.77	x	3.52	x	114.87	x	0.76	x	0.7	=	149.07	(78)
South	0.9x	0.77	x	1.1	x	114.87	x	0.76	x	0.7	=	46.59	(78)
South	0.9x	0.77	x	1.1	×	114.87	x	0.76	×	0.7	=	46.59	(78)
South	0.9x	0.77	x	3.52	×	110.55	x	0.76	x	0.7	=	143.46	(78)
South	0.9x	0.77	x	1.1	x	110.55	x	0.76	x	0.7	] =	44.83	(78)
South	0.9x	0.77	x	1.1	×	110.55	x	0.76	×	0.7	] =	44.83	(78)
South	0.9x	0.77	x	3.52	x	108.01	x	0.76	x	0.7	] =	140.17	(78)
South	0.9x	0.77	x	1.1	x	108.01	x	0.76	x	0.7	] =	43.8	(78)
South	0.9x	0.77	x	1.1	x	108.01	x	0.76	x	0.7	=	43.8	(78)
South	0.9x	0.77	x	3.52	x	104.89	x	0.76	x	0.7	] =	136.13	(78)
South	0.9x	0.77	x	1.1	x	104.89	x	0.76	x	0.7	=	42.54	(78)
South	0.9x	0.77	x	1.1	×	104.89	×	0.76	x	0.7	=	42.54	(78)
South	0.9x	0.77	x	3.52	x	101.89	x	0.76	x	0.7	=	132.22	(78)
South	0.9x	0.77	x	1.1	x	101.89	x	0.76	x	0.7	=	41.32	(78)
South	0.9x	0.77	x	1.1	×	101.89	x	0.76	x	0.7	] =	41.32	(78)
South	0.9x	0.77	x	3.52	×	82.59	×	0.76	×	0.7	] =	107.17	(78)
South	0.9x	0.77	x	1.1	×	82.59	×	0.76	×	0.7	] =	33.49	(78)
South	0.9x	0.77	x	1.1	×	82.59	x	0.76	×	0.7	=	33.49	(78)
South	0.9x	0.77	x	3.52	x	55.42	x	0.76	x	0.7	=	71.92	(78)
South	0.9x	0.77	x	1.1	x	55.42	x	0.76	x	0.7	=	22.47	(78)

South	0.9x	0.77	x	1.	1	x	5	5.42	) × [	0.76	x	0.7		= [	22.47	(78)
South	0.9x	0.77	x	3.5	52	x	4	40.4	×	0.76	x	0.7		= [	52.43	(78)
South	0.9x	0.77	x	1.	1	x	4	40.4	× [	0.76	x	0.7		= [	16.38	(78)
South	0.9x	0.77	x	1.	1	x	4	40.4	× [	0.76	x	0.7		= [	16.38	(78)
West	0.9x	0.77	x	1.7	79	x	1	9.64	İ×「	0.76	×	0.7		= [	12.96	(80)
West	0.9x	0.77	x	1.7	79	x	3	8.42	i × [	0.76	×	0.7		= [	25.35	(80)
West	0.9x	0.77	x	1.7	79	x	6	3.27	İ×「	0.76	×	0.7		= [	41.76	(80)
West	0.9x	0.77	x	1.7	79	x	9	2.28	İ×「	0.76	×	0.7		= [	60.9	(80)
West	0.9x	0.77	x	1.7	79	x	1	13.09	i × [	0.76	×	0.7		= [	74.63	(80)
West	0.9x	0.77	x	1.7	79	x	1	15.77	i × Ē	0.76	×	0.7		= [	76.4	(80)
West	0.9x	0.77	x	1.7	79	x	1	10.22	İ×「	0.76	×	0.7		= [	72.74	(80)
West	0.9x	0.77	x	1.7	79	x	9	4.68	i × [	0.76	×	0.7		= [	62.48	(80)
West	0.9x	0.77	x	1.7	79	x	7	3.59	İ×「	0.76	×	0.7		= [	48.56	(80)
West	0.9x	0.77	x	1.7	79	x	4	5.59	İ×「	0.76	×	0.7		= [	30.09	(80)
West	0.9x	0.77	x	1.7	79	x	2	4.49	× [	0.76	x	0.7	-	= [	16.16	(80)
West	0.9x	0.77	x	1.7	79	x	1	6.15	× [	0.76	x	0.7		= [	10.66	(80)
Solar ( (83)m= Total (	gains in 157.45 gains – ii	watts, cal 276.3 nternal an	culatec <sup>395.49</sup> nd solar	for eac 512.66 (84)m =	h mont 590.08 = (73)m	h 3 5 1 + (	91.51 83)m	568.01 , watts	<mark>(83)</mark> m = 510.2	= Sum(74)m . 2 436.51	<mark>(82)m</mark> 310.46	6 190.17	133.6	8		(83)
(84)m=	829.16	942.58	1035.64	1112.24	1147.4	6 1 <sup>.</sup>	111.48	1066.91	1019.4	46 970.06	884.82	2 809.45	787.1	1		(84)
7. Me	ean inter	nal tempe	erature	(heating	g seaso	n)										
7. Me Temp	ean inter perature	nal tempe during he	erature eating p	(heating eriods in	g seaso n the liv	n) /ing	area f	rom Tal	ole 9, <sup>-</sup>	Th1 (°C)				Г	21	(85)
7. Me Temp Utilisa	ean inter perature ation fac	nal tempe during he tor for gai	erature eating p ins for l	(heating eriods in living are	y seaso n the liv ea, h1,i	n) /ing m (s	area f see Ta	rom Tat ble 9a)	ole 9, <sup>-</sup>	Th1 (°C)				]	21	(85)
7. Me Temp Utilisa	ean inter perature ation fac	nal tempe during he tor for ga Feb	erature eating p ins for l Mar	(heating eriods in iving are Apr	y seaso n the liv ea, h1,i May	n) /ing m (s /	area f ee Ta Jun	rom Tab ble 9a) Jul	ole 9, <sup>-</sup> Au	Th1 (°C) g Sep	Oct	Nov	De	[ c	21	(85)
7. Me Temp Utilisa (86)m=	ean inter perature ation fac Jan 0.99	nal tempe during he tor for ga Feb 0.98	erature eating p ins for l Mar 0.96	(heating eriods in iving are Apr 0.89	n the live ea, h1,i May 0.75	n) /ing m (s /	area f see Ta Jun 0.56	rom Tab ble 9a) Jul <sub>0.41</sub>	ole 9, Au 0.44	Th1 (°C) g Sep 0.68	Oct 0.92	Nov 0.98	De 0.99	с )	21	(85)
7. Me Temp Utilisa (86)m= Mear	ean inter perature ation fac Jan 0.99	nal tempe during he tor for ga Feb 0.98 I tempera	erature eating p ins for l Mar 0.96 ture in	(heating eriods in living are Apr 0.89 living ar	y seaso n the liv ea, h1,i May 0.75 ea T1 (	n) /ing m (s /	area f see Ta Jun 0.56 ow ste	from Tab ble 9a) Jul 0.41 ps 3 to 7	ole 9, <sup>-</sup> Au 0.44 7 in Ta	Th1 (°C) g Sep 0.68 ble 9c)	Oct 0.92	Nov 0.98	De 0.99	с )	21	(85)
7. Me Temp Utilisa (86)m= Mear (87)m=	ean inter perature ation fac Jan 0.99 n interna 20.22	nal tempe during he tor for ga Feb 0.98 I tempera 20.37	erature eating p ins for l Mar 0.96 ture in 20.58	(heating eriods in living ard Apr 0.89 living ar 20.81	y seaso n the liv ea, h1,i May 0.75 ea T1 ( 20.94	n) /ing m (s /	area f see Ta Jun 0.56 ow ste 20.99	From Tab ble 9a) Jul 0.41 ps 3 to 7 21	ole 9, <sup>-</sup> Au 0.44 7 in Ta 21	Th1 (°C) g Sep 0.68 ble 9c) 20.98	Oct 0.92 20.8	Nov 0.98 20.47	De 0.99 20.19	<b>c</b> 9	21	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mear (87)m= Temp	ean inter perature ation fac Jan 0.99 n interna 20.22 perature	nal tempe during he tor for ga Feb 0.98 I tempera 20.37 during he	erature eating p ins for 1 Mar 0.96 ture in 20.58 eating p	(heating periods in living an Apr 0.89 living ar 20.81 periods in	y seaso n the liv ea, h1,, May 0.75 ea T1 ( 20.94 n rest c	on) /ing m (s / (follo	area f see Ta Jun 0.56 ow ste 20.99 velling	From Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta	Die 9, Aug 0.44 7 in Ta 21 able 9,	Th1 (°C) g Sep 0.68 ble 9c) 20.98 Th2 (°C)	Oct 0.92 20.8	Nov 0.98 20.47	De 0.99 20.19	c ) 9	21	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mear (87)m= Temp (88)m=	ean inter perature ation fac Jan 0.99 interna 20.22 perature 20.14	nal tempe during he tor for ga Feb 0.98 I tempera 20.37 during he 20.14	erature eating p ins for 1 Mar 0.96 ture in 20.58 eating p 20.14	(heating periods in living an 0.89 living an 20.81 periods in 20.15	seaso           n the live           ea, h1,i           May           0.75           ea T1 (           20.94           n rest c           20.15	n) /ing m (s / (follo	area 1 see Ta Jun 0.56 ow ste 20.99 velling 20.16	From Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.16	Au Au 0.44 7 in Ta 21 able 9, 20.10	Th1 (°C) g Sep 0.68 ble 9c) 20.98 Th2 (°C) 5 20.16	Oct 0.92 20.8 20.15	Nov 0.98 20.47 20.15	De 0.99 20.15	( ) 9	21	(85) (86) (87) (88)
7. Me Temp Utilis: (86)m= Mear (87)m= Temp (88)m= Utilis:	ean inter perature ation fac Jan 0.99 interna 20.22 perature 20.14	nal tempe during he tor for ga Feb 0.98 I tempera 20.37 during he 20.14	erature eating p ins for Mar 0.96 ture in 20.58 eating p 20.14 ins for	(heating periods in living ard 0.89 living ar 20.81 periods in 20.15 rest of d	seaso           n the live           ea, h1,i           May           0.75           ea T1 (           20.94           n rest c           20.15	n) ving m (s / (follo (follo f dw 1 2 x h2	area f see Ta Jun 0.56 ow ste 20.99 velling 20.16	From Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.16 ee Table	Au       0.44       7 in Ta       21       able 9,       20.10       9a)	Th1 (°C) g Sep 0.68 ble 9c) 20.98 Th2 (°C) 5 20.16	Oct 0.92 20.8 20.15	Nov 0.98 20.47 20.15	De 0.99 20.19 20.15	[ c ) 9	21	(85) (86) (87) (88)
7. Me Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m=	ean inter perature ation fac Jan 0.99 n interna 20.22 perature 20.14 ation fac 0.99	nal temper during he tor for ga Feb 0.98 I tempera 20.37 during he 20.14 tor for ga 0.98	erature eating p ins for 1 Mar 0.96 ture in 20.58 eating p 20.14 ins for 1 0.95	(heating periods in Apr 0.89 living ar 20.81 periods in 20.15 rest of d 0.86	seaso           n the live           ea, h1,,           May           0.75           ea T1 (           20.94           n rest c           20.15           welling           0.7	n) ving m (s / (follc (follc 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 2 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y 1 y y 1 y 1 y y y y y y y y y y y y	area 1 see Ta Jun 0.56 ow ste 20.99 velling 20.16 ,m (se 0.49	From Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.16 ee Table 0.33	Die 9, Aug 0.44 7 in Ta 21 able 9, 20.10 9a) 0.36	Th1 (°C) g Sep 0.68 ble 9c) 20.98 Th2 (°C) 5 20.16	Oct 0.92 20.8 20.15	Nov 0.98 20.47 20.15	Der 0.99 20.15 20.15	5	21	(85) (86) (87) (88) (88)
7. Me Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m=	an inter perature ation fac Jan 0.99 interna 20.22 perature 20.14 ation fac 0.99	nal tempe during he tor for ga Feb 0.98 I tempera 20.37 during he 20.14 tor for ga 0.98	erature eating p ins for l Mar 0.96 ture in 20.58 eating p 20.14 ins for l 0.95	(heating periods in living are 0.89 living ar 20.81 periods in 20.15 rest of d 0.86	seaso           n the liv           ea, h1,,i           May           0.75           ea T1 (           20.94           n rest c           20.15           welling           0.7	n) ving m (s / (follc if dw if dw i, h2 lling	area 1 see Ta Jun 0.56 20.99 velling 20.16 ,m (se 0.49	From Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.16 ee Table 0.33	Aug 0.44 7 in Ta 21 able 9, 20.10 9a) 0.36	Th1 (°C) g Sep 0.68 ble 9c) 20.98 Th2 (°C) 5 20.16 0.6 0.6	Oct 0.92 20.8 20.15 0.89	Nov 0.98 20.47 20.15 0.98	De 0.99 20.15 20.15	c [ 9 ]	21	(85) (86) (87) (88) (89)
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7. Me 7. Me Temp Utilis: (86)m= Mear (87)m= Temp (88)m= Utilis: (89)m= Mear (90)m= Mear (90)m= Mear (90)m= Set T	an inter perature ation fac Jan 0.99 n interna 20.22 perature 20.14 ation fac 0.99 n interna 19.11 n interna 19.44 v adjustn 19.29 ace hea i to the r	nal temper         during he         tor for gai         Feb         0.98         I tempera         20.37         during he         20.14         tor for gai         0.98         I tempera         0.98         I tempera         19.33         I tempera         19.41         nent to the         19.49         ting requi         mean inte	erature eating p ins for 1 Mar 0.96 ture in 20.58 eating p 20.14 ins for 1 0.95 ture in 19.62 ture (fo 19.91 e mean 19.76 rement ernal ter	(heating eriods in Apr 0.89 living ar 20.81 eriods in 20.15 rest of d 0.86 the rest 19.94 r the wh 20.2 interna 20.05	seaso           n the live           ea, h1,           May           0.75           ea T1 (           20.94           n rest c           20.15           welling           0.7           of dwe           20.1           nole dw           20.36           I tempe           20.21	in) ving m (s (follo f dw f dw f dw f dw f ving eff f dw f f eff f dw f f f f f f f f f f f f f	area f ee Ta Jun 0.56 0w ste 20.99 velling 20.16 ,m (se 0.49 1 T2 (for 20.16 1 T2 (for 20.16 1 T2 (for 20.41 1 Te fro 20.26 1 at stellar	From Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.16 ee Table 0.33 ollow ste 20.16 	Aug         Aug         0.44         7 in Ta         21         able 9,         20.10         9a)         0.366         eps 3 t         20.10         + (1 -         20.47         4e, w         20.20         Table	Th1 (°C) g Sep 0.68 ble 9c) 20.98 Th2 (°C) 5 20.16 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.	Oct 0.92 20.8 20.15 0.89 e 9c) 19.94 A = Liv 20.19 ppriate 20.04 t Ti,m=	Nov 0.98 20.47 20.15 0.98 19.47 ring area ÷ (4 19.77 19.62 =(76)m an	Der 0.99 20.15 20.15 0.99 19.07 4) = 19.4 19.25 d re-ca		21 0.3	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)
7. Me Temp Utilis: (86)m= Mear (87)m= Temp (88)m= Utilis: (89)m= Mear (90)m= Mear (90)m= Mear (92)m= Apply (93)m= 8. Sp Set T the u	an inter perature ation fac Jan 0.99 interna 20.22 perature 20.14 ation fac 0.99 interna 19.11 interna 19.44 y adjustn 19.29 ace hea i to the r tillisation	nal temper         during he         tor for gai         Feb         0.98         I tempera         20.37         during he         20.14         tor for gai         0.98         I tempera         20.14         tor for gai         0.98         I tempera         19.33         I tempera         19.64         19.49         ting requi         mean inte         factor for gai	erature eating p ins for 1 Mar 0.96 ture in 20.58 eating p 20.14 ins for 1 0.95 ture in 19.62 ture (fo 19.91 e mean 19.76 rement ernal ter	(heating periods in living an 0.89 living an 20.81 periods in 20.15 rest of d 0.86 the rest 19.94 or the wh 20.2 ninterna 20.05	seaso           n the live           ea, h1, y           May           0.75           ea T1 (           20.94           n rest c           20.15           welling           0.7           of dwe           20.1           nole dw           20.36           I tempe           20.21           re obta           able 9a	n) ving m (s / follc follc f dw 2 follc 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving 2 ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving ving	area f ee Ta Jun 0.56 bw ste 20.99 velling 20.16 ,m (se 0.49 T2 (for 20.16 ag) = fl 20.41 ure fro 20.26 d at ste	From Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.16 ee Table 0.33 ollow ste 20.16 _A × T1 20.41 m Table 20.26	Au         0.44         7 in Ta         21         able 9,         20.10         9a)         0.366         pps 3 t         20.10         + (1 -         20.44         4e, w         20.20         Table	Th1 (°C) g Sep 0.68 ble 9c) 20.98 Th2 (°C) 5 20.16 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.	Oct 0.92 20.8 20.15 0.89 e 9c) 19.94 LA = Liv 20.19 ppriate 20.04	Nov 0.98 20.47 20.15 0.98 19.47 ring area ÷ (4 19.77 19.62 =(76)m an	De 0.99 20.15 20.15 0.99 19.07 4) = 19.4 19.25 d re-ca	5 7 5 7 7 6 5	21 0.3	(85) (86) (87) (88) (89) (90) (91) (92) (93)

Utilisa	ation fac	tor for g	ains, hrr	n:										
(94)m=	0.99	0.97	0.94	0.86	0.7	0.5	0.34	0.37	0.61	0.88	0.97	0.99		(94)
Usefu	ul gains,	hmGm	, W = (9	4)m x (84	4)m									
(95)m=	818.81	918.04	974.84	953.86	806.22	552.9	360.32	379.1	593.55	780.92	787.76	779.54		(95)
Mont	hly aver	age exte	rnal terr	nperature	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 interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]				
(97)m=	1518.7	1474.47	1336.85	1111.05	845.91	557.02	360.63	379.67	607.14	939.26	1250.76	1510.37		(97)
Spac	e heatin	g require	ement fo	r each m	honth, k	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	520.72	373.92	269.34	113.17	29.53	0	0	0	0	117.81	333.36	543.74		_
								Tota	l per year	(kWh/year	<sup>•</sup> ) = Sum(9	8)15,912 =	2301.59	(98)
Spac	e heatin	g require	ement in	ı kWh/m²	/year								21.19	(99)
9a. En	erav rea	quiremer	nts – Ind	ividual h	eating s	vstems i	ncludinc	i micro-C	CHP)					_
Spac	e heatii	ng:			<u> </u>									
Fract	ion of sp	bace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fract	ion of sp	bace hea	at from n	nain syst	em(s)			(202) = 1 ·	- (201) =				1	(202)
Fract	ion of to	tal heati	na from	main sve	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main sna	ace heat	ing syste	em 1								90.8	$\frac{1}{(206)}$
Effici	ancy of	soconda		omontar	v hoatin	a svetor	o 0/						00.0	
LINCK			i y/suppi		y nealing		1, 70		-			_	0	(200)
•	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Spac	e heatin	g require	$\frac{1}{2}$			)			0	117.01	222.26	E 40 74	l	
	520.72	373.92	209.34	113.17	29.53	0	0	0	0	117.01	333.30	543.74		
(211)n	า = {[(98	6)m x (20	4)] } x 1	100 ÷ (20	)6)					· · · · · · ·	· · · · · · ·		l	(211)
	573.48	411.81	296.63	124.64	32.52	0	0	0	0	129.74	367.13	598.83		٦
								lota	ii (kvvn/yea	ar) = Sum(2)	211) <sub>15,1012</sub>	=	2534.79	(211)
Spac	e heatin	g fuel (s	econdar	y), kWh/	month									
= {[(98	)m x (20	)1)]}x1	00 ÷ (20	)8) 									I	
(215)m=	0	0	0	0	0	0	0				0	0		
								TOLA	ii (KVVII/yea	ar) =Sum(2	213) <sub>15,1012</sub>	-	0	(215)
Water	heating	<b>)</b>	ton ( la											
Output	215 47	ater nea	ter (caic	178 18	00VE) 172.51	151 94	145.57	162.28	164 07	185.36	196.03	210.28	l	
Efficie		ater hea	ter	110.10	11 2.01		110.07	102.20	101.07	100.00	100.00	210.20	81.5	7(216)
(217)m-	87.87	87.44	86.6	84.88	82 74	81.5	81.5	81.5	81.5	84.88	87.12	88	01.5	(217)
		hooting	00.0	04.00	02.74	01.5	01.5	01.5	01.5	04.00	07.12	00		(2)
(219)n	ו water 1 = (64)	meaning, m x 100	кууп/пі ) ÷ (217`	)m										
(219)m=	245.23	217.19	230.3	209.93	208.5	186.43	178.61	199.11	201.31	218.39	225.01	238.96		
								Tota	I = Sum(2	19a) <sub>112</sub> =		•	2558.98	(219)
Annua	al totals	i								k	Wh/year		kWh/year	4
Space	heating	fuel use	ed, main	system	1								2534.79	]
Water	heating	fuel use	d										2558.98	1
	-													_

Electricity for pumps, fans and electric keep-hot

central heating pump:		30	(230c)
boiler with a fan-assisted flue		45	(230e
Total electricity for the above, kWh/year	sum of (230	a)(230g) =	75 (231)
Electricity for lighting			458.9 (232)
Electricity generated by PVs			-647.71 (233)
10a. Fuel costs - individual heating systems	:		
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	<b>Fuel Cost</b> £/year
Space heating - main system 1	(211) x	3.48 x 0.01 =	88.21 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	- 0 (241)
Space heating - secondary	(215) x	13.19 × 0.01 =	= <u> </u>
Water heating cost (other fuel)	(219)	3.48 × 0.01 =	89.05 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	9.89 (249)
(if off-peak tariff, list each of (230a) to (230g) Energy for lighting	separately as applicable and approximately (232)	ply fuel price according to 13.19 × 0.01 =	Table 12a 60.53 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13 19 × 0.01 =	-85.43 (252)
Appendix Q items: repeat lines (253) and (25	(A) as needed	10.10	(202)
הטטכווטוא עדווכוווס. ובטכמו ווווכס ובטטו מווט ובט			
Total energy cost (245)	)(247) + (250)(254) =		282.25 (255)
Total energy cost       (245)         11a. SAP rating - individual heating systems	)(247) + (250)(254) =		282.25 (255)
Total energy cost(245)11a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)	)(247) + (250)(254) = S		282.25 (255) 0.42 (256)
Total energy cost(245)11a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)	((247) + (250)(254) = (i) x (256)] ÷ [(4) + 45.0] =		282.25 (255) 0.42 (256) 0.77 (257)
Total energy cost(245)11a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)SAP rating (Section 12)	i) x (256)] ÷ [(4) + 45.0] =		282.25 (255) 0.42 (256) 0.77 (257) 89.24 (258)
Total energy cost       (245)         11a. SAP rating - individual heating systems         Energy cost deflator (Table 12)         Energy cost factor (ECF)       [(255)         SAP rating (Section 12)         12a. CO2 emissions – Individual heating systems	stems including micro-CHP		282.25       (255)         0.42       (256)         0.77       (257)         89.24       (258)
Total energy cost       (245)         11a. SAP rating - individual heating systems         Energy cost deflator (Table 12)         Energy cost factor (ECF)       [(255)         SAP rating (Section 12)         12a. CO2 emissions – Individual heating systems	(247) + (250)(254) = (3) x (256)] ÷ [(4) + 45.0] = (3) stems including micro-CHP Energy kWh/year	<b>Emission factor</b> kg CO2/kWh	282.25 (255) 0.42 (256) 0.77 (257) 89.24 (258) Emissions kg CO2/year
Total energy cost       (245)         11a. SAP rating - individual heating systems         Energy cost deflator (Table 12)         Energy cost factor (ECF)       [(255)         SAP rating (Section 12)         12a. CO2 emissions – Individual heating systems         Space heating (main system 1)	(247) to freedout (247) + (250)(254) = (3) x (256)] ÷ [(4) + 45.0] = stems including micro-CHP Energy KWh/year (211) x	Emission factor kg CO2/kWh	282.25 (255) 0.42 (256) 0.77 (257) 89.24 (258) Emissions kg CO2/year 547.51 (261)
Total energy cost       (245)         11a. SAP rating - individual heating systems         Energy cost deflator (Table 12)         Energy cost factor (ECF)       [(255)         SAP rating (Section 12)         12a. CO2 emissions – Individual heating systems         Space heating (main system 1)         Space heating (secondary)	(247) + (250)(254) = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(4) + 45.0] = (i) x (256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] ÷ [(256)] • [(256)] ÷ [(	Emission factor kg CO2/kWh 0.216 = 0.519 =	282.25 (255) 0.42 (256) 0.77 (257) 89.24 (258) Emissions kg CO2/year 547.51 (261) 0 (263)
Total energy cost       (245)         11a. SAP rating - individual heating systems         Energy cost deflator (Table 12)         Energy cost factor (ECF)       [(255)         SAP rating (Section 12)         12a. CO2 emissions – Individual heating systems         Space heating (main system 1)         Space heating (secondary)         Water heating	(247) + (250)(254) = (i) x (256)] ÷ [(4) + 45.0] = (c) stems including micro-CHP (c) kWh/year (c) (211) x (c) (215) x (c) (219) x	Emission factor kg CO2/kWh 0.216 = 0.519 = 0.216 =	282.25 (255) 0.42 (256) 0.77 (257) 89.24 (258) Emissions kg CO2/year 547.51 (261) 0 (263) 552.74 (264)
Total energy cost(245)11a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)SAP rating (Section 12)12a. CO2 emissions – Individual heating systemsSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heating	(247) + (250)(254) = (3) (247) + (250)(254) = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (211) x (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) =	Emission factor kg CO2/kWh 0.216 = 0.519 = 0.216 =	282.25 (255) 0.42 (256) 0.77 (257) 89.24 (258) Emissions kg CO2/year 547.51 (261) 0 (263) 552.74 (264) 1100.25 (265)
Total energy cost       (245)         11a. SAP rating - individual heating systems         Energy cost deflator (Table 12)         Energy cost factor (ECF)       [(255)         SAP rating (Section 12)         12a. CO2 emissions – Individual heating systems         Space heating (main system 1)         Space heating (secondary)         Water heating         Space and water heating         Electricity for pumps, fans and electric keep-	(247) + (250)(254) = (3) (247) + (250)(254) = (256)] ÷ [(4) + 45.0] = (256)] ÷ [(4) + 45.0] = (256)] * (211) x (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x	Emission factor kg CO2/kWh 0.216 = 0.519 = 0.216 =	282.25 (255) 0.42 (256) 0.77 (257) 89.24 (258) Emissions kg CO2/year 547.51 (261) 0 (263) 552.74 (264) 1100.25 (265) 38.93 (267)
Total energy cost(245)11a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-lElectricity for lighting	(247) + (250)(254) = (i) x (256)] ÷ [(4) + 45.0] = (c) x (256)] ÷ [(4) + 45.0] = (c) x (210) x (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) = (c) x (231) x (232) x (232) x	Emission factor kg CO2/kWh 0.216 = 0.519 = 0.216 = 0.519 = 0.519 =	282.25 (255) 0.42 (256) 0.77 (257) 89.24 (258) Emissions kg CO2/year 547.51 (261) 0 (263) 552.74 (264) 1100.25 (265) 38.93 (267) 238.17 (268)
Total energy cost(245)11a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-IElectricity for lightingEnergy saving/generation technologiesItem 1	(247) + (250)(254) = s $(247) + (250)(254) =$ s s s s s s s s s s s s s s s s s s s	Emission factor kg CO2/kWh 0.216 = 0.519 = 0.216 = 0.519 = 0.519 = 0.519 =	282.25 (255) 0.42 (256) 0.77 (257) 89.24 (258) Emissions kg CO2/year 547.51 (261) 0 (263) 552.74 (264) 1100.25 (265) 38.93 (267) 238.17 (268) -336.16 (269)
Total energy cost(245)11a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)Energy cost factor (ECF)(255)SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-IElectricity for lightingEnergy saving/generation technologiesItem 1Total CO2, kg/year	$F(x) = \frac{1}{10000000000000000000000000000000000$	Emission factor kg CO2/kWh 0.216 = 0.519 = 0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519 =	282.25 (255) 0.42 (256) 0.77 (257) 89.24 (258) Emissions kg CO2/year 547.51 (261) 0 (263) 552.74 (264) 1100.25 (265) 38.93 (267) 238.17 (268) -336.16 (269) 1041.18 (272)

El rating (section 14)				91	(274)
13a. Primary Energy					
	<b>Energy</b> kWh/year	<b>Primary</b> factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22	=	3092.44	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	3121.95	(264)
Space and water heating	(261) + (262) + (263) + (264) =			6214.39	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1408.82	(268)
Energy saving/generation technologies Item 1		3.07	=	-1988.48	(269)
'Total Primary Energy	sum	of (265)(271) =		5864.98	(272)
Primary energy kWh/m²/year	(272)	) ÷ (4) =		54	(273)

Assessor Name:       Anthony Wing-King       Stroma Number:       STR0002972         Software Name:       Stroma FSAP 2012       Software Version:       Version:       1.0.3.15         Address :       Image: Stroma SSAP 2012       Stroma Number:       STR0002972       Version:       1.0.3.15         Address :       Image: Stroma Number:       Stroma Number:       Stroma Number:       Stroma Number:       Version:       1.0.3.15         Ground floor       Image: Stroma Number:       Avera(m?)       Avera(m?)       Avera(m?)       Version:       Volume(m?)         Ground floor       Image: Stroma Number:       Avera(m?)       Avera(m?)       Avera(m?)       Volume(m?)       Volume(m?)         Operating volume       Image: Stroma Number of the Stroma Number of the Stroma Number of the manage of the Stroma Number of the member of the Stroma Number of the member of the Stroma Number of the Stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number of stroma Number Num Num Num Num Num Num Num Num Num Num				User D	etails:						
Software Name:         Stroma FSAP 2012         Software Version:         Version:         1.0.3.15           Address:         Image: Control of the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the second and the se	Assessor Name:	Anthony Wing	g-King		Stroma	a Num	ber:		STRO	002972	
Property Address: Flat 6         Address:         Aldress:         Coveral dwelling dimensions:         Area(m <sup>3</sup> )       Av. Height(m)       Volume(m <sup>3</sup> )         Ground floor       Volume(m <sup>3</sup> )         Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)       Area(m <sup>3</sup> )       Volume(m <sup>3</sup> )         Diversity of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the set of the se	Software Name:	Stroma FSAF	P 2012		Softwa	re Ver	sion:		Versio	n: 1.0.3.15	
Acrea(m <sup>2</sup> )       Av: Height(m)       Volume(m <sup>2</sup> )         Ground floor       Section (1a) x       2.7       (2a) = 255.45       (3a)         Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)       94.61       (1a) x       2.7       (2a) = 255.45       (5a)         Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2"         Number of chimneys       main meaning heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating			Pi	roperty A	Address:	Flat 6					
Arce(m <sup>3</sup> )       Av. Height(m)       Volume(m <sup>3</sup> )         Ground floor       2.7       (2a) =       255.45       (3a)         Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $34.61$ (4)       255.45       (5)         Dwelling volume       (3a)+(3b)+(3c)+(3d)+(3e)+(3n) =       255.45       (5)         2. Vendilation rate:       main heating       total       m <sup>3</sup> per hour       (6a)         Number of chimneys       0       +       0       =       0       x40 =       0       (6b)         Number of passive vents       0       x10 =       30       (7a)       x40 =       0       (7b)         Number of thueless gas fires       0       x40 =       0       (7c)       Air changes per hour         Infiltration due to chimneys, flues and fans = (5a)+(5b)+(7a)+(7b)+(7c) =       30       x40 =       0       (7c)         Number of storeys in the dwelling (ns)       (3b)+(3c)+(3c)+(7a)+(7c)+(7c) =       30       (1b)       0       (1c)         Additional infiltration       0.25 for steel or timber frame or 0.35 for masonry construction       (1b)       (1c)       0       (1c)         If bit supended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0       0       (13)       0       (14) <td>Address :</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Address :										
All equity       Volume(iii)         Volume(iii)         Volume(iii)         Volume(iii)         Volume(iii)         Volume(iii)         Volume(iiii)         Volume(iiiii)	1. Overall dwelling dime	nsions:		Aros	(m <sup>2</sup> )			iaht(m)		Volumo(m <sup>3</sup> )	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $94.61$ (a)         Dwelling volume       (3a)+(3b)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c	Ground floor			9	4.61	(1a) x	AV. He	2.7	(2a) =	255.45	(3a)
Dwelling volume       (3a)+(3b)+(3c)+(3d)+(3c)+((3n))       255.45       (5)         2. Ventilation rate:       main heating 10 mber of chimneys       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       +       0       + <td>Total floor area TFA = (1a</td> <td>a)+(1b)+(1c)+(1d</td> <td>l)+(1e)+(1n</td> <td>) 9</td> <td>4.61</td> <td>(4)</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Total floor area TFA = (1a	a)+(1b)+(1c)+(1d	l)+(1e)+(1n	) 9	4.61	(4)					
2. Ventilation rate:       main heating       other       total       m³ per hour         Number of chimneys       0       +       0       =       0       x40 =       0       (6a)         Number of open flues       0       +       0       =       0       x40 =       0       (6a)         Number of open flues       0       +       0       =       0       x40 =       0       (6a)         Number of intermittent fans       0       x10 =       0       (7c)       0       x40 =       0       (7c)         Number of flueless gas fires       0       x40 =       0       (7c)	Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	255.45	(5)
main heatingsecondary heatingothertotalm³ per hourNumber of chimneys $0$ $+$ $0$ $=$ $0$ $x40$ $=$ $0$ (6a)Number of open flues $0$ $+$ $0$ $=$ $0$ $x20$ $0$ (6b)Number of intermittent fans $3$ $x10$ $3$ $x10$ $3$ $x10$ $3$ $(7a)$ Number of passive vents $0$ $x40$ $0$ $1$ $0$ $(7a)$ $3$ $x10$ $0$ $(7a)$ Number of flueless gas fires $0$ $x40$ $0$ $0$ $(7a)$ $0$ $x40$ $0$ $(7a)$ Number of storeys in the dwelling (ns) $A$ $a$ $a$ $a$ $a$ $(a)$ $(a)$ $(a)$ Additional infiltration: $0.5$ for steel or timber frame or $0.35$ for masonry construction $(9)$ $(14)$ $a$ $a$ $a$ $a$ $a$ $a$ $(a)$ $(a)$ $(a)$ $a$ $a$ $a$ $a$ $a$ $a$ $(a)$ $(a)$ $(a)$ $(a)$ $a$ $a$ $a$ $a$ $a$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $a$ $a$ $a$ $a$ $a$ $a$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$ $(a)$	2. Ventilation rate:										
Number of chimneys $0$ $+$ $0$ $+$ $0$ $=$ $0$ $x40$ $=$ $0$ $(6a)$ Number of open flues $0$ $+$ $0$ $+$ $0$ $=$ $0$ $x20$ $0$ $(6b)$ Number of intermittent fans $3$ $x10$ $=$ $30$ $(7a)$ $x10$ $0$ $(7a)$ Number of passive vents $0$ $x10$ $0$ $x10$ $0$ $(7a)$ $0$ $x40$ $0$ $0$ $(7a)$ Number of flueless gas fires $0$ $x40$ $0$ $0$ $x40$ $0$ $0$ $(7a)$ $x40$ $0$ $0$ $(7a)$ Number of storeys flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ $0$ $x40$ $0$ $0$ $(7a)$ $(7b)$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$ $a$		main heating	secondar heating	у	other		total			m <sup>3</sup> per hou	•
Number of open flues $0$ $0$ $0$ $0$ $0$ $220$ $0$ $0$ $0$ Number of intermittent fans $3$ $10$ $30$ $(7a)$ Number of passive vents $0$ $x10$ $0$ $(7b)$ Number of flueless gas fires $0$ $x40$ $0$ $(7c)$ Number of flueless gas fires $0$ $x40$ $0$ $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ = $30$ $+(5)$ = $0.12$ Number of storeys in the dwelling (ns) $0$ $0$ $0$ $(10)$ Additional infiltration $(0)-1 a,0.1$ = $0$ $(10)$ Structural infiltration $(25$ for steel or timber frame or $0.35$ for masonry construction $(0)-1 a,0.1$ = $0$ If suspended wooden floor, enter $0.2$ (unsealed) or $0.1$ (sealed), else enter $0$ $0$ $(12)$ Percentage of windows and doors draught stripped $0$ $0$ $(13)$ Window infiltration rate $0.25 \cdot [0.2 \times (14) + 100] =$ $0$ $(16)$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ $(17)$ If based on air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ $(17)$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ $(17)$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ $(17)$ Air permeability value, q50, exp	Number of chimneys	0	+ 0	+	0	] = [	0	X 4	40 =	0	(6a)
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Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4(17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ . otherwise $(18) = (16)$ 0.32(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.32(18)Number of sides sheltered2(19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85(20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.27(21)Infiltration rate modified for monthly wind speed0.32(21)(21)Monthly average wind speed from Table 70.215.154.94.44.33.83.744.34.54.7Wind Factor (22a)m = (22)m ÷ 4(22a)m =1.271.231.11.080.950.9211.081.121.18	Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$ 0.32(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered2(19)Shelter factor(20) = 1 - [0.075 x (19)] =0.85(20)Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.27(21)Infiltration rate modified for monthly wind speed0.32(21)0.85(20)Monthly average wind speed from Table 70.270.210.27(21)(22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div 4$ (22a)m = 1.27 $1.23$ $1.1$ $1.08$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	Air permeability value,	q50, expressed i	n cubic metre	s per ho	ur per so	quare m	etre of e	nvelope	area	4	(17)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered $2$ (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed $0.27$ (21)Infiltration rate modified for monthly wind speed $0.27$ (21)Monthly average wind speed from Table 7 $(22)m = 5.1 + 5 + 4.9 + 4.4 + 4.3 + 3.8 + 3.8 + 3.7 + 4 + 4.3 + 4.5 + 4.7$ Wind Factor (22a)m = (22)m ÷ 4 $(22a)m = 1.27 + 1.25 + 1.23 + 1.1 + 1.08 + 0.95 + 0.95 + 0.92 + 1 + 1.08 + 1.12 + 1.18$	If based on air permeabil	ty value, then (18	8) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (	16)				0.32	(18)
Number of sides shellered       2       (19)         Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $0.85$ (20)         Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $0.27$ (21)         Infiltration rate modified for monthly wind speed $110 \times (20) =$ $0.27$ (21)         Monthly average wind speed from Table 7 $(22)m =$ $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div 4$ $(22)m \div 4$ $1.27$ $1.23$ $1.1$ $1.08$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	Air permeability value applie	s if a pressurisation to d	est has been don	e or a deg	iree air pei	meability i	is being us	sed			
Infiltration rate incorporating shelter factor(21) = (18) × (20) =Infiltration rate modified for monthly wind speedJanFebMarAprMayJunJulAugSepOctNovDecMonthly average wind speed from Table 7(22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m ÷ 4(22a)m= $1.27$ $1.25$ $1.23$ $1.1$ $1.08$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	Shelter factor	u			(20) = 1 - [	0.075 x (1	9)] =			0.85	(19)
Infiltration rate modified for monthly wind speed $\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Infiltration rate incorporat	ing shelter factor			(21) = (18)	x (20) =				0.00	](21)
Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Monthly average wind speed from Table 7	Infiltration rate modified for	or monthly wind s	speed						I	0.21	
Monthly average wind speed from Table 7         (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m ÷ 4         (22a)m= $1.27$ $1.25$ $1.23$ $1.1$ $1.08$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m ÷ 4         (22a)m= $1.27$ $1.25$ $1.23$ $1.1$ $1.08$ $0.95$ $0.92$ $1$ $1.08$ $1.12$ $1.18$	Monthly average wind sp	eed from Table 7	7								
Wind Factor (22a)m = (22)m $\div 4$ (22a)m=       1.27       1.25       1.23       1.1       1.08       0.95       0.92       1       1.08       1.12       1.18	(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	Wind Factor $(22a)m = (22a)m $	2)m ÷ 4									
	(22a)m= 1.27 1.25	1.23 1.1 1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	tion rate	e (allowi	ng for sh	elter an	d wind sp	peed) =	(21a) x (	(22a)m					
0.34	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.3	0.32		
Calculate effect	tive air c	change r	rate for t	he appli	cable cas	se						0	(220)
If exhaust air hea	at pump u	sina Appe	endix N. (2	3b) = (23a	) x Fmv (e	guation (N	N5)) . other	wise (23b	(23a) = (23a)			0	(23b)
If balanced with I	heat recov	verv: effici	encv in %	allowing f	or in-use fa	actor (from	n Table 4h)	=	()			0	(23c)
a) If balanced	l mecha	nical ve	ntilation	with her	at recove	erv (MVI	⊣R) (24a	)m = (2	2b)m + (;	23b) <b>x</b> [*	1 – (23c)	- 1001	(200)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If balanced	d mecha	inical ve	ntilation	without	heat rec	overy (N	ىسى NV) (24b	)m = (2	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho	use ext	ract ven	tilation c	or positiv	e input v	entilatio	on from o	utside				I	
if (22b)m	< 0.5 ×	(23b), t	hen (240	c) = (23b	); otherw	vise (24	c) = (22b	) m + 0	.5 × (23b	)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m	entilatio = 1, the	n or whe	ole hous m = (22t	e positiv )m othe	ve input v erwise (24	ventilatio 4d)m = 0	on from le 0.5 + [(22	oft 2b)m² x	0.5]				
(24d)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d)
Effective air c	change i	rate - en	iter (24a	) or (24b	o) or (24c	c) or (24	d) in box	(25)			-		
(25)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
3 Heat losses	and he	at loss r	aramata	or:									
J. 1 1641 103363		ai 1055 L	Jaramete	7I.									
ELEMENT	Gros	s	Openin	gs	Net Are	ea	U-valu	le	AXU		k-value	)	AXk
ELEMENT	Gross area (	s (m²)	Openin m	gs 2	Net Are A ,m	a 1 <sup>2</sup>	U-valu W/m2	ie K	A X U (W/ł	<)	k-value kJ/m²-ł	) <	A X k kJ/K
ELEMENT Doors	Gross area (	s (m²)	Openin m	gs 2	Net Are A ,m	ea 1 <sup>2</sup> x	U-valu W/m2	ie K =	A X U (W/ł 3.22	<)	k-value kJ/m²∙ł	) <	A X k kJ/K (26)
ELEMENT Doors Windows Type	Gross area (	s (m²)	Openin m	gs 2	Net Are A ,m 2.3 1.41	ea 1 <sup>2</sup> x	U-valu W/m2 1.4 /[1/( 1.1 )+	Ie K = 0.04] =	A X U (W/ł 3.22 1.49	<) 	k-value kJ/m²·ł	) <	A X k kJ/K (26) (27)
ELEMENT Doors Windows Type	Gross area ( 1 2	s (m <sup>2</sup> )	Openin m	gs 2	Net Are A ,m 2.3 1.41 1.79	ea 1 <sup>2</sup> x x <sup>1,</sup> x <sup>1,</sup>	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+	ie K 0.04] = 0.04] =	A X U (W/ł 3.22 1.49 1.89	<) 	k-value kJ/m²۰ł	s <	A X k kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type	Gross area ( 1 2 3	s (m²)	Openin m	gs 2	Net Are A ,m 2.3 1.41 1.79 1.41	$ \begin{array}{c} \text{pa} \\ \text{p}^2 \\ \text{x}^1 \\ \text{x}^1 \\ \text{x}^1 \\ \text{x}^1 \end{array} $	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	Ie K 0.04] = 0.04] = 0.04] =	A X U (W/ł 3.22 1.49 1.89 1.49	<) 	k-value kJ/m²-ŀ	9 <	A X k kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gross area ( 1 2 3 4	s (m <sup>2</sup> )	Openin m	gs 2	Net Are A ,m 2.3 1.41 1.79 1.41 3.52	$ \begin{array}{c} \text{pa} \\ \text{p}^2 \\ \text{r} \\ \text{r} \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \end{array} $	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	Ie K = = 0.04] = 0.04] = 0.04] =	A X U (W/ł 3.22 1.49 1.89 1.49 3.71	<>	k-value kJ/m²-ŀ	, ≺	A X k kJ/K (26) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gross area ( 1 2 3 4 5	s (m <sup>2</sup> )	Openin m	gs 2	Net Are A ,m 2.3 1.41 1.79 1.41 3.52 1.79	$ \begin{array}{c} \text{a} \\ \text{b}^2 \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\ \text{c} \\$	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	Ie K = = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/ł 3.22 1.49 1.89 1.49 3.71 1.89		k-value kJ/m²-ŀ	9 <b>X</b>	A X k kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gross area ( 1 2 3 4 5 6	at 1055 p s (m <sup>2</sup> )	Openin m	gs 2	Net Are A ,m 2.3 1.41 1.79 1.41 3.52 1.79 1.79	$ \begin{array}{c} \text{pa} \\ \text{p}^2 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^1 \\ \text{r}^$	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+	Je         K         0.04]         0.04]         0.04]         0.04]         0.04]         0.04]         0.04]         0.04]         0.04]	A X U (W/ł 3.22 1.49 1.89 1.49 3.71 1.89 1.89	$\langle \rangle$	k-value kJ/m²-ŀ	2	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
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ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type2 Walls Type3	Gross area ( 1 2 3 4 5 6 7 24.7 43.09 23.35	s (m <sup>2</sup> )	Annex           Openin           m           4.93           3.2           5.37	gs 2	Net Are A ,m 2.3 1.41 1.79 1.41 3.52 1.79 1.79 1.79 1.79 19.77 39.89 17.98	$ \begin{array}{c} \text{pa} \\ \text{p}^{2} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{1} \\ \text{x}^{$	U-valu W/m2 1.4 /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ /[1/( 1.1 )+ 0.13 0.13	Je         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]         =         0.04]         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =           =         =	A X U (W/ł 3.22 1.49 1.89 1.49 3.71 1.89 1.89 1.89 2.57 5.19 2.34		k-value kJ/m²-ŀ		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
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\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	33.74	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	22553.77	(34)
Thermal mass parameter (TMP = $Cm \div TFA$ ) in kJ/m <sup>2</sup> K	Indicative Value: Medium	250	(35)
			-

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

can be i	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	K						10.63	(36)
if details	of therma	al bridging	are not kr	10wn (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			44.37	(37)
Ventila	ation 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=	47.14	46.94	46.75	45.86	45.69	44.92	44.92	44.77	45.22	45.69	46.03	46.39		(38)
Heat t	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	91.51	91.32	91.13	90.24	90.07	89.29	89.29	89.15	89.59	90.07	90.41	90.76		
				!			!	<u>.</u>		Average =	Sum(39)1.	12 /12=	90.24	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.97	0.97	0.96	0.95	0.95	0.94	0.94	0.94	0.95	0.95	0.96	0.96		_
Numb	er of day	/s in moi	nth (Tab	le 1a)						Average =	Sum(40)1.	12 /12=	0.95	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
				•						•	•	•		
4 Wa	ater hea	tina ener	rav reau	irement <sup>.</sup>								kWh/ve	ear:	
			9) 1044											
Assum		ipancy, l	N	<b>1</b> 4	( 0 0000	ио (тг	- 40.0		040/		2.	68		(42)
if TF	A > 13. A £ 13.	9, $N = 1$ 9, $N = 1$	+ 1.76 X	r - exp	(-0.0003	649 X (11	-A -13.9	)2)] + 0.0	JU13 X (	IFA -13.	.9)			
Annua	l averag	je hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		97	.94		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed	to achieve	a water us	se target o	f	-		
not mor	e that 125	litres per j	person pe	r day (all w	ater use, I	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	107.73	103.81	99.9	95.98	92.06	88.14	88.14	92.06	95.98	99.9	103.81	107.73		_
Francis	contont of	botwater	used as	la data di ma	anthly 1	100 v Vd v		). Tm / 2600		Total = Su	m(44) <sub>112</sub> =	=	1175.26	(44)
Energy			useu - cai	r T	5riuriiy = 4.	190 x Va,n	11 X 11111 X L	1 3000		iin (see ra	idies ID, I T	<i>c, 1a)</i>	I	
(45)m=	159.76	139.73	144.19	125.71	120.62	104.09	96.45	110.68	112	130.53	142.48	154.72		<b>-</b>
lf instan	taneous v	vater heatii	na at noini	t of use (no	hot water	storage)	enter () in	boxes (46	) to (61)	Total = Su	m(45) <sub>112</sub> =	=	1540.95	(45)
(46)m	22.06	20.06	01.62	10.00	18.00	45.64	44.47	10.0	10.0	10.59	04.07	22.24	l	(46)
Water	storage	20.90 loss:	21.03	10.00	16.09	15.61	14.47	10.0	10.0	19.56	21.37	23.21		(40)
Storac	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munitv h	neating a	nd no ta	ank in dw	vellina. e	nter 110	) litres in	(47)				-		
Otherv	vise if no	o stored	hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	ər '0' in (	47)			
Water	storage	loss:												
a) If n	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energ	y lost fro	m water	storage	e, kWh/ye	ear			(48) x (49)	) =			0		(50)
b) If n	nanufact	urer's de	eclared	cylinder l	oss fact	or is not	known:						I	
HOt Wa	ater stor	age loss	Tactor fi	rom Tabl	e 2 (kW	n/litre/da	ay)					0		(51)
Volum	e factor	from Ta	ee secii ble 2a	011 4.3								0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(52)
1		-									L	-		( /

Energy Enter	/ lost fro (50) or (	om water (54) in (5	storage 55)	e, kWh/y₀	ear			(47) x (51)	) x (52) x (	53) =		0		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	l d solar sto	I orage, (57)	n = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	<b>1</b> 7)m = (56)	n where (	H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (ar	nual) fro	ı m Tahlı	<u> </u>							0		(58)
Primar	y circuit	loss cal	culated	for each	month (	59)m = (	(58) ÷ 36	5 × (41)	m			-		
(mo	, dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	50.96	46.03	50.91	47.33	46.91	43.47	44.92	46.91	47.33	50.91	49.32	50.96		(61)
Total h	eat 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=	210.72	185.76	195.1	173.04	167.53	147.55	141.37	157.59	159.33	181.43	191.79	205.68		(62)
Solar DI	-IW 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 (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	210.72	185.76	195.1	173.04	167.53	147.55	141.37	157.59	159.33	181.43	191.79	205.68		_
								Outp	out from wa	ater heate	r (annual)₁	12	2116.9	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	65.86	57.97	60.67	53.63	51.83	45.48	43.3	48.53	49.07	56.13	59.7	64.18		(65)
inclu	ide (57)	m in calo	culation	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. Int	ternal ga	ains (see	Table 5	5 and 5a	):									
Metab	olic gair	s (Table	e 5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	161.02	161.02	161.02	161.02	161.02	161.02	161.02	161.02	161.02	161.02	161.02	161.02		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	58.89	52.3	42.54	32.2	24.07	20.32	21.96	28.54	38.31	48.65	56.78	60.53		(67)
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=	369.12	372.95	363.29	342.75	316.81	292.43	276.14	272.31	281.96	302.51	328.45	352.83		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	53.79	53.79	53.79	53.79	53.79	53.79	53.79	53.79	53.79	53.79	53.79	53.79		(69)
Pumps	and fai	ns gains	(Table :	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	se.g. ev	aporatic	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-107.35	-107.35	-107.35	-107.35	-107.35	, -107.35	-107.35	-107.35	-107.35	-107.35	-107.35	-107.35		(71)
Water	heating	gains (T	able 5)											
(72)m=	88.52	86.26	, 81.54	74.49	69.67	63.16	58.2	65.23	68.16	75.44	82.92	86.27		(72)
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	• + (69)m + (	(70)m + (7	1)m + (72)	m	I	
(73)m=	626.99	621.97	597.84	559.9	521.01	486.37	466.76	476.54	498.89	537.06	578.61	610.09		(73)
6. <u>So</u>	lar gains	6:		•	•		•							

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

Orienta	ition:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.79	×	10.63	×	0.76	×	0.7	] =	7.02	(74)
North	0.9x	0.77	x	1.41	x	10.63	x	0.76	×	0.7	] =	5.53	(74)
North	0.9x	0.77	x	1.79	x	20.32	×	0.76	×	0.7	] =	13.41	(74)
North	0.9x	0.77	x	1.41	x	20.32	x	0.76	x	0.7	] =	10.56	(74)
North	0.9x	0.77	x	1.79	x	34.53	x	0.76	x	0.7	=	22.79	(74)
North	0.9x	0.77	x	1.41	x	34.53	<b>x</b>	0.76	x	0.7	=	17.95	(74)
North	0.9x	0.77	x	1.79	x	55.46	x	0.76	x	0.7	=	36.6	(74)
North	0.9x	0.77	x	1.41	x	55.46	x	0.76	x	0.7	=	28.83	(74)
North	0.9x	0.77	x	1.79	x	74.72	x	0.76	x	0.7	=	49.31	(74)
North	0.9x	0.77	x	1.41	x	74.72	x	0.76	x	0.7	=	38.84	(74)
North	0.9x	0.77	x	1.79	x	79.99	x	0.76	x	0.7	=	52.78	(74)
North	0.9x	0.77	x	1.41	x	79.99	x	0.76	x	0.7	=	41.58	(74)
North	0.9x	0.77	x	1.79	x	74.68	x	0.76	x	0.7	=	49.28	(74)
North	0.9x	0.77	x	1.41	x	74.68	x	0.76	x	0.7	=	38.82	(74)
North	0.9x	0.77	x	1.79	x	59.25	x	0.76	x	0.7	=	39.1	(74)
North	0.9x	0.77	x	1.41	x	59.25	x	0.76	x	0.7	=	30.8	(74)
North	0.9x	0.77	x	1.79	x	41.52	x	0.76	x	0.7	=	27.4	(74)
North	0.9x	0.77	x	1.41	x	41.52	x	0.76	x	0.7	=	21.58	(74)
North	0.9x	0.77	x	1.79	x	24.19	x	0.76	x	0.7	=	15.96	(74)
North	0.9x	0.77	x	1.41	x	24.19	x	0.76	x	0.7	=	12.57	(74)
North	0.9x	0.77	x	1.79	x	13.12	x	0.76	x	0.7	=	8.66	(74)
North	0.9x	0.77	x	1.41	x	13.12	x	0.76	x	0.7	=	6.82	(74)
North	0.9x	0.77	x	1.79	x	8.86	x	0.76	×	0.7	] =	5.85	(74)
North	0.9x	0.77	x	1.41	x	8.86	x	0.76	x	0.7	=	4.61	(74)
East	0.9x	1	x	1.79	x	19.64	x	0.76	x	0.7	=	12.96	(76)
East	0.9x	1	x	1.79	x	19.64	x	0.76	x	0.7	=	12.96	(76)
East	0.9x	1	x	1.79	x	19.64	x	0.76	x	0.7	=	12.96	(76)
East	0.9x	1	x	1.79	x	38.42	x	0.76	x	0.7	=	25.35	(76)
East	0.9x	1	x	1.79	x	38.42	x	0.76	x	0.7	=	25.35	(76)
East	0.9x	1	x	1.79	x	38.42	x	0.76	x	0.7	=	25.35	(76)
East	0.9x	1	x	1.79	x	63.27	x	0.76	x	0.7	=	41.76	(76)
East	0.9x	1	x	1.79	x	63.27	x	0.76	x	0.7	=	41.76	(76)
East	0.9x	1	x	1.79	x	63.27	x	0.76	x	0.7	=	41.76	(76)
East	0.9x	1	x	1.79	x	92.28	x	0.76	x	0.7	=	60.9	(76)
East	0.9x	1	x	1.79	x	92.28	x	0.76	x	0.7	] =	60.9	(76)
East	0.9x	1	x	1.79	x	92.28	x	0.76	×	0.7	] =	60.9	(76)
East	0.9x	1	x	1.79	×	113.09	×	0.76	×	0.7	] =	74.63	(76)
East	0.9x	1	x	1.79	x	113.09	x	0.76	×	0.7	] =	74.63	(76)
East	0.9x	1	x	1.79	x	113.09	x	0.76	x	0.7	] =	74.63	(76)

East	0.9x	1	x	1.79	×	115.77	x	0.76	x	0.7	] =	76.4	(76)
East	0.9x	1	x	1.79	x	115.77	x	0.76	x	0.7	=	76.4	(76)
East	0.9x	1	x	1.79	x	115.77	x	0.76	x	0.7	=	76.4	(76)
East	0.9x	1	x	1.79	x	110.22	x	0.76	x	0.7	=	72.74	(76)
East	0.9x	1	x	1.79	x	110.22	x	0.76	x	0.7	=	72.74	(76)
East	0.9x	1	x	1.79	x	110.22	x	0.76	x	0.7	=	72.74	(76)
East	0.9x	1	x	1.79	x	94.68	x	0.76	x	0.7	=	62.48	(76)
East	0.9x	1	x	1.79	x	94.68	x	0.76	x	0.7	=	62.48	(76)
East	0.9x	1	x	1.79	x	94.68	x	0.76	x	0.7	=	62.48	(76)
East	0.9x	1	x	1.79	×	73.59	x	0.76	x	0.7	] =	48.56	(76)
East	0.9x	1	x	1.79	x	73.59	x	0.76	x	0.7	=	48.56	(76)
East	0.9x	1	x	1.79	x	73.59	x	0.76	x	0.7	=	48.56	(76)
East	0.9x	1	x	1.79	x	45.59	x	0.76	x	0.7	=	30.09	(76)
East	0.9x	1	x	1.79	×	45.59	x	0.76	x	0.7	] =	30.09	(76)
East	0.9x	1	x	1.79	x	45.59	x	0.76	x	0.7	=	30.09	(76)
East	0.9x	1	x	1.79	x	24.49	x	0.76	x	0.7	=	16.16	(76)
East	0.9x	1	x	1.79	x	24.49	x	0.76	x	0.7	=	16.16	(76)
East	0.9x	1	x	1.79	x	24.49	x	0.76	x	0.7	=	16.16	(76)
East	0.9x	1	x	1.79	x	16.15	x	0.76	x	0.7	=	10.66	(76)
East	0.9x	1	x	1.79	x	16.15	x	0.76	x	0.7	=	10.66	(76)
East	0.9x	1	x	1.79	x	16.15	x	0.76	x	0.7	=	10.66	(76)
West	0.9x	0.77	x	1.41	×	19.64	x	0.76	x	0.7	=	10.21	(80)
West	0.9x	0.77	x	3.52	x	19.64	x	0.76	x	0.7	=	25.49	(80)
West	0.9x	0.77	x	1.41	×	38.42	x	0.76	x	0.7	] =	19.97	(80)
West	0.9x	0.77	x	3.52	×	38.42	x	0.76	x	0.7	] =	49.86	(80)
West	0.9x	0.77	x	1.41	x	63.27	x	0.76	x	0.7	] =	32.89	(80)
West	0.9x	0.77	x	3.52	×	63.27	x	0.76	x	0.7	] =	82.11	(80)
West	0.9x	0.77	x	1.41	x	92.28	x	0.76	x	0.7	=	47.97	(80)
West	0.9x	0.77	x	3.52	×	92.28	x	0.76	x	0.7	] =	119.76	(80)
West	0.9x	0.77	x	1.41	x	113.09	x	0.76	x	0.7	=	58.79	(80)
West	0.9x	0.77	x	3.52	x	113.09	x	0.76	x	0.7	] =	146.76	(80)
West	0.9x	0.77	x	1.41	x	115.77	x	0.76	x	0.7	=	60.18	(80)
West	0.9x	0.77	x	3.52	x	115.77	x	0.76	x	0.7	=	150.24	(80)
West	0.9x	0.77	x	1.41	x	110.22	x	0.76	x	0.7	=	57.3	(80)
West	0.9x	0.77	x	3.52	x	110.22	x	0.76	x	0.7	] =	143.03	(80)
West	0.9x	0.77	x	1.41	x	94.68	x	0.76	x	0.7	=	49.22	(80)
West	0.9x	0.77	x	3.52	×	94.68	×	0.76	x	0.7	=	122.86	(80)
West	0.9x	0.77	x	1.41	×	73.59	×	0.76	x	0.7	] =	38.25	(80)
West	0.9x	0.77	x	3.52	×	73.59	×	0.76	x	0.7	=	95.5	(80)
West	0.9x	0.77	x	1.41	x	45.59	x	0.76	x	0.7	=	23.7	(80)
West	0.9x	0.77	x	3.52	x	45.59	x	0.76	x	0.7	=	59.16	(80)

West	0.9x	0.77	x	1.4	1	x	2	4.49	x	0.76	x	0.7	=	12.73	(80)
West	0.9x	0.77	x	3.5	52	x	2	4.49	x	0.76	_ × [	0.7	=	31.78	(80)
West	0.9x	0.77	x	1.4	1	x	1	6.15	x	0.76		0.7	=	8.4	(80)
West	0.9x	0.77	x	3.5	52	x	1	6.15	x	0.76	_ × [	0.7	=	20.96	(80)
	Ŀ														
Solar o	gains in	watts, ca	alculated	d for eac	h month				(83)m = S	um(74)m .	(82)m				
(83)m=	87.13	169.87	281.01	415.86	517.6	53	33.99	506.64	429.42	328.42	201.66	108.47	71.79		(83)
Total g	ains – i	nternal a	ind sola	r (84)m =	= (73)m ·	+ (8	83)m	, watts				-		I	
(84)m=	714.12	791.84	878.85	975.75	1038.61	10	20.36	973.4	905.96	827.32	738.71	687.08	681.88		(84)
7. Me	an inter	nal temp	erature	(heating	season	)						•			
Temp	erature	during h	eating p	periods ir	n the livi	ng	area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	) (S	ее Та	ble 9a)							
	Jan	Feb	Mar	Apr	May	Ù	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.97	0.9	0.75	(	0.55	0.4	0.45	0.71	0.93	0.99	0.99		(86)
Moon	intorno	L tompor	oturo in	living or			w etc	no 2 to 7	l in Tobl			<b>I</b>		1	
(87)m-	20.16	20.29	20.52	20.78	20.94			21 21	21	20.97	20.75	20.4	20.13	1	(87)
(07)11-	20.10	20.25	20.02	20.70	20.04	<u> </u>	0.55	21	21	20.07	20.10	20.4	20.13		(0.)
Temp	erature	during h	eating p	periods ir	n rest of	dw	elling	from Ta	ble 9, T	h2 (°C)	r		1	I	(00)
(88)m=	20.11	20.11	20.11	20.12	20.12	2	20.13	20.13	20.13	20.13	20.12	20.12	20.12		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)		-		-		
(89)m=	0.99	0.98	0.96	0.87	0.7		0.48	0.32	0.37	0.63	0.91	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing	T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	19	19.19	19.51	19.87	20.07	2	0.13	20.13	20.13	20.1	, 19.84	19.36	18.96		(90)
										f	LA = Livir	ng area ÷ (4	4) =	0.38	(91)
Mean	interna	l tompor	atura (fo	or the wh	ala dwa	llin	a) – fl	Δ 🗸 Τ1	ㅗ (1 _ fl	Δ) <del>v</del> T2					
(92)m=	19.43	19.61	19.89	20.21	20.39	2	9) – II 0.45	20.46	20.46	20.43	20.18	19.75	19.4		(92)
Apply	adiustr	nent to th	he mear	L internal	temper	<u>atu</u>	ire fro	m Table	4e whe	ere appro	opriate			i	
(93)m=	19.28	19.46	19.74	20.06	20.24		20.3	20.31	20.31	20.28	20.03	19.6	19.25		(93)
8. Sp	ace hea	ting regu	uirement	t I		1						1			
Set T	i to the i	mean int	ernal te	mperatu	re obtair	ned	at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calo	culate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a					-					
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hrr	n:							r	1	i	1	
(94)m=	0.99	0.98	0.95	0.87	0.7	(	0.49	0.34	0.38	0.65	0.91	0.98	0.99		(94)
Usefu	ıl gains,	hmGm ,	W = (9	4)m x (84	4)m						r			1	
(95)m=	706.17	775.46	835.96	846.31	730.2	50	04.75	330.55	347.48	535.12	669.88	671.9	675.86		(95)
Month	nly aver	age exte	rnal tem	nperature	e from Ta	abl	e 8			i		i		I	( )
(96)m=	4.3	4.9	6.5	8.9	11.7	Ĺ	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	hal tempe	erature,	Lm I	i , W =	=[(39)m :	x [(93)m	– (96)m	]			I	
(97)m=	1371.27	1329.22	1206.39	1007.33	769.63	50	08.98	330.92	348.23	553.44	849.56	1130.42	1365.92		(97)
Space	e heatin	g require	ement fo	or each n	nonth, k	Wh T	/mont	h = 0.02	24 x [(97	)m – (95 I	)m] x (4	1)m	<b>-</b> (- ) (-	I	
(98)m=	494.83	372.13	275.6	115.93	29.33		0	0	0	0	133.68	330.13	513.41		
									Tota	al per year	(kWh/yea	r) = Sum(9	8)15,912 =	2265.04	(98)
Space	e heatin	g require	ement in	kWh/m²	/year									23.94	(99)

9a. En	ergy rec	luiremer	nts – Ind	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												-
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fract	on of to	tal heatii	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.8	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %			-			0	(208)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c	calculate	d above)								1	
	494.83	372.13	275.6	115.93	29.33	0	0	0	0	133.68	330.13	513.41		
(211)m	n = {[(98	)m x (20	(4)] } x 1	100 ÷ (20	)6)	0			0	4 47 00	000 50	505 40	1	(211)
	544.97	409.83	303.52	127.68	32.3	0	0	0 Tota		147.23	363.58	565.43	0404 54	7(214)
Snac	o hootin	a fuol (o	ocondar	w) k\//b/	month			Tota	i (ittili yot			2	2494.54	
3pac = {[(98	)m x (20	)1)] } x 1	econdar 00 ÷ (20	у), күүн/ )8)	monun									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	2	0	(215)
Water	heating	I												_
Output	from w	ater hea	ter (calc	ulated a	bove)	447.55	4 4 4 0 7	457.50	450.00	404.40	404 70	005.00	1	
Efficie	210.72	ater hea	195.1 ter	173.04	167.53	147.55	141.37	157.59	159.33	181.43	191.79	205.68	91.5	7(216)
(217)m=	87.81	87.48	86.7	84,99	82,76	81.5	81.5	81.5	81.5	85.2	87,15	87.93	01.0	(217)
Fuel fo	or water	heating.	kWh/m	onth	02.110	0.110	0.110	0.110	0.110	00.2	01110	01100	]	· · ·
(219)n	n = (64)	m x 100	) ÷ (217)	)m									1	
(219)m=	239.98	212.35	225.03	203.59	202.43	181.05	173.46	193.36	195.5	212.94	220.08	233.91		-
								lota	I = Sum(2)	19a) <sub>112</sub> =			2493.69	(219)
Annua Space	heating	fuel use	ed. main	system	1					K	wh/year	•	<b>kWh/year</b>	1
Water	heating	fueluse	d	eyetetti	•								2403.60	J
	i leating			a la atria									2495.09	]
Electri	city for p	oumps, ta	ans and	electric	keep-no	ſ							1	
centra	al heatin	g pump:	:									30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)
Total e	electricity	/ for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electri	city for li	ghting											416	(232)
Electri	city gene	erated by	y PVs										-647.71	(233)
10a. I	- uel cos	ts - indiv	/idual he	eating sy	stems:									-4
						<b>Fu</b> kW	<b>el</b> /h/year			<b>Fuel P</b> (Table	<b>rice</b> 12)		<b>Fuel Cost</b> £/year	
Space	heating	- main s	system 1	1		(211	1) x			3.4	8	x 0.01 =	86.81	(240)

(213) x

(215) x

Space heating - main system 2

Space heating - secondary

0

0

(241)

(242)

x 0.01 =

x 0.01 =

0

13.19

Water heating cost (other fuel)	(219)		3.48	x 0.01 =	86.78	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to (23	0g) separately a	s applicable and a	apply fuel price acc	ording to T	able 12a	-
Energy for lighting	(232)		13.19	x 0.01 =	54.87	(250)
Additional standing charges (Table 12)					120	(251)
	one of	(233) to (235) x)	13.19	x 0.01 =	-85.43	(252)
Appendix Q items: repeat lines (253) and	(254) as needed	ł				
Total energy cost	245)(247) + (250).	(254) =			272.92	(255)
11a. SAP rating - individual heating syst	ems					
Energy cost deflator (Table 12)					0.42	(256)
Energy cost factor (ECF)	(255) x (256)] ÷ [(4) +	+ 45.0] =			0.82	(257)
SAP rating (Section 12)					88.55	(258)
12a. CO2 emissions – Individual heating	systems includi	ng micro-CHP				
	<b>Ener</b> kWh/	<b>gy</b> year	<b>Emission fa</b> kg CO2/kWh	ctor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211)	x	0.216	=	538.82	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	538.64	(264)
Space and water heating	(261) +	(262) + (263) + (264)	=		1077.46	(265)
Electricity for pumps, fans and electric ke	ep-hot (231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	215.9	(268)
Energy saving/generation technologies Item 1			0.519	=	-336.16	(269)
Total CO2, kg/year		5	sum of (265)(271) =		996.12	(272)
CO2 emissions per m <sup>2</sup>		(	272) ÷ (4) =		10.53	(273)
El rating (section 14)					90	(274)
13a. Primary Energy						-
	<b>Ener</b> kWh/	<b>gy</b> year	<b>Primary</b> factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	3043.34	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	3042.3	(264)
Space and water heating	(261) +	(262) + (263) + (264)	=		6085.64	(265)
Electricity for pumps, fans and electric ke	ep-hot (231)	x	3.07	=	230.25	(267)
Electricity for lighting	(232)	x	0	=	1277.13	(268)
Energy saving/generation technologies Item 1			3.07	=	-1988.48	(269)

'Total Primary Energy Primary energy kWh/m²/year sum of (265)...(271) =

(272) ÷ (4) =

5604	1.53	(272)
59.	24	(273)

Assessor Name:Anthony Wing-KingStroma Number:STR0002972Software Name:Stroma FSAP 2012Software Version:Version: 1.0.3.15Property Address: FlatAddress:Address:Ground floorStroma FSAP 2012Stroma Number:Stroma Number:Stroma Number:Volume(m?)Ground floorAv. Height(m)Volume(m?)Z.7(2a) $245.94$ (Sa)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ $ar.os$ </th <th></th> <th></th> <th>User I</th> <th>Details:</th> <th></th> <th></th> <th></th> <th></th> <th></th>			User I	Details:					
Property Address: Flat 7Address :1. Overall dwelling dimensions:Area(m?)Av. Height(m)Volume(m?)Ground floor91.09total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)91.09total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)91.09Volume(m?)Outling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =245.94(5)2. Ventilation rate:mainsecondarynothertotalmain meating+ 0+ 0- 0(6)Number of chimmeys.0+ 0+ 0+ 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0- 0 <t< th=""><th>Assessor Name: Software Name:</th><th>Anthony Wing-Kin Stroma FSAP 201</th><th>ig 2</th><th>Stroma N Software</th><th>Number: • Version:</th><th></th><th>STRO Versio</th><th>002972 n: 1.0.3.15</th><th></th></t<>	Assessor Name: Software Name:	Anthony Wing-Kin Stroma FSAP 201	ig 2	Stroma N Software	Number: • Version:		STRO Versio	002972 n: 1.0.3.15	
Address :1.Overal dwelling dimensions:Area(m <sup>2</sup> )Av. Height(m)Volume(m <sup>3</sup> )Ground floor91.09(1a) x2.7(2a) =245.94(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)91.09(1a) x2.7(2a) =245.94(5)2. Ventilation rate:main meatingsecondary heatingothertotalm <sup>3</sup> per hourNumber of chimneys0×40 =0(6a)Number of passive vents0×40 =0×40 =0(a)Number of flueless gas fires0×40 =0(a)(b)Number of storeys in the dwelling (ns)Additional infiltration0×40 =0(a)Additional infiltration:0×40 =0(a)Number of storeys in the dwelling (ns)Adi colspan="2">(a)(b)Number of storeys in the dwelling (ns)Adi colspan="2">(a)(b)Adi colspan="2">(a) <t< th=""><th></th><th></th><th>Property</th><th>Address: Fla</th><th>at 7</th><th></th><th></th><th></th><th></th></t<>			Property	Address: Fla	at 7				
A Overall dwelling dimensions:Area(m <sup>2</sup> ) 91.09Av. Height(m) (1a) xVolume(m <sup>2</sup> ) (2a) =Volume(m <sup>2</sup> ) (3a)Ground floor91.09(1a) x2.7(2a) =245.94(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)91.09(3a)+(3b)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c) +(3a)Dwelling volume(3a)+(3b)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c	Address :								
Area(m?)Av. Height(m)Volume(m?)Ground floor $91.09$ $(1a) \times$ $2.7$ $(2a) =$ $245.94$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ $91.09$ $(4)$ $(4)$ $(2a)+(3d)+(3c)+(3d)+(3e)+(3n) =$ $245.94$ $(5)$ Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3c)+(3d)+(3e)+(3n) =$ $245.94$ $(5)$ $(5)$ 2. Ventilation rate: $(a) + 0 =$ $0$ $x = 0$ $(a) +$ Number of chimneys $0$ $+$ $0$ $=$ $0$ $(a) +$ Number of open flues $0$ $+$ $0$ $=$ $0$ $(a) +$ Number of intermittent flans $4$ $x = 0$ $(7e)$ Number of passive vents $0$ $x = 0$ $(7e)$ Number of flueless gas fires $0$ $x = 0$ $(7e)$ Number of storeys in the dwelling (ns) $x = 0$ $x = 0$ $(1e)$ Additional infiltration $(2b)+(7a)+(7b)+(7b) =$ $40$ $+(5) =$ $0.16$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) $0$ $(10)$ Structural infiltration $(2b)+(7a)+(7b)+(7b) =$ $40$ $0$ $(10)$ Structural infiltration $0.25 + (0.2 \times (14) + 100] =$ $0$ $(12)$ If hordraght lobby, enter 0.05, else enter 0 $0.25 + (0.2 \times (14) + 100] =$ $0$ $(13)$ Percentage of windows and doors draught stripped $0.25 + (0.2 \times (14) + 100] =$ $0.36$ $(14)$ Window infiltration rate $(a) + (10) + (12) + ($	1. Overall dwelling dimer	isions:							
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $91.09$ (4) Dwelling volume (3a)+(3c)+(3d)+(3c)+(3d)+(3e)+(3n) = 245.94 (6) <b>2. Ventilation rate:</b> Number of chimneys $0$ + $0$ + $0$ = $0$ x40 = $0$ (6a) Number of open flues $0$ + $0$ + $0$ = $0$ x40 = $0$ (6b) Number of open flues $0$ + $0$ + $0$ = $0$ x40 = $0$ (6b) Number of intermittent fans $4$ x10 = $40$ (7a) Number of passive vents $0$ x 40 = $0$ (7c) Number of flueless gas fires $0$ x40 = $0$ (7c) Number of flueless gas fires $0$ x40 = $0$ (7c) Number of storeys in the dwelling (ns) Additional infiltration $(9)$ to (16) Number of storeys in the dwelling (ns) Additional infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if</i> both per ventage of windows and doors draught stripped Window infiltration $0.25 \cdot [0.2 \times (14) + 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area <i>if</i> based on air permeability value, then $(18) = [(17) + 20)(4)$ , otherwise (18) = (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area <i>if</i> based on air permeability value, then $(18) = [(17) + 20)(4)$ , otherwise (18) = (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area <i>if</i> based on air permeability value, then $(18) = [(17) + 20)(4)$ , otherwise (18) = (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area <i>if</i> based on air permeability value, then $(18) = [(17) + 20)(4)$ , otherwise (18) = (16) Air permeability value q50, expressed in cubic metres per hour per square metre of envelope area <i>if</i> based on air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area <i>if</i> based on air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area <i>if</i> based on air permeability value, q50, expre	Ground floor		Are	e <b>a(m²)</b> 91.09 (1a)	Av. He	<b>ight(m)</b> 2.7	(2a) =	245.94	(3a)
Develling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =245.94(5)2. Ventilation rate:main heating 0 $\phi$ other heatingtotalm³ per hourNumber of chimneys0+0=0(6e)Number of open flues0+0=0(6e)Number of intermittent fans4x10 =40(7e)Number of passive vents0x10 =0(7c)Number of flueless gas fires0x40 =0(7c)Number of storeys in the dwelling (ns) $Additional infiltration0(9)(9)Additional infiltration0.5 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (afterdeducting areas of openings); if equal user 0.35(9)(11)Percentage of windows and doors draught stripped0(12)0(12)Window infiltration0.25 - [0.2 x (14) + 100] =(14)Window infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =(16)Additional infiltration0.25 - [0.2 x (14) + 100] =(14)If no draught lobby, enter 0.25, espended on or a degree air permeability is being used(15)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area(17)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area(17)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area(17)Air permeab$	Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1e	e)+(1n)	91.09 (4)					
2. Ventilation rate:       main heating       secondary heating       other       total       m³ per hour         Number of chimneys       0       +       0       =       0       x40 =       0       (6a)         Number of open flues       0       +       0       =       0       x20 =       0       (6b)         Number of open flues       0       +       0       =       0       x20 =       0       (6b)         Number of intermittent fans       4       x10 =       40       (7a)       0       x10 =       0       (7c)         Number of flueless gas fires       0       x40 =       0       (7c)        At to =       0       (7c)         Number of storeys in the dwelling (ns) $x40 =$ 0       (17)       otherwise continue from (9) to (16)        0       (10)       0       (10)         Structural infiltration       0.25 for steel or timber frame or 0.35 for masonry construction       (b) (10)       0       (11)       0       (12)       0       (13)         Percentage of windows and doors draught stripped       0.25 for steel or 0       0.25 for (12) x (14) + 100] =       0       (13)         Air permeability value, q50, expressed in cubic metres per hour	Dwelling volume			(3a	a)+(3b)+(3c)+(3c	l)+(3e)+	(3n) =	245.94	(5)
main heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating heating 	2. Ventilation rate:	-	-						
Number of chimneys $\overline{0}$ + $\overline{0}$ + $\overline{0}$ = $\overline{0}$ $x40$ = $\overline{0}$ $(6a)$ Number of open flues $\overline{0}$ + $\overline{0}$ + $\overline{0}$ = $\overline{0}$ $(x20)$ = $\overline{0}$ $(6b)$ Number of intermittent fans $44$ $x10$ = $40$ $(7a)$ $44$ $x10$ = $\overline{0}$ $(7c)$ Number of passive vents $\overline{0}$ $x40$ = $\overline{0}$ $(7c)$ $x40$ = $\overline{0}$ $(7c)$ Number of flueless gas fires $\overline{0}$ $x40$ = $\overline{0}$ $(7c)$ $x40$ = $\overline{0}$ $(7c)$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ $40$ $+(5)$ $\overline{0}$ $(6b)$ $(7c)$ Number of storeys in the dwelling (ns) $Additional infiltration$ $(9)-1]x0.1$ $\overline{0}$ $(10)$ Structural infiltration: $0.25$ for steel or timber frame or $0.35$ for masonry construction $(9)-1]x0.1$ $\overline{0}$ $(11)$ if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user $0.35$ $\overline{0}$ $(12)$ $\overline{0}$ $(13)$ Percentage of windows and doors draught stripped $0$ $(14)$ $\overline{0}$ $(15)$ $\overline{0}$ $(16)$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ $(17)$ $\overline{0}$ $(16)$ Air permeability value, q50, expressed in cubic metres per hour per square wall area (after debility value, q50, expressed in cubic m		main se heating h	econdary neating	other	total			m <sup>3</sup> per hou	•
Number of open flues $0 + 0 + 0 = 0$ $x 20 = 0$ (6b) Number of intermittent fans $4 = 10$ (7a) Number of passive vents $0 = 10$ (7b) Number of gassive vents $0 = 10$ (7c) Number of flueless gas fires $0 = 10$ (7c) Air changes per hour $4 = 0$ (7c) Air changes per hour $4 = 0$ (7c) Air changes per hour $4 = 0$ (7c) Number of storeys in the dwelling (ns) Additional infiltration $0 = 0$ (9) Additional infiltration $0 = 0$ (9) Additional infiltration $0 = 0$ (9) If suppended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration $0 = 0$ (12) If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration $0 = 0$ (12) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = (10) = 0.85 (20)	Number of chimneys	0 +	0 +	0	= 0	x 4	0 =	0	(6a)
Number of intermittent fans4 $x 10 =$ 40(7a)Number of passive vents0 $x 10 =$ 0(7b)Number of flueless gas fires0 $x 40 =$ 0(7c)Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 40 $\div (5) =$ 0.16(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(9)Number of storeys in the dwelling (ns)0(9)(10)Additional infiltration(9)-1]×0.1 =0(10)Structural infiltration:0.25 for steel or timber frame or 0.35 for masonry construction0(12)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(12)If no draught lobby, enter 0.05, else enter 00(13)0(14)Percentage of windows and doors draught stripped0(14)(11)(15)0(15)Mirdow infiltration0.25 - [0.2 x (14) + 100] =0(15)(16)(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4(17)Air permeability value, qto explices if a pressurisation test has been done or a degree air permeability is being used0.36(18)Number of sides sheltered(20) = 1 - [0.075 x (19)] =0.35(20)Shelter factor(20) = 1 - [0.075 x (19)] =0.35(20)	Number of open flues	0 +	0 +	0	= 0	x 2	0 =	0	(6b)
Number of passive vents $0$ $x 10 =$ $0$ $(7b)$ Number of flueless gas fires $0$ $x 40 =$ $0$ $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ $40$ $+(5) =$ $0.16$ $(8)$ If a pressurisation test has been carried out or is intended, proceed to $(17)$ , otherwise continue from $(9)$ to $(16)$ $0$ $(9)$ Number of storeys in the dwelling (ns) $0$ $0$ $(9)$ Additional infiltration $(9)$ $0$ $(10)$ Structural infiltration: $0.25$ for steel or timber frame or $0.35$ for masonry construction $0$ $(11)$ if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user $0.35$ $0$ $0$ If suspended wooden floor, enter $0.2$ (unsealed) or $0.1$ (sealed), else enter $0$ $0$ $(12)$ Percentage of windows and doors draught stripped $0$ $(14)$ Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ $0$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ $0$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used $0.36$ Number of sides sheltered $(20) = 1 - [0.075 \times (19)] =$ $2$ Chieft factor $(20) = 1 - [0.075 \times (19)] =$ $2$	Number of intermittent fan	s	J L		4	x 1	0 =	40	(7a)
Number of flueless gas fires 0   x 40 = 0   (7c) Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c) = 40   + (5) = 0.16   (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration $(9)-1]x0.1 = 0   (9)$ Additional infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration $0.25 - [0.2 \times (14) + 100] = 0   (15)$ 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 If based on air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Number of sides sheltered Number of sides sheltered Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = 0   (20)$	Number of passive vents				0	x 1	0 =	0	(7b)
Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) = 40 + (5) = 0.16$ (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)Number of storeys in the dwelling (ns)Additional infiltrationAdditional infiltrationStructural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 009999999999999999999999999999999999999999999999999999999999999999 <td>Number of flueless gas fire</td> <td>es</td> <td></td> <td></td> <td>0</td> <td>x 4</td> <td>0 =</td> <td>0</td> <td>(7c)</td>	Number of flueless gas fire	es			0	x 4	0 =	0	(7c)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 40$ + $(5) = 0.16$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration $(9)$ Additional infiltration $(9)$ Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ (20) $= 1 - [0.075 \times (19)] =$							Air ch	anges per ho	ur
Additional infiltration $(10)$ $(10)$ $(10)$ 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) $(10)$ $(10)$ Additional infiltration $(10)$ $(10)$ Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction $(11)$ if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 $(11)$ If no draught lobby, enter 0.05, else enter 0 $0$ $(12)$ Percentage of windows and doors draught stripped $0$ $(14)$ Window infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ $0$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $(17)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used $(14)$ Number of sides sheltered $(20) = 1 - [0.075 \times (19)] =$ $(20)$ Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $(20)$	Infiltration due to chimney	s flues and fans = $(6)$	a)+(6b)+(7a)+(7b)+	(7c) =	40		(5) -	0.16	
Number of storeys in the dwelling (ns) $0$ Additional infiltration $[(9)-1]x0.1 =$ Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction $0$ if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 $0$ If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 $0$ If no draught lobby, enter 0.05, else enter 0 $0$ Percentage of windows and doors draught stripped $0$ Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ $4$ $(17)$ $Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered22(19)3belter factor(20) = 1 - [0.075 \times (19)] =2(19)0.85(20)$	If a pressurisation test has be	en carried out or is intende	ed, proceed to (17),	otherwise conti	inue from (9) to (	(16)	(0) -	0.10	
Additional infiltration $(9)-1]x0.1 =$ 0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(11)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) + 100] =0Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)0.36Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used2Number of sides sheltered2(19)Shelter factor(20) = 1 - [0.075 x (19)] =0.85Ut triane the base of the table of the table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of table of ta	Number of storeys in the	e dwelling (ns)					[	0	(9)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaIf based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredShelter factor(20) = 1 - [0.075 x (19)] =Ut trice to the factor(21) = (10) (10)(22) = 1 - [0.075 x (19)] =	Additional infiltration					[(9)-	1]x0.1 =	0	(10)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration Infiltration rate Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = (21) - (10) - (20)	Structural infiltration: 0.2	25 for steel or timber	frame or 0.35 fo	or masonry co	onstruction			0	(11)
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 Percentage of windows and doors draught stripped Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ (21) $\times (12) - (22)$	if both types of wall are pre	sent, use the value corres	ponding to the grea	ter wall area (ai	fter				
If no draught lobby, enter 0.05, else enter 0 $0$ $(13)$ Percentage of windows and doors draught stripped $0$ $(14)$ Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ $0$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ $0$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ $0.36$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used $2$ Number of sides sheltered $2$ $(19)$ Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $0.85$ Citie triane to be the factor $(20) = 1 - [0.075 \times (19)] =$ $0.85$	If suspended wooden flo	oor, enter 0.2 (unseal	led) or 0.1 (seal	ed), else ent	ter 0		[	0	<b>(</b> 12)
Percentage of windows and doors draught stripped0(14)Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0(15)Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4(17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.36(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used2(19)Number of sides sheltered $(20) = 1 - [0.075 \times (19)] =$ 2(19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85(20)	If no draught lobby, ente	er 0.05, else enter 0	, ,	,.				0	(13)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ $0$ $(15)$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ $0$ $(16)$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $4$ $(17)$ If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ $0.36$ $(18)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used $2$ $(19)$ Number of sides sheltered $(20) = 1 - [0.075 \times (19)] =$ $0.85$ $(20)$	Percentage of windows	and doors draught st	tripped					0	(14)
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 area4(17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.36(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used2(19)Number of sides sheltered $(20) = 1 - [0.075 \times (19)] =$ 0.85(20)	Window infiltration			0.25 - [0.2 x (1	14) ÷ 100] =		ĺ	0	(15)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4(17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.36(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used2(19)Number of sides sheltered(20) = 1 - [0.075 x (19)] =0.85(20)	Infiltration rate			(8) + (10) + (1	1) + (12) + (13) -	+ (15) =		0	(16)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.36       (18)         Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used       2       (19)         Number of sides sheltered       (20) = 1 - [0.075 x (19)] =       0.85       (20)         If the time of the factor       (21) = (12) = (22)       (20)	Air permeability value, c	50, expressed in cub	oic metres per h	our per squa	are metre of e	envelope	area	4	(17)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.85$ (20)	If based on air permeabilit	y value, then (18) = [(1	7) ÷ 20]+(8), otherv	vise (18) = (16)				0.36	(18)
Number of sides sheltered       2       (19)         Shelter factor       (20) = 1 - $[0.075 \times (19)] =$ 0.85       (20)         L (i) (10) (10) (10)       (20)       (20)       (20)	Air permeability value applies	if a pressurisation test has	s been done or a de	egree air permea	ability is being u	sed	г		
	Shelter factor			(20) = 1 - [0.07	75 x (19)] =			2	$-\binom{(19)}{(20)}$
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.31$ (21)	Infiltration rate incorporatir	ng shelter factor		(21) = (18) x (2	20) =		l	0.31	$\int_{(21)}^{(20)}$
Infiltration rate modified for monthly wind speed	Infiltration rate modified fo	r monthly wind speed	ł				l	0.01	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb M	Mar Apr May	Jun Jul	Aug	Sep Oct	Nov	Dec		
Monthly average wind speed from Table 7	Monthly average wind spe	ed from Table 7	•	· · ·					
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	(22)m= 5.1 5 4	.9 4.4 4.3	3.8 3.8	3.7	4 4.3	4.5	4.7		
Wind Factor (22a)m = (22)m $\div$ 4	Wind Factor $(22a)m = (22)$	)m ÷ 4	· ·		1	·			
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95 0.95	0.92	1 1.08	1.12	1.18		

Adjusted infil	tration rat	e (allowi	ing for sh	elter an	d wind s	peed) =	(21a) x (	22a)m					
0.39	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36		
Calculate effe	ective air cal ventila	change	rate for t	he appli	cable ca	se					1		(220)
lf exhaust air	heat pump	usina Appe	endix N. (2	3b) = (23a	a) × Fmv (e	equation (	N5)) . otherv	wise (23b	) = (23a)		l	0	(23b)
If balanced w	ith heat rec	overv: effic	iencv in %	allowing	or in-use f	actor (fron	n Table 4h)	=	, (,			0	(230)
a) If baland	red mech	anical ve	ntilation	with he	at recove	⊃rv (MV	HR) (24a)	m = (2)	2h)m + (2	3h) x [′	   _ (23c)	 - 1001	(230)
(24a)m = 0			0	0	0			0		0	0	. 100]	(24a)
b) If balance	 ced mech	I anical ve	entilation	without	L heat rec	L :overv (l	I I MV) (24b)	m = (2)	11 2b)m + (2	3b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole	house ex	tract ver	ntilation of	or positiv	/e input v	ventilatio	on from o	utside	I I				
, if (22b)	)m < 0.5 >	< (23b), t	then (24d	c) = (23k	); other	wise (24	c) = (22b)	) m + 0.	.5 × (23b)				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natura if (22b)	al ventilati )m = 1, th	on or wh en (24d)	ole hous $m = (22k)$	e positi b)m othe	ve input erwise (2	ventilati 4d)m =	on from lo 0.5 + [(22	oft 2b)m² x	0.5]				
(24d)m= 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57		(24d)
Effective a	ir change	rate - er	nter (24a	) or (24l	b) or (24	c) or (24	d) in box	(25)					
(25)m= 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57		(25)
3 Heat loss	os and b	at loss r	oaramot	or:									
ELEMENT	Gros	SS (m <sup>2</sup> )	Openin	gs	Net Ar	ea	U-valu	e	AXU	· · ·	k-value	)	A X k
	uicu	$(\Pi = )$		-	A,r	n²	VV/m2k	ς	(VV/K	.)	KJ/m²∙r	<b>\</b>	
Doors	arca	(11-)	II	-	A ,r	m²	VV/m2r	<   =	(W/K 3.22	.)	KJ/M²∙r	<b>N</b>	(26)
Doors Windows Typ	be 1	(111-)	II	-	A ,r 2.3 4.61	m² x x1	VV/m2r 1.4 /[1/( 1.1 )+ (	 	(VV/K 3.22 4.86		KJ/M²•ł	× ·	(26)
Doors Windows Typ Windows Typ	be 1 be 2	(11-)	II	-	A ,r 2.3 4.61	n² x x1 x1	VV/m2r <u>1.4</u> /[1/( 1.1 )+ ( /[1/( 1.1 )+ (	<b>x</b> =   0.04] =   0.04] =	(W/K 3.22 4.86		KJ/M²·ł	X	(26) (27) (27)
Doors Windows Typ Windows Typ Windows Typ	be 1 be 2 be 3	(11-)	11	-	A ,r 2.3 4.61 1.11	n <sup>2</sup> x x1 x1 x1 x1	VV/m2r <u>1.4</u> /[1/( 1.1 )+ ( /[1/( 1.1 )+ ( /[1/( 1.1 )+ (	<pre>&lt; =   .0.04] =   .0.04] =   .0.04] =   </pre>	(W/K 3.22 4.86 1.17 1.89		KJ/M <sup>2</sup> ·P	X	(26) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ	be 1 be 2 be 3 be 4	(11-)			A ,r 2.3 4.61 1.11 1.79	n <sup>2</sup> x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	VV/m2r 1.4 /[1/( 1.1 )+ ( /[1/( 1.1 )+ ( /[1/( 1.1 )+ ( /[1/( 1.1 )+ (	<pre></pre>	(W/K 3.22 4.86 1.17 1.89 1.16		KJ/M²•P	×	(26) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	be 1 be 2 be 3 be 4 be 5	(11-)		-	A ,r 2.3 4.61 1.11 1.79 1.1 0.99	n <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1	VV/m2r 1.4 /[1/( 1.1 )+ ( /[1/( 1.1 )+ ( /[1/( 1.1 )+ ( /[1/( 1.1 )+ ( /[1/( 1.1 )+ (	$\begin{array}{c} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/K 3.22 4.86 1.17 1.89 1.16 1.04		KJ/M²∙r	×	(26) (27) (27) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	be 1 be 2 be 3 be 4 be 5 be 6	(11-)		-	A,r 2.3 4.61 1.11 1.79 1.1 0.99 2.19	n <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	$\frac{1.4}{(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1)+(1)+(1/(1)+(1)+(1/(1)+(1)+(1)+(1)+(1/(1)+(1)+(1)+(1/(1)+(1)+(1/(1)+(1)+(1)+(1)+(1)+(1)+(1/(1)+(1)+(1)+(1)+(1)+(1)+(1)+(1)+(1)+(1)+$	$\begin{array}{c} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(VV/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31		KJ/M²•r	×	(26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	2 2 2 2 2 2 2 3 2 2 5 5 5 5 5 5 5 5 5 5	(11-)		-	A,r 2.3 4.61 1.11 1.79 1.1 0.99 2.19 1.79	n <sup>2</sup> 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>1</sup>	$\frac{1.4}{(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1)+(1/(1)+(1)+(1/(1)+(1)+(1/(1)+(1)+(1)+(1/(1)+(1)+(1/(1)+(1)+(1)+(1)+(1/(1)+(1)+(1)+(1)+(1)+(1)+(1)+(1)+(1)+(1)+$	$ \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	(W/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31 1.89		KJ/M²•r	X	(26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	2000 1 2000 2 2000 3 2000 4 2000 5 2000 6 2000 7 2000 8	(11-)		-	A,r 2.3 4.61 1.11 1.79 1.1 0.99 2.19 1.79 1.79	n <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	$\frac{1.4}{(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1))))))))))))))))))))))))))))))))$	$ \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	(VV/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31 1.89 1.89		KJ/M²•r	×	(26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	2 2 2 2 2 2 2 2 2 2 2 2 2 2	(11-)		-	A,r 2.3 4.61 1.11 1.79 1.1 0.99 2.19 1.79 1.79 0.99	n <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	$\frac{1.4}{(1/(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+$	$ \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	(W/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31 1.89 1.89 1.04		KJ/M²•r	×	(26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor	2 2 2 2 2 2 2 2 3 2 2 4 2 2 5 2 5 5 2 5 5 5 5 6 6 5 5 5 6 7 2 5 7 5 5 5 5 6 7 5 5 5 5 7 5 7 5 7 5 7 5	(11-)		-	A,r 2.3 4.61 1.11 1.79 1.1 0.99 2.19 1.79 1.79 0.99 0.566	$\begin{array}{c c} n^{2} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2}$	$\frac{1.4}{[1/(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+$	$\sum_{i=1}^{i} = i$ $\sum_{i=1}^{2} \sum_{i=1}^{2}	(VV/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31 1.89 1.89 1.89 1.04		KJ/M²•P		(26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Type1	2 2 2 2 2 2 2 2 2 2 2 2 2 2	14	6.4		A,r 2.3 4.61 1.11 1.79 1.1 0.99 2.19 1.79 1.79 0.99 0.566 12.74	$\begin{array}{c} n^{2} \\ x \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{2} \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ $	$\frac{1.4}{[1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+$	$\sum_{i=1}^{n} =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i  =  i$	(VV/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31 1.89 1.89 1.89 1.04 0.05094 1.66		KJ/m²• P		(26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Type1 Walls Type2	2 = 1 2 = 2 2 = 3 2 = 4 2 = 5 2 = 6 2 = 7 2 = 8 2 = 9 19.7 42.6	14	6.4		A,r 2.3 4.61 1.11 1.79 1.79 2.19 1.79 1.79 0.99 0.566 12.74 39.46	$\begin{array}{c c} n^{2} & x \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{2} \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ $	$\frac{1.4}{[1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)$	$\begin{cases} \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.0$	(VV/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31 1.89 1.89 1.89 1.04 0.05094 1.66 5.13		KJ/m²• P		(26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Type1 Walls Type3	1000	14 56 79	6.4 3.2 5.77		A,r 2.3 4.61 1.11 1.79 1.1 0.99 2.19 1.79 1.79 0.99 0.566 12.74 39.46 15.02	$\begin{array}{c} n^{2} \\ x \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{2} \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ $	$\frac{1.4}{[1/(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+(1.1)+$	$\begin{cases} \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.0$	(VV/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31 1.89 1.89 1.89 1.04 0.05094 1.66 5.13 1.95		KJ/m²• ł		<ul> <li>(26)</li> <li>(27)</li> <li>(22)</li> <li>(29)</li> <li>(29)</li> <li>(29)</li> </ul>
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Type1 Walls Type3 Walls Type4	2000 = 1 2000 = 2 2000 = 3 2000 = 3 2000 = 2 2000	14 56 79 3	6.4 3.2 5.77 2.3		A,r 2.3 4.61 1.11 1.79 1.1 0.99 2.19 1.79 1.79 0.99 0.566 12.74 39.46 15.02 27	$n^{2}$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{2}$ $x$ $x$ $x$ $x$ $x$ $x$ $x$ $x$ $x$ $x$	$\frac{1.4}{[1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1)+(1/(1)+$	$\begin{cases} \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ $	(VV/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31 1.89 1.89 1.89 1.04 0.05094 1.66 5.13 1.95 3.17		KJ/m²• ł		(26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Floor Walls Type1 Walls Type3 Walls Type4 Walls Type5	$\begin{array}{c} 1 \\ 1 \\ 1 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\$	14 56 79 3 9	6.4 3.2 5.77 2.3		A,r 2.3 4.61 1.11 1.79 1.79 2.19 1.79 1.79 0.99 0.566 12.74 39.46 15.02 27 0	$n^{2}$ $x$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{1}$ $x^{2}$ $x$ $x$ $x$ $x$ $x$ $x$ $x$ $x$ $x$ $x$	$\frac{1.4}{(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1.1)+(1/(1)+(1/(1)+(1/(1.1)+(1/(1.1)+(1/(1)+(1)+(1/(1)+(1/(1)+(1)+(1/(1$	$\begin{cases} \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 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] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ $	(VV/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31 1.89 1.04 0.05094 1.66 5.13 1.95 3.17 0		KJ/m²• ł		<ul> <li>(26)</li> <li>(27)</li> <li>(22)</li> <li>(29)</li> </ul>
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Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type3 Walls Type3 Walls Type4 Walls Type5 Roof Total area of	2 = 1 2 = 2 2 = 3 2 = 4 2 = 5 2 = 6 2 = 6 2 = 7 2 = 6 2 = 7 2 = 6 2 = 7 2 = 6 2 = 7 2 = 6 2 = 7 2 = 6 2 = 7 2 = 6 2 = 7 2 = 6 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2 = 7 2	14 56 79 3 9 7	6.4 3.2 5.77 2.3 0.99 0		A,r 2.3 4.61 1.11 1.79 1.79 1.79 1.79 1.79 0.99 0.566 12.74 39.46 15.02 27 0 0.57 114.0	$\begin{array}{c} n^{2} \\ x \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{2} \\ x^{2} \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ x \\ $	W/m2r         1.4         /[1/(1.1)+(         /[1/(1.1)+(         /[1/(1.1)+(         /[1/(1.1)+(         /[1/(1.1)+(         /[1/(1.1)+(         /[1/(1.1)+(         /[1/(1.1)+(         /[1/(1.1)+(         /[1/(1.1)+(         0.09         0.13         0.13         0.13         0.13         0.13	$\begin{cases} \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 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 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.0$	(VV/K 3.22 4.86 1.17 1.89 1.16 1.04 2.31 1.89 1.89 1.04 0.05094 1.66 5.13 1.95 3.17 0 0.06		KJ/m²• ł		<ul> <li>(26)</li> <li>(27)</li> <li>(29)</li> <li>(21)</li> </ul>

\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions

Fabric heat loss,  $W/K = S (A \times U)$ 

(26)(30) + (32) =	(26)	(30)	+	(32)	=
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Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	17948.58	(34)
Therm	al mass	parame	ter (TMF	- = Cm -	÷ TFA) ir	ı kJ/m²K			Indicat	tive Value:	Medium		250	(35)
For des can be t	ign asses: used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	e constructi	on are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						11.05	(36)
if details	of therma	al bridging	are not kn	nown (36) :	= 0.15 x (3	1)				<i>(</i> )				_
l otal f	abric he	at loss							(33) +	(36) =			43.52	(37)
Ventila	ation hea	at loss ca	alculated	d monthl	y I				(38)m	= 0.33 × (	25)m x (5)		1	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	-	(20)
(38)m=	46.85	46.61	46.37	45.25	45.04	44.06	44.06	43.88	44.44	45.04	45.46	45.9	]	(36)
Heat t	ransfer o	coefficier	nt, W/K	1			r		(39)m	= (37) + (3	38)m		1	
(39)m=	90.37	90.13	89.89	88.77	88.56	87.58	87.58	87.4	87.96	88.56	88.98	89.43	ļ	<b>-</b>
Heat lo	oss para	meter (H	HLP), W	/m²K					/ (40)m	Average = = (39)m ÷	Sum(39)₁. (4)	12 /12=	88.77	(39)
(40)m=	0.99	0.99	0.99	0.97	0.97	0.96	0.96	0.96	0.97	0.97	0.98	0.98		_
Numb	er of day	/s in moi	nth (Tab	le 1a)			-		, , , , , , , , , , , , , , , , , , ,	<pre>\verage =</pre>	Sum(40)1.	12 /12=	0.97	(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)
if TF if TF	A > 13. A £ 13.	9, N = 1 9, N = 1	+ 1.76 x	: [1 - exp	0.0003	49 x (TF	FA -13.9	)2)] + 0.0	013 x (1	FA -13.	9)	_	1	
Annua Reduce	l averag	je hot wa al average	ater usag hot water	ge in litre usage by	es per da 5% if the a	iy Vd,avo Iwelling is	erage = designed t	(25 x N) to achieve	+ 36 a water us	e target o	96 f	.91	]	(43)
not mor	e that 125	litres per j	person pei I	r day (all w T	/ater use, l	not and col	ld)							
1 104	Jan	Feb	Mar	Apr	May								1	
JUL WAL	er usaye r	n nues per		acrimonui	Vdm - fo	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(44)m=	106.6	102.72		r	Vd,m = fa	Jun ctor from 7	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec	]	
Energy			98.85	94.97	Vd,m = fa 91.09	Jun ctor from 7 87.22	Jul Table 1c x 87.22	Aug (43) 91.09	Sep 94.97	Oct 98.85	Nov 102.72	Dec 106.6	]	
•••	content of	hot water	98.85 used - cal	94.97 Iculated m	Vd,m = fai 91.09 onthly = 4.	Jun ctor from 7 87.22 190 x Vd,n	Jul Fable 1c x 87.22 n x nm x E	Aug (43) 91.09 07m / 3600	Sep 94.97 kWh/mon	Oct 98.85 Fotal = Suu th (see Ta	Nov 102.72 m(44)112 bbles 1b, 1	Dec 106.6 c, 1d)	1162.9	(44)
(45)m=	content of 158.08	hot water 138.26	98.85 used - cal 142.67	94.97 Iculated me 124.39	Vd,m = far91.09 onthly = 4. 119.35	Jun ctor from 7 87.22 190 x Vd,n 102.99	Jul Table 1c x 87.22 n x nm x D 95.44	Aug (43) 91.09 07m / 3600 109.51	Sep 94.97 <i>kWh/mon</i> 110.82	Oct 98.85 Total = Suu th (see Ta 129.15	Nov 102.72 m(44) <sub>112</sub> = bbles 1b, 1 140.98	Dec 106.6 c, 1d) 153.1	] 	(44)
(45)m= If instan	content of 158.08 taneous v	hot water 138.26 vater heati	98.85 used - cal 142.67 ng at point	94.97 Iculated me 124.39 t of use (no	Vd,m = fai 91.09 onthly = 4. 119.35 o hot water	Uun ctor from 7 87.22 190 x Vd,n 102.99 storage),	Jul Fable 1c x 87.22 n x nm x E 95.44 enter 0 in	Aug (43) 91.09 07m / 3600 109.51 boxes (46)	Sep 94.97 9 <i>kWh/mon</i> 110.82 9 <i>to</i> (61)	Oct 98.85 Fotal = Sun th (see Ta 129.15 Fotal = Sun	Nov 102.72 m(44) <sub>112</sub> = ables 1b, 1 140.98 m(45) <sub>112</sub> =	Dec 106.6 <i>c, 1d)</i> 153.1	1162.9	(44) (45)
(45)m= (46)m= (46)m= Water	content of 158.08 taneous v 23.71 storage	i hot water 138.26 vater heatii 20.74 IOSS:	98.85 used - cal 142.67 ng at point 21.4	94.97 Iculated mile 124.39 t of use (no 18.66	Vd,m = fai 91.09 onthly = 4. 119.35 o hot water 17.9	Jun ctor from 7 87.22 190 x Vd,r 102.99 * storage), 15.45	Jul Fable 1c x 87.22 n x nm x E 95.44 enter 0 in 14.32	Aug (43) 91.09 07m / 3600 109.51 boxes (46) 16.43	Sep 94.97 9 <i>kWh/mon</i> 110.82 9 <i>to</i> (61) 16.62	Oct 98.85 Total = Suu th (see Ta 129.15 Total = Suu 19.37	Nov 102.72 m(44) <sub>112</sub> = bbles 1b, 1 140.98 m(45) <sub>112</sub> = 21.15	Dec 106.6 <i>c, 1d)</i> 153.1 22.96	] 	(44) (45) (46)
(45)m= (46)m= Water Storag	content of 158.08 taneous v 23.71 storage je volum	i hot water 138.26 vater heatii 20.74 IOSS: ne (litres)	98.85 used - cal 142.67 ng at point 21.4 ) includir	94.97 Iculated mi 124.39 t of use (no 18.66	Vd,m = fa 91.09 onthly = 4. 119.35 o hot water 17.9 olar or W	Uun <i>ctor from</i> 7 87.22 190 x Vd,r 102.99 <sup>-</sup> storage), 15.45 /WHRS ≈	Jul <i>Fable 1c x</i> 87.22 <i>n x nm x E</i> 95.44 <i>enter 0 in</i> 14.32 storage	Aug (43) 91.09 07m / 3600 109.51 boxes (46, 16.43 within sa	Sep 94.97 110.82 0 to (61) 16.62	Oct 98.85 Fotal = Sun th (see Ta 129.15 Fotal = Sun 19.37	Nov 102.72 m(44) <sub>112</sub> = ables 1b, 1 140.98 m(45) <sub>112</sub> = 21.15	Dec 106.6 <i>c, 1d)</i> 153.1 22.96	] 	(44) (45) (46) (47)
(45)m= (46)m= Water Storag f com Otherv Water	taneous v 23.71 storage volum munity h vise if no storage	hot water 138.26 vater heatin 20.74 loss: ne (litres) neating a p stored loss:	98.85 used - cal 142.67 ng at point 21.4 ) includir includir hot wate	94.97 Iculated mi 124.39 t of use (no 18.66 ing any so ank in dw er (this ir	Vd,m = fa 91.09 onthly = 4. 119.35 o hot water 17.9 olar or W velling, e	Jun           ctor from 1           87.22           190 x Vd,r.           102.99           storage),           15.45           /WHRS           nter 110           nstantan	Jul Fable 1c x 87.22 m x nm x D 95.44 enter 0 in 14.32 storage litres in neous co	Aug (43) 91.09 07m / 3600 109.51 boxes (46, 16.43 within sa (47) ombi boil	Sep 94.97 9 <i>kWh/mon</i> 110.82 9 <i>to</i> (61) 16.62 ame vess ers) ente	Oct 98.85 Fotal = Sun th (see Ta 129.15 Fotal = Sun 19.37 Sel er 'O' in (	Nov 102.72 m(44) <sub>112</sub> = ables 1b, 1 140.98 m(45) <sub>112</sub> = 21.15 ( 47)	Dec 106.6 <i>c, 1d)</i> 153.1 22.96 0	]    ]  ] 	(44) (45) (46) (47)
45)m= f instan 46)m= Water Storag f com Otherv Water a) If m	taneous v 23.71 storage ye volum munity h vise if no storage nanufact	ater heating 138.26 vater heatin 20.74 loss: he (litres) heating a postored loss: surer's de	98.85 used - cal 142.67 ng at point 21.4 includir ind no ta hot wate	94.97 Iculated mi 124.39 t of use (no 18.66 ng any si ank in dw er (this ir oss facto	Vd,m = fa 91.09 onthly = 4. 119.35 o hot water 17.9 olar or W velling, e ncludes i	Jun           ctor from 1           87.22           190 x Vd,r.           102.99           * storage),           15.45           /WHRS #           nter 110           nstantan           wn (kWh	Jul Fable 1c x 87.22 n x nm x E 95.44 enter 0 in 14.32 storage litres in heous co h/day):	Aug (43) 91.09 0 <i>Tm</i> / 3600 109.51 boxes (46) 16.43 within sa (47) ombi boil	Sep 94.97 9 <i>kWh/mon</i> 110.82 9 <i>to</i> (61) 16.62 ame vess ers) ente	Oct 98.85 Fotal = Suu th (see Ta 129.15 Fotal = Suu 19.37 Sel er 'O' in (	Nov 102.72 m(44) <sub>112</sub> = tbles 1b, 1 140.98 m(45) <sub>112</sub> = 21.15	Dec 106.6 <i>c, 1d)</i> 153.1 22.96 0	] 	(44) (45) (46) (47) (48)
(45)m= (46)m= (46)m= Water Storag If com Otherv Nater a) If m Fempe	taneous v 23.71 storage volum munity h vise if no storage nanufact erature f	hot water 138.26 vater heatin 20.74 loss: ne (litres) neating a postored loss: curer's de actor fro	98.85 used - cal 142.67 ng at point 21.4 includir nd no ta hot wate eclared I m Table	94.97 Iculated mi 124.39 t of use (no 18.66 ing any so ank in dw er (this ir oss facto 2b	Vd,m = fa 91.09 onthly = 4. 119.35 o hot water 17.9 olar or W velling, e ncludes i or is kno	Jun ctor from 7 87.22 190 x Vd,r 102.99 storage), 15.45 /WHRS 1 nter 110 nstantan wn (kWh	Jul Fable 1c x 87.22 n x nm x E 95.44 enter 0 in 14.32 storage litres in neous co n/day):	Aug (43) 91.09 0 <i>Tm / 3600</i> 109.51 <i>boxes (46)</i> 16.43 within sa (47) ombi boil	Sep 94.97 9 <i>kWh/mon</i> 110.82 9 <i>to</i> (61) 16.62 ame vess ers) ente	Oct 98.85 Total = Sun th (see Ta 129.15 Total = Sun 19.37 Sel er 'O' in (	Nov 102.72 m(44)112 the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows the shows	Dec 106.6 <i>c, 1d)</i> 153.1 22.96 0 0 0	]    ]  ] 	(44) (45) (46) (47) (48) (49)

Hot wa If com Volum Tempe	ater stor munity h e factor erature f	age loss neating s from Tal actor fro	factor fr ee secti ble 2a m Table	rom Tab on 4.3 9 2b	le 2 (kW	h/litre/da	ıy)					0 0 0		(51) (52) (53)
Energy	y lost fro	m water	storage	e, kWh/y	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter	(50) or	(54) in (5	55)									0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	om Table	• 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41	)m						
(61)m=	50.96	46.03	50.37	46.83	46.42	43.01	44.45	46.42	46.83	50.37	49.32	50.96		(61)
Total h	leat reg	uired for	water h	eating ca	ı alculatec	l for eac	h month	(62)m =	0.85 x (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	209.04	184.29	193.04	171.22	165.77	146	139.88	155.93	157.66	179.52	190.3	204.05	(00)	(62)
Solar Di	-W input (	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	v) (enter '0	if no sola	r contribut	ion to wate	er heating)	1	
(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	I				I					1	
(64)m=	209.04	184.29	193.04	171.22	165.77	146	139.88	155.93	157.66	179.52	190.3	204.05		
								l Outp	ut from wa	ater heater	l r (annual)₁	12	2096.71	(64)
Heat d	ains fro	m water	heating.	. kWh/m	onth 0.2	5 ´ [0.85	x (45)m	n + (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	1	-
(65)m=	65.3	57.48	60.03	53.07	51.29	45	42.84	48.02	48.56	55.54	59.2	63.64		(65)
inclu	L Ide (57)	n in calc	culation	I of (65)m	I only if c	l vlinder i	s in the o	l dwellina	or hot w	ater is fr	om com	munitv h	eating	
5 101				5 and 5a	\.	yiiriddi i		awoning	or not w		on com	interney in	outing	
J. III	lemai ya			Janu Ja	).									
Metab	olic gain	Eph	5), Wat		May	lun	lul	Δυσ	Sen	Oct	Nov	Dec	1	
(66)m =	158 42	158 42	158 42	158 42	158.42	158 42	158 42	158 42	158 42	158 42	158 42	158 42		(66)
Lightin			tod in Ar	nondiv			r   0a) a						1	()
(67)m-	54 9	(Calcula 48.76	30 65			18 94	20 47	26.61	35 71	45 35	52.93	56.42	1	(67)
	0 <del>4.0</del>	ing (agle					12 or 14	20.01		40.00	02.00	50.42	1	(0.)
							13 01 L1	$\frac{5a}{265.44}$			220.17	242.02		(68)
(00)11=	309.0	(	304.13	334.1	300.02	205.05	209.10	205.44	274.00	294.00	320.17	343.93	1	(00)
Cookir	ng gains		ted in A	ppendix	L, equat		or L15a	), also se		5	50.40	50.40	l	(60)
(69)m=	53.48	53.48	53.48	53.48	53.48	53.48	53.48	53.48	53.48	53.48	53.48	53.48	ł	(69)
Pumps	s and fai	ns gains	(Table &	5a)		-	-	1.		-	-	-	I	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)		i				· · · · · ·	1	
(71)m=	-105.61	-105.61	-105.61	-105.61	-105.61	-105.61	-105.61	-105.61	-105.61	-105.61	-105.61	-105.61		(71)
Water	heating	gains (T	able 5)										1	
(72)m=	87.77	85.53	80.69	73.7	68.94	62.5	57.59	64.54	67.44	74.65	82.23	85.54		(72)

Total i	interna	l gains =					(66)m + (6	67)m +	+ (68	)m + (69)m + (1	70)m +	(71)m + (72)	m		
(73)m=	611.76	607.12	583.76	547.11	509.48	4	75.78 456	.52	465.	88 487.29	524.1	6 564.61	595.18		(73)
6. So	lar gain	IS:													
Solar g	gains are	calculated u	using sola	r flux from	Table 6a	a and	associated e	equation	ons t	o convert to the	e applic	able orientat	ion.		
Orient	ation:	Access F Table 6d	actor	Area m²			Flux Table 6	а		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.9	99	x	10.63		x	0.76	x	0.7	=	3.88	(74)
North	0.9x	0.77	x	0.9	99	x	20.32		x	0.76	x	0.7	=	7.42	(74)
North	0.9x	0.77	x	0.9	99	x	34.53		x	0.76	x	0.7	=	12.6	(74)
North	0.9x	0.77	x	0.9	99	x	55.46		x	0.76	x	0.7	=	20.24	(74)
North	0.9x	0.77	x	0.9	99	x	74.72		x	0.76	x	0.7	=	27.27	(74)
North	0.9x	0.77	x	0.9	99	x	79.99		x	0.76	x	0.7	=	29.19	(74)
North	0.9x	0.77	x	0.9	99	x	74.68		x	0.76	x	0.7	=	27.26	(74)
North	0.9x	0.77	x	0.9	99	x	59.25		x	0.76	x	0.7	=	21.62	(74)
North	0.9x	0.77	x	0.9	99	x	41.52		x	0.76	x	0.7	=	15.15	(74)
North	0.9x	0.77	x	0.9	99	x	24.19		x	0.76	x	0.7	=	8.83	(74)
North	0.9x	0.77	x	0.9	99	x	13.12		x	0.76	x	0.7	=	4.79	(74)
North	0.9x	0.77	х	0.9	99	x	8.86		x	0.76	x	0.7	=	3.24	(74)
East	0.9x	1	x	2.1	9	x	19.64		x	0.76	x	0.7	=	15.86	(76)
East	0.9x	1	x	1.7	<b>'</b> 9	x	19.64		x	0.76	x	0.7	=	12.96	(76)
East	0.9x	1	x	1.7	79	x	19.64		x	0.76	×	0.7	=	12.96	(76)
East	0.9x	1	x	2.2	9	x	38.42		x	0.76	x	0.7	=	31.02	(76)
East	0.9x	1	x	1.7	<b>'</b> 9	x	38.42		x	0.76	×	0.7	=	25.35	(76)
East	0.9x	1	x	1.7	<b>'</b> 9	x	38.42		x	0.76	x	0.7	=	25.35	(76)
East	0.9x	1	x	2.2	9	x	63.27		x	0.76	x	0.7	=	51.09	(76)
East	0.9x	1	x	1.7	<b>'</b> 9	x	63.27		x	0.76	x	0.7	=	41.76	(76)
East	0.9x	1	х	1.7	79	x	63.27		x	0.76	x	0.7	=	41.76	(76)
East	0.9x	1	x	2.2	9	x	92.28		x	0.76	x	0.7	=	74.51	(76)
East	0.9x	1	x	1.7	79	x	92.28		x	0.76	x	0.7	=	60.9	(76)
East	0.9x	1	х	1.7	79	x	92.28		x	0.76	x	0.7	=	60.9	(76)
East	0.9x	1	x	2.2	9	x	113.09		x	0.76	×	0.7	=	91.31	(76)
East	0.9x	1	x	1.7	79	x	113.09		x	0.76	x	0.7	=	74.63	(76)
East	0.9x	1	х	1.7	79	x	113.09		x	0.76	x	0.7	=	74.63	(76)
East	0.9x	1	x	2.1	9	x	115.77		x	0.76	x	0.7	=	93.47	(76)
East	0.9x	1	х	1.7	79	x	115.77		x	0.76	x	0.7	=	76.4	(76)
East	0.9x	1	х	1.7	<b>'</b> 9	x	115.77		x	0.76	x	0.7	=	76.4	(76)
East	0.9x	1	x	2.1	9	x	110.22		x	0.76	x	0.7	=	88.99	(76)
East	0.9x	1	x	1.7	79	x	110.22		x	0.76	x	0.7	=	72.74	(76)
East	0.9x	1	x	1.7	79	x	110.22		x	0.76	x	0.7	=	72.74	(76)
East	0.9x	1	x	2.2	9	x	94.68		x	0.76	x	0.7	=	76.44	(76)

East	0.9x	1	x	1.79	x	94.68	x	0.76	x	0.7	=	62.48	(76)
East	0.9x	1	x	1.79	x	94.68	x	0.76	x	0.7	] =	62.48	(76)
East	0.9x	1	x	2.19	x	73.59	x	0.76	x	0.7	] =	59.42	(76)
East	0.9x	1	x	1.79	x	73.59	x	0.76	x	0.7	] =	48.56	(76)
East	0.9x	1	x	1.79	x	73.59	x	0.76	x	0.7	] =	48.56	(76)
East	0.9x	1	x	2.19	x	45.59	x	0.76	x	0.7	=	36.81	(76)
East	0.9x	1	x	1.79	x	45.59	<b>x</b>	0.76	x	0.7	=	30.09	(76)
East	0.9x	1	x	1.79	×	45.59	x	0.76	x	0.7	=	30.09	(76)
East	0.9x	1	x	2.19	x	24.49	x	0.76	x	0.7	] =	19.77	(76)
East	0.9x	1	x	1.79	×	24.49	x	0.76	x	0.7	=	16.16	(76)
East	0.9x	1	x	1.79	x	24.49	x	0.76	x	0.7	=	16.16	(76)
East	0.9x	1	x	2.19	x	16.15	x	0.76	x	0.7	=	13.04	(76)
East	0.9x	1	x	1.79	×	16.15	x	0.76	x	0.7	=	10.66	(76)
East	0.9x	1	x	1.79	x	16.15	x	0.76	x	0.7	=	10.66	(76)
South	0.9x	0.77	x	1.11	x	46.75	x	0.76	x	0.7	=	19.13	(78)
South	0.9x	0.77	x	1.1	x	46.75	x	0.76	x	0.7	=	18.96	(78)
South	0.9x	0.77	x	0.99	x	46.75	x	0.76	x	0.7	=	17.06	(78)
South	0.9x	0.77	x	1.11	x	76.57	x	0.76	x	0.7	=	31.33	(78)
South	0.9x	0.77	x	1.1	x	76.57	x	0.76	x	0.7	=	31.05	(78)
South	0.9x	0.77	x	0.99	x	76.57	x	0.76	x	0.7	=	27.95	(78)
South	0.9x	0.77	x	1.11	x	97.53	x	0.76	x	0.7	=	39.91	(78)
South	0.9x	0.77	x	1.1	x	97.53	x	0.76	x	0.7	=	39.55	(78)
South	0.9x	0.77	x	0.99	x	97.53	x	0.76	x	0.7	=	35.6	(78)
South	0.9x	0.77	x	1.11	×	110.23	x	0.76	x	0.7	] =	45.11	(78)
South	0.9x	0.77	x	1.1	x	110.23	x	0.76	x	0.7	=	44.7	(78)
South	0.9x	0.77	x	0.99	x	110.23	x	0.76	x	0.7	=	40.23	(78)
South	0.9x	0.77	x	1.11	x	114.87	x	0.76	x	0.7	=	47.01	(78)
South	0.9x	0.77	x	1.1	x	114.87	x	0.76	x	0.7	=	46.59	(78)
South	0.9x	0.77	x	0.99	x	114.87	x	0.76	x	0.7	=	41.93	(78)
South	0.9x	0.77	x	1.11	x	110.55	x	0.76	x	0.7	=	45.24	(78)
South	0.9x	0.77	x	1.1	x	110.55	x	0.76	x	0.7	=	44.83	(78)
South	0.9x	0.77	x	0.99	x	110.55	x	0.76	x	0.7	=	40.35	(78)
South	0.9x	0.77	x	1.11	×	108.01	x	0.76	x	0.7	] =	44.2	(78)
South	0.9x	0.77	x	1.1	x	108.01	x	0.76	x	0.7	=	43.8	(78)
South	0.9x	0.77	x	0.99	x	108.01	x	0.76	x	0.7	=	39.42	(78)
South	0.9x	0.77	x	1.11	x	104.89	x	0.76	x	0.7	=	42.93	(78)
South	0.9x	0.77	x	1.1	×	104.89	×	0.76	x	0.7	] =	42.54	(78)
South	0.9x	0.77	x	0.99	×	104.89	x	0.76	x	0.7	] =	38.29	(78)
South	0.9x	0.77	x	1.11	×	101.89	x	0.76	x	0.7	=	41.69	(78)
South	0.9x	0.77	x	1.1	x	101.89	x	0.76	x	0.7	=	41.32	(78)
South	0.9x	0.77	x	0.99	×	101.89	x	0.76	x	0.7	=	37.19	(78)

South	0.9x	0.77	x	1.11	x	82.59	x	0.76	x	0.7	=	33.8	(78)
South	0.9x	0.77	×	1.1	- X	82.59	x	0.76	×	0.7	=	33.49	(78)
South	0.9x	0.77	x	0.99	X	82.59	x	0.76	x	0.7	=	30.14	(78)
South	0.9x	0.77	x	1.11	Ī×	55.42	x	0.76	×	0.7	=	22.68	(78)
South	0.9x	0.77	x	1.1	Ī×	55.42	x	0.76	×	0.7	=	22.47	(78)
South	0.9x	0.77	x	0.99	- X	55.42	x	0.76	x	0.7	=	20.23	(78)
South	0.9x	0.77	x	1.11	X	40.4	x	0.76	×	0.7	=	16.53	(78)
South	0.9x	0.77	x	1.1	X	40.4	x	0.76	×	0.7	_ =	16.38	(78)
South	0.9x	0.77	x	0.99	x	40.4	x	0.76	x	0.7	=	14.74	(78)
West	0.9x	0.77	x	4.61	x	19.64	x	0.76	x	0.7	=	33.38	(80)
West	0.9x	0.77	x	1.79	x	19.64	x	0.76	x	0.7	=	12.96	(80)
West	0.9x	0.77	x	4.61	x	38.42	x	0.76	x	0.7	=	65.3	(80)
West	0.9x	0.77	x	1.79	x	38.42	x	0.76	x	0.7	=	25.35	(80)
West	0.9x	0.77	x	4.61	x	63.27	x	0.76	x	0.7	=	107.54	(80)
West	0.9x	0.77	x	1.79	x	63.27	x	0.76	x	0.7	=	41.76	(80)
West	0.9x	0.77	x	4.61	x	92.28	x	0.76	x	0.7	=	156.84	(80)
West	0.9x	0.77	x	1.79	x	92.28	x	0.76	x	0.7	=	60.9	(80)
West	0.9x	0.77	x	4.61	x	113.09	x	0.76	x	0.7	=	192.21	(80)
West	0.9x	0.77	x	1.79	x	113.09	x	0.76	×	0.7	=	74.63	(80)
West	0.9x	0.77	x	4.61	x	115.77	x	0.76	×	0.7	=	196.76	(80)
West	0.9x	0.77	x	1.79	x	115.77	x	0.76	×	0.7	=	76.4	(80)
West	0.9x	0.77	x	4.61	x	110.22	x	0.76	x	0.7	=	187.33	(80)
West	0.9x	0.77	x	1.79	x	110.22	x	0.76	x	0.7	=	72.74	(80)
West	0.9x	0.77	x	4.61	x	94.68	x	0.76	x	0.7	=	160.91	(80)
West	0.9x	0.77	x	1.79	x	94.68	x	0.76	x	0.7	=	62.48	(80)
West	0.9x	0.77	x	4.61	x	73.59	x	0.76	x	0.7	=	125.07	(80)
West	0.9x	0.77	x	1.79	x	73.59	x	0.76	×	0.7	=	48.56	(80)
West	0.9x	0.77	x	4.61	x	45.59	x	0.76	x	0.7	=	77.48	(80)
West	0.9x	0.77	x	1.79	x	45.59	x	0.76	x	0.7	=	30.09	(80)
West	0.9x	0.77	x	4.61	x	24.49	x	0.76	x	0.7	=	41.62	(80)
West	0.9x	0.77	x	1.79	x	24.49	x	0.76	x	0.7	=	16.16	(80)
West	0.9x	0.77	x	4.61	x	16.15	x	0.76	×	0.7	=	27.45	(80)
West	0.9x	0.77	×	1.79	×	16.15	x	0.76	x	0.7	=	10.66	(80)
Solar	gains in	watts, calcu	lated	for each mor	nth		(83)m	ı = Sum(74)m .	(82)m				
(83)m=	147.16	270.13 41	1.56	564.34 670.2	21 6	79.05 649.21	570	.17 465.53	310.8	1 180.04	123.36		(83)
Total	gains – i	internal and	solar	(84)m = (73)	m + (	83)m , watts							

995.32

(84)m=

758.92

877.25

Temperature during heating periods in the living area from Table 9, Th1 (°C)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

952.83

834.97

744.65

718.54

1111.45 1179.7 1154.83 1105.73 1036.05

(84)

(85)

21

(86)m=	0.99	0.98	0.94	0.84	0.67	0.48	0.35	0.39	0.62	0.89	0.98	0.99		(86)
Mean	interna	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	20.2	20.37	20.61	20.85	20.96	21	21	21	20.98	20.81	20.46	20.16		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
(88)m=	20.09	20.09	20.09	20.1	20.11	20.12	20.12	20.12	20.11	20.11	20.1	20.1		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.99	0.97	0.92	0.8	0.61	0.42	0.28	0.31	0.55	0.86	0.97	0.99		(89)
Mean	interna	temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	19.04	19.29	19.62	19.94	20.07	20.11	20.12	20.12	20.1	19.91	19.42	18.99		(90)
			-		_	-		-	f	LA = Livin	g area ÷ (4	4) =	0.36	(91)
Mean	interna	temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.45	19.67	19.97	20.26	20.39	20.43	20.43	20.43	20.41	20.23	19.79	19.41		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	e 4e, whe	ere appro	opriate				
(93)m=	19.3	19.52	19.82	20.11	20.24	20.28	20.28	20.28	20.26	20.08	19.64	19.26		(93)
8. Spa	ace hea	ting requ	uirement					Table O		· <b>T</b> ' · · · /	70)		la ta	
the ut	to the r ilisation	nean int factor fo	ernal tei or dains	mperatur using Ta	re obtain Ible 9a	ied at ste	ep 11 of	l able 9	o, so tha	t II,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	):			1							
(94)m=	0.98	0.96	0.92	0.8	0.62	0.43	0.29	0.33	0.56	0.85	0.97	0.99		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	746.16	846.1	912.7	890.38	734.3	495.04	322.08	338.8	533.01	713.37	718.65	709.16		(95)
Month	nly avera	age exte	ernal tem	perature	e from Ta	able 8	40.0	40.4		10.0	74			(06)
(96)m=	4.3	4.9	0.5	8.9		14.6	10.0	16.4	(06)m	10.6	7.1	4.2		(90)
(97)m=	1355.35	1317.7	1197.52	995.36	756.34	497.15	322.26	339.14	- (90)m 542.1	839.4	1116.02	1346.48		(97)
Space	e heatin	a require	ement fo	r each m	nonth, k	Nh/mon	h = 0.02	24 x [(97]	)m – (95	)ml x (4'	1)m	1010110		
(98)m=	453.23	316.91	211.91	75.58	16.4	0	0	0	0	93.77	286.11	474.17		
I								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	1928.09	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								21.17	(99)
9a En	erav rec	uiremer	nts – Ind	ividual h	eating s	vstems i	ncludina	umicro-C	(HP)			L		
Space	e heatir	ng:				) etce .			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =			Ī	1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		ĺ	1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1								90.8	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec	kWh/ve	⊐ ar
Space	e heatin	g require	ement (c	alculate	d above	)	L		<u> </u>					-
	453.23	316.91	211.91	75.58	16.4	0	0	0	0	93.77	286.11	474.17		
(211)m	i = {[(98	)m x (20	4)] } x 1	00 ÷ (20	)6)									(211)
	499.15	349.02	233.38	83.24	18.06	0	0	0	0	103.27	315.1	522.22		
								Tota	l (kWh/yea	ar) = Sum(2)	211) <sub>15,1012</sub>	=	2123.45	(211)

Space heating fuel (secondary), kWh/month

= {[(98]	)m x (201)] } x	(100 ÷ (20	)8)										
(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												-
Output	from water he	$\frac{\text{eater (calc}}{0}$	ulated al	bove)	146	120.99	155.02	157.66	170.52	100.2	204.05	1	
Efficier	ncv of water h	eater	171.22	105.77	140	139.00	155.95	157.00	179.52	190.5	204.03	81.5	7(216)
(217)m=	87.64 87.14	4 86.12	84.14	82.26	81.5	81.5	81.5	81.5	84.47	86.84	87.79	01.0	(217)
Fuel fo	r water heatin	ig, kWh/m	onth									]	
(219)m	<u>i = (64)m x 1</u>	<u>00 ÷ (217</u>	)m									1	
(219)m=	238.51 211.4	8 224.17	203.5	201.52	179.14	171.63	191.33 Tota	193.44	212.53	219.13	232.44	0470.04	
Δnnua	l totals						1014	ii – Ourii(2	– ۱۵۵) <sub>112</sub>	Wh/voa		2478.84	(219)
Space	heating fuel u	ised, main	system	1					ĸ	vvii/yeai		2123.45	1
Water	heating fuel u	sed										2478.84	1
Electric	city for pumps	, fans and	electric	keep-ho	t								J
centra	al heating pur	np:		·							30	]	(230c)
boiler	with a fan-as	sisted flue									45	]	(230e)
Total e	lectricity for th	ne above,	kWh/yea	r			sum	of (230a).	(230g) =	:		75	(231)
Electric	city for lighting	J										387.79	(232)
Electric	city generated	by PVs										-647.71	(233)
10a. F	Fuel costs - in	dividual he	eating sy	stems:									
					Fu	ام			Fuol P	Prico		Fuel Cost	
					k٧	/h/year			(Table	12)		£/year	
Space	heating - mai	n system '	1		(21	1) x			3.4	18	x 0.01 =	73.9	(240)
Space	heating - mai	n system 2	2		(21:	3) x			0	)	x 0.01 =	0	(241)
Space	heating - seco	ondary			(21	5) x			13.	19	x 0.01 =	0	(242)
Water	heating cost (	other fuel)			(219	9)			3.4	18	x 0.01 =	86.26	(247)
Pumps	, fans and ele	ectric keep	-hot		(23	1)			13.	19	x 0.01 =	9.89	(249)
(if off-p Energy	eak tariff, list for lighting	each of (2	30a) to (	230g) se	eparately (232	y as app <sup>2)</sup>	licable a	nd apply	/ fuel pri 13.	ce accoi	ding to x 0.01 =	Table 12a 51.15	(250)
Additio	nal standing o	charges (T	able 12)									120	(251)
					one	of (233) to	o (235) x)		13	10	x 0.01 =	_85.43	-
Annen	div O itoms: r	angat lings	2 (252) a	nd (251)	25 000	hah			L <sup>13.</sup>	19		-00.40	
Total	enerav co	st	s (200) ai	(245)(	(247) + (25	50)(254)	=					255.77	(255)
11a. S	SAP rating - in	ndividual h	eating sy	/stems	-								
Energy	rost deflator	(Tahle 12	)									0.40	(256)
Linergy			/	[(255) v	(256)1 · [/	(4) + 45 01	_					0.42	$\int_{1}^{(230)}$

SAP rating (Section 12)			88.99 (258)
12a. CO2 emissions – Individual heating systems	including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	458.66 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	535.43 (264)
Space and water heating	(261) + (262) + (263) + (26	64) =	994.09 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	201.26 (268)
Energy saving/generation technologies Item 1		0.519 =	-336.16 (269)
Total CO2, kg/year		sum of (265)(271) =	898.12 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	9.86 (273)
El rating (section 14)			91 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	2590.61 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	3024.18 (264)
Space and water heating	(261) + (262) + (263) + (26	64) =	5614.79 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25 (267)
Electricity for lighting	(232) x	0 =	1190.51 (268)
Energy saving/generation technologies Item 1		3.07 =	-1988.48 (269)
'Total Primary Energy		sum of (265)(271) =	5047.07 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =	55.41 (273)

			User D	etails:						
Assessor Name: Software Name:	Anthony Wing Stroma FSAP	g-King 2012		Stroma Softwa	a Num are Ver	ber: sion:		STRO Versio	002972 n: 1.0.3.15	
		P	roperty A	Address:	Flat 8					
Address :										
1. Overall dwelling dimer	isions:									
Ground floor			Area	80	(1a) x	<b>Av. Hei</b>	<b>ght(m)</b> .7	(2a) =	216	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)	)+(1e)+(1n	i)	80	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	216	(5)
2. Ventilation rate:	•			- 41		1-1-1				
Number of chimneys	main heating	secondar heating + 0 + 0	y ·		] = [			10 = 20 -	0	(6a)
	0	. 0		0	ן ־ ר	0		-	0	
Number of intermittent fan	S					3	x 1	0 =	30	(7a)
Number of passive vents						0	x 1	0 =	0	(7b)
Number of flueless gas fire	es					0	x 4	- 04	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans en carried out or is i	s = (6a)+(6b)+(7)	a)+(7b)+(7 d to (17), o	7c) = therwise c	ontinue fro	30 om (9) to (	16)	÷ (5) =	0.14	(8)
Number of storeys in the	e dwelling (ns)		( ).				,	[	0	(9)
Additional infiltration							[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or tim	nber frame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening	sent, use the value ( s); if equal user 0.3	corresponding to 5	the greate	er wall area	a (after					-
If suspended wooden flo	bor, enter 0.2 (ur	nsealed) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else ente	er ()							0	(13)
Vindow infiltration	and doors draug	gnt stripped		0 25 - [0 2	$\mathbf{x}(14) \pm 1$	001 -			0	
				(8) + (10) -	+ (11) + (1	2) + (13) +	- (15) =		0	(15)
Air permeability value	50 expressed in	n cubic metre	s ner ho	ur ner so	uare me	etre of e	nvelope	area	0	$\int_{(17)}^{(10)}$
If based on air permeabilit	v value. then (18	$(17) = [(17) \div 20] + (8)$	3), otherwis	se $(18) = (18)$	16)		nvelope	ulou	0.34	1(17) 1(18)
Air permeability value applies	if a pressurisation te	est has been don	e or a deg	ree air per	meability i	is being us	sed	l	0.01	
Number of sides sheltered	l							[	2	(19)
Shelter factor				(20) = 1 - [	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.29	(21)
Infiltration rate modified fo	r monthly wind s	speed								
Jan Feb I	/lar Apr I	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	.9 4.4 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		

Adjusted in	nfiltrat	ion rate	(allowin	ng for sh	nelter ar	nd wind s	peed) =	= (21a) x	(22a)m				_	
0.	.37	0.36	0.35	0.32	0.31	0.27	0.27	0.27	0.29	0.31	0.32	0.34		
Calculate	effecti	ive air ch vontilati	hange ra	ate for t	he appl	cable ca	se							(22.0)
If exhaust	air hea	t numn us	ing Appe	ndix N (2	(23) = (23)	a) x Emv (e	equation (	N5)) other	wise (23h	(23a)			0	(234)
If balance	d with h	eat recove	erv: efficie	rank ra, (2)	allowing	for in-use f	actor (from	m Table 4h)	-	<i>(</i> 200)			0	(230)
a) If hold	anaad	maabar			with ho				m = (2)	2b)m ( (2	26) v [	1 (220)	0	(230)
(24a)m-									$\frac{1}{1}$	$\frac{2}{1}$	0	1 - (230)	] ]	(24a)
b) If bal		mochar		otilation	without				$\frac{1}{2}$	1	2h)	Ů	J	( ,
(24b)m=				0	0				0		0	0	1	(24b)
c) If who	- Je hoi		act vent	tilation o	n nositiv		ventilati	on from c	utside				J	
if (2	2b)m ·	< 0.5 × (	(23b), th	nen (240	c) = (23	o); other	vise (24	lc) = (22b	) m + 0	.5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If nat	ural ve	entilation	n or who	le hous	e positi	ve input	ventilati	on from l	oft	I I			1	
if (2	2b)m :	= 1, ther	n (24d)n	n = (22b	o)m oth	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m= 0.	.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(24d)
Effective	e air cl	hange ra	ate - ent	ter (24a	) or (24	b) or (24	c) or (24	1d) in box	(25)					
(25)m= 0.	.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25)
3. Heat lo	osses	and hea	at loss p	aramete	ər:									
ELEMEN	T	Gross	; m <sup>2</sup> )	Openin	gs	Net Ar	ea	U-valu	ie	AXU	~	k-value	e	A X k
		u 00 (i		11	1-	A, r	11 <del>~</del>	vv/m2	ĸ	(VV/K	.)	KJ/M2+I	r N	10/10
Windows -	Type 1	1	, iii )		1-	A ,r	∏- 	vv/m∠ +[1/( 1.1 )+	K 0.04] =	(VV/K 1.38	.) 	KJ/M²∙I	rx	(27)
Windows <sup>-</sup> Windows <sup>-</sup>	Type 1 Type 2	1 2	,	n	1-	A ,r	x1	vv/m2  /[1/( 1.1 )+  /[1/( 1.1 )+	K 0.04] = 0.04] =	(VV/K 1.38 0.91	.) 	KJ/M²∙I	κ.	(27)
Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup>	Type 1 Type 2 Type 3	1 2 3	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		l <del>,</del>	A ,r 1.31 0.86 2.19	x1 x1 x1 x1	vv/m2  /[1/( 1.1 )+  /[1/( 1.1 )+  /[1/( 1.1 )+	(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] = 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] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(VV/K 1.38 0.91 2.31	,) 	KJ/M²•I	Υ.	(27) (27) (27)
Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup>	Type 1 Type 2 Type 3 Type 4	1 2 3 4	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		lt.	A ,r 1.31 0.86 2.19 1.76	x1 x1 x1 x1 x1	VV/M2 I/[1/( 1.1 )+ I/[1/( 1.1 )+ I/[1/( 1.1 )+ I/[1/( 1.1 )+	$\begin{array}{l} \kappa \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \end{array}$	(VV/K 1.38 0.91 2.31 1.85		KJ/M²∙I	Υ.	(27) (27) (27) (27) (27)
Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup>	Type 1 Type 2 Type 3 Type 4 Type 5	4 00 () 2 3 4 5	,		Γ <b>Ε</b>	A,r 1.31 0.86 2.19 1.76 3.52	-    x1    x1    x1    x1    x1	VV/M2 //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+	$\begin{array}{l} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \end{array}$	(VV/K 1.38 0.91 2.31 1.85 3.71		KJ/M²∙I	Υ.	(27) (27) (27) (27) (27) (27)
Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup>	Type 1 Type 2 Type 3 Type 4 Type 5 Type 6	1 2 3 4 5	,		F.	A,r 1.31 0.86 2.19 1.76 3.52 3.41	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	VV/M2 //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+	$\begin{array}{l} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \end{array}$	(VV/K 1.38 0.91 2.31 1.85 3.71 3.59		KJ/M²∙I	Υ.	(27) (27) (27) (27) (27) (27) (27) (27)
Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup>	Type 1 Type 2 Type 3 Type 4 Type 5 Type 6 Type 7	4 104 (1 2 3 4 5 6 7	,		F.	A,r 1.31 0.86 2.19 1.76 3.52 3.41 1.32	x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1	VV/M2 //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+	$\begin{array}{l} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	(VV/K 1.38 0.91 2.31 1.85 3.71 3.59 1.39		KJ/M²∙I	Υ.	(27) (27) (27) (27) (27) (27) (27) (27)
Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup>	Type 1 Type 2 Type 3 Type 4 Type 5 Type 6 Type 7 Type 8	4 00 () 2 3 4 5 5 7 8	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		F.	A,r 1.31 0.86 2.19 1.76 3.52 3.41 1.32 0.97	x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1	VV/M2 //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+ //[1/( 1.1 )+	$\begin{array}{l} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	(VV/K 1.38 0.91 2.31 1.85 3.71 3.59 1.39 1.02		KJ/M²∙I	Υ.	(27) (27) (27) (27) (27) (27) (27) (27)
Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup>	Type 1 Type 2 Type 3 Type 4 Type 5 Type 6 Type 7 Type 8 Type 9	4 104 (1 2 3 4 5 7 3 9	,		<b>F</b>	A,r 1.31 0.86 2.19 1.76 3.52 3.41 1.32 0.97 0.97	x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1       x1	VV/M2 //[1/( 1.1 )+ //[1/( 1.1 )+	$ \begin{array}{l} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array} $	(VV/K 1.38 0.91 2.31 1.85 3.71 3.59 1.39 1.02 1.02	> 	KJ/M <sup>2</sup> •I		(27) (27) (27) (27) (27) (27) (27) (27)
Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup>	Type 1 Type 2 Type 3 Type 4 Type 5 Type 7 Type 8 Type 9	4 00 () 1 2 3 4 5 5 7 8 9	,		F-	A,r 1.31 0.86 2.19 1.76 3.52 3.41 1.32 0.97 0.97 0.566	11-     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1       ×1     ×1	VV/M2 //[1/( 1.1 )+ //[1/( 1.1 )+	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \end{array}$	(VV/K 1.38 0.91 2.31 1.85 3.71 3.59 1.39 1.02 1.02 0.05094		KJ/M <sup>2</sup> •1		(27) (27) (27) (27) (27) (27) (27) (27)
Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Windows <sup>-</sup> Floor Walls Type	Type 1 Type 2 Type 3 Type 4 Type 5 Type 6 Type 7 Type 8 Type 9	2 2 3 4 5 5 7 8 9 24.17		10.0	1	A,r 1.31 0.86 2.19 1.76 3.52 3.41 1.32 0.97 0.566 14.16	$ \begin{array}{c} 11^{2} \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 \\ \times 1 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\* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions

Fabric heat loss,  $W/K = S (A \times U)$ 

36.03 (33)

Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32a)(30) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (3													16754.66	(34)
Therma	l mass	parame	ter (TM	- = Cm -	: TFA) ir	n kJ/m²K		Indica	tive Value		250	(35)		
For desigi can be us	n assess ed instea	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are no	t known pr	recisely the	e indicative	values of	TMP in Ta	able 1f		
Therma	l bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	K						8.73	(36)
if details o	of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)								_
I OTAL TADRIC NEAT IOSS $(33) + (36) =$												44.76	(37)	
Ventilati	ion hea	at loss ca	alculated	d monthly	y I				(38)m	= 0.33 × (	25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m=	40.45	40.26	40.08	39.22	39.06	38.31	38.31	38.17	38.6	39.06	39.38	39.72		(38)
Heat tra	nsfer c	coefficier	nt, W/K						(39)m	= (37) + (	38)m		1	
(39)m=	85.21	85.02	84.84	83.98	83.82	83.07	83.07	82.93	83.36	83.82	84.15	84.49		_
Average = Sum(39) 112 /12=Heat loss parameter (HLP), W/m²K $(40)m = (39)m \div (4)$												83.98	(39)	
(40)m=	1.07	1.06	1.06	1.05	1.05	1.04	1.04	1.04	1.04	1.05	1.05	1.06		_
Number	of day	vs in moi	nth (Tab	le 1a)	-	-			/	Average =	Sum(40)1.	12 /12=	1.05	(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. Wat	er heat	ting ener	rgy requ	irement:								kWh/ye	ear:	
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9 N = 1												]	(42)	
Annual Reduce th	averag	e hot wa al average	ater usag hot water	ge in litre usage by	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed	(25 x N) to achieve	+ 36 a water us	se target o	92 f	69	]	(43)
not more	that 125	litres per j	person pei I	r day (all w T	ater use, l	hot and co	ld)				1	r	1	
Ļ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	usage II	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	l able 1c x	(43)					1	
(44)m=	101.96	98.25	94.55	90.84	87.13	83.42	83.42	87.13	90.84	94.55	98.25	101.96		_
Energy co	ontent of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x D	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )	) kWh/mor	Total = Su oth (see Ta	m(44) <sub>112</sub> = ables 1b, 1	= c, 1d)	1112.32	(44)
(45)m=	151.21	132.25	136.47	118.97	114.16	98.51	91.28	104.75	106	123.53	134.85	146.44		
lf instanta	neous w	ater heatii	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46,	) to (61)	Total = Su	m(45) <sub>112</sub> =	=	1458.42	(45)
(46)m=	22.68	19.84	20.47	17 85	17 12	14 78	13.69	15 71	15.9	18 53	20.23	21.97		(46)
Water s	torage	loss:		17.00					10.0	10.00	20.20	21.07	1	()
Storage	volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comm Otherwi	iunity h se if no	eating a stored	nd no ta	ank in dw er (this ir	velling, e ncludes i	nter 110 nstantar	) litres in neous co	(47) ombi boil	ers) ente	er '0' in (	47)			
a) If me	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/dav).					0		(48)
Temper	ature f	actor fro	m Tahlo	2b			"aay).					0	]	
Energy	lost fro	m water	storage	 . k\∧/h∧	ar			(48) v (40)	-			0		(43)
b) If ma	anufact	urer's de	eclared (	cylinder l	loss fact	or is not	known:	(49) × (49)	. –			U	l	(50)

Hot water storage loss factor from Table 2 (kWh/litre/day)       0         If community heating see section 4.3       0         Volume factor from Table 2a       0         Temperature factor from Table 2b       0													(51) (52) (53)	
Energy	Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) =													(54)
Enter	Enter (50) or (54) in (55)													(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)r	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	• 3				<u> </u>	<u> </u>		0		(58)
Primary circuit loss calculated for each month (59)m = (58) $\div$ 365 x (41)m														
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)														
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	Combi loss calculated for each month (61)m = (60) $\div$ 365 x (41)m													
(61)m=	50.96	45.22	48.18	44.8	44.4	41.14	42.51	44.4	44.8	48.18	48.45	50.96		(61)
Total h	L	L uired for	water h	L eating ca	I	l for eac	L h month	(62)m –	0.85 x (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m-	202 17	177 47	184.65	163 77	158 56	139.65	133.8	149 15	150.8	171 71	183.3	197 39		(62)
Solar Di								() (optor '0	lif no colo	r oontributi		r booting)		(0-)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)														
(auu a									5)	0	0	0		(63)
				0	0	0	0	0	0	0	0	0		(00)
Output	1000 47	ater nea		462.77	150 50	120.65	122.0	140.15	150.0	474 74	102.2	107.20	1	
(64)m=	202.17	177.47	184.65	163.77	158.56	139.65	133.8	149.15	150.8	171.71	183.3	197.39	2042.42	
						- / • • •	<i>( , _</i> )	Outp	out from wa	ater neate	r (annual)1	12	2012.43	(04)
Heat g	ains fro	m water	heating,	, kVVh/m T	onth 0.2	5 [0.85 T	× (45)m	i + (61)m I	n] + 0.8 x	(46)m	+ (57)m I	+ (59)m	J	(05)
(65)m=	63.02	55.28	57.42	50.76	49.06	43.04	40.98	45.93	46.44	53.12	56.95	61.43		(65)
inclu	ıde (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	Table 5	5 and 5a	):									
Metab	olic gair	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	147.77	147.77	147.77	147.77	147.77	147.77	147.77	147.77	147.77	147.77	147.77	147.77		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see <sup>-</sup>	Table 5					
(67)m=	48.91	43.44	35.33	26.75	19.99	16.88	18.24	23.71	31.82	40.4	47.15	50.27		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	327.52	330.92	322.36	304.12	281.11	259.48	245.03	241.63	250.19	268.42	291.44	313.07		(68)
Cookir	na aains	(calcula	ted in A	r Doendix	L. equat	tion L15	or L15a	). also se	e Table	5				
(69)m=	52.24	52.24	52.24	52.24	52.24	52.24	52.24	52.24	52.24	52.24	52.24	52.24		(69)
Pumps	L	L	(Table /	I 5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
				tive velu	<u>ا</u> مد) (۲۵۲		Ĺ	Ĺ	Ľ	Ĺ	Ĺ	Ĺ		x =1
(71)~-	s e.y. ev				5) (180	-09 51	-09 F1	-09 F1	-09 E1	-09 F1	-09 F1	-09 E1		(71)
	-30.01	-30.01	-30.01	-30.01	-30.01	-30.01	-90.01	-30.01	-90.91	-90.91	-30.01	-30.31		(•••)
vvater	neating	gains (1			05.63	F0 =0	<b>FF 6 6</b>	01 = 2	0.1.5.		70 /	00.57		(70)
(72)m=	84.7	82.26	77.18	70.5	65.94	59.78	55.08	61.73	64.51	71.4	79.1	82.57		(72)

Total	interna	I gains =	:		(66)m + (67)						3)m + (69	9)m + (7	'0)m +	(71)m + (72)m				
(73)m=	565.63	565.63 561.12 539.36		;	505.86 471.54 440.63		40.63	422.84	422.84 431.56		451.01 484.72		2 522.19	550.4	ł		(73)	
6. Sc	olar gair	ns:																
Solar	Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.																	
Orientation: Access Factor Table 6d				Area m²			Flux Table 6a		g_ Table 6b		- e 6b	FF Table 6c				Gains (W)		
North	0.9x	1	:	x	0.97	,	x	10	.63	x	0.1	76	x	0.7		- [	4.94	(74)
North	0.9x	1	:	x	0.97	,	x	20	.32	x	0.1	76	×	0.7	-	= [	9.44	(74)
North	0.9x	1	:	x	0.97	,	x	34	.53	x	0.	76	x	0.7		= [	16.04	(74)
North	0.9x	1	:	x	0.97	,	x	55	.46	x	0.	76	x	0.7		- [	25.76	(74)
North	0.9x	1	:	x	0.97	,	x	74	.72	x	0.	76	x	0.7		- [	34.7	(74)
North	0.9x	1	:	x	0.97	,	x	79	.99	x	0.	76	x	0.7	-	= [	37.15	(74)
North	0.9x	1	:	x	0.97	,	x	74	.68	x	0.	76	×	0.7		- [	34.68	(74)
North	0.9x	1	:	x	0.97	,	x	59	.25	x	0.	76	×	0.7	-	= [	27.52	(74)
North	0.9x	1	:	x	0.97	,	x	41	.52	x	0.	76	x	0.7	-	= [	19.28	(74)
North	0.9x	1		x	0.97	,	x	24	.19	x	0.1	76	x	0.7	-	- [	11.23	(74)
North	0.9x	1	:	x	0.97	,	x	13	.12	x	0.	76	×	0.7	-	- [	6.09	(74)
North	0.9x	1	:	x	0.97	,	x	8.	86	x	0.1	76	x	0.7	-	- [	4.12	(74)
East	0.9x	1		x	1.31		x	19	.64	x	0.1	76	x	0.7	-	- [	12.32	(76)
East	0.9x	1	:	x	0.86	;	x	19	.64	x	0.1	76	x	0.7	-	= [	8.09	(76)
East	0.9x	1	:	x	2.19	)	x	19	.64	x	0.	76	x	0.7	-	= [	20.59	(76)
East	0.9x	1		x	1.31		x	38	.42	x	0.1	76	x	0.7	-	= [	24.1	(76)
East	0.9x	1	:	x	0.86	;	x	38	.42	x	0.	76	×	0.7	-	= [	15.82	(76)
East	0.9x	1	:	x	2.19	)	x	38	.42	x	0.	76	x	0.7	-	= [	40.29	(76)
East	0.9x	1		x	1.31		x	63	.27	x	0.1	76	x	0.7	-	= [	39.69	(76)
East	0.9x	1	:	x	0.86	j	x	63	.27	x	0.	76	x	0.7	-	- [	26.05	(76)
East	0.9x	1	:	x	2.19	)	x	63	.27	x	0.1	76	x	0.7	-	- [	66.35	(76)
East	0.9x	1	:	x	1.31		x	92	.28	x	0.	76	x	0.7	-	- [	57.88	(76)
East	0.9x	1	:	x	0.86	j	x	92	.28	x	0.	76	x	0.7	-	= [	38	(76)
East	0.9x	1	:	x	2.19	)	x	92	.28	x	0.1	76	x	0.7	-	- [	96.76	(76)
East	0.9x	1	:	x	1.31		x	11:	3.09	x	0.	76	x	0.7	-	- [	70.93	(76)
East	0.9x	1	:	x	0.86	;	x	11:	3.09	x	0.	76	x	0.7	-	- [	46.57	(76)
East	0.9x	1	:	x	2.19	)	x	11:	3.09	x	0.	76	x	0.7	-	= [	118.59	(76)
East	0.9x	1		x	1.31		x	11	5.77	x	0.1	76	x	0.7	-	= [	72.61	(76)
East	0.9x	1	:	x	0.86	;	x	11:	5.77	x	0.	76	x	0.7	-	= [	47.67	(76)
East	0.9x	1	:	x	2.19	)	x	11:	5.77	x	0.	76	x	0.7	-	= [	121.39	(76)
East	0.9x	1		x	1.31		x	110	).22	×	0.	76	x	0.7	-	- [	69.13	(76)
East	0.9x	1		x	0.86	;	x	110	).22	×	0.7	76	x	0.7	-	= [	45.38	(76)
East	0.9x	1		x	2.19	)	x	110	).22	x	0.	76	x	0.7	-	= [	115.57	(76)
East	0.9x	1		x	1.31		x	94	.68	x	0.	76	x	0.7		- [	59.38	7(76)

East	0.9x	1	x	0.86	×	94.68	x	0.76	x	0.7	] =	38.98	(76)				
East	0.9x	1	x	2.19	x	94.68	x	0.76	x	0.7	=	99.27	(76)				
East	0.9x	1	x	1.31	x	73.59	x	0.76	x	0.7	=	46.16	(76)				
East	0.9x	1	x	0.86	x	73.59	x	0.76	x	0.7	=	30.3	(76)				
East	0.9x	1	x	2.19	x	73.59	x	0.76	x	0.7	=	77.16	(76)				
East	0.9x	1	x	1.31	x	45.59	x	0.76	x	0.7	=	28.59	(76)				
East	0.9x	1	x	0.86	x	45.59	x	0.76	x	0.7	=	18.77	(76)				
East	0.9x	1	x	2.19	x	45.59	x	0.76	x	0.7	=	47.8	(76)				
East	0.9x	1	x	1.31	x	24.49	x	0.76	x	0.7	=	15.36	(76)				
East	0.9x	1	x	0.86	x	24.49	x	0.76	x	0.7	=	10.08	(76)				
East	0.9x	1	x	2.19	x	24.49	x	0.76	x	0.7	=	25.68	(76)				
East	0.9x	1	x	1.31	x	16.15	x	0.76	x	0.7	=	10.13	(76)				
East	0.9x	1	x	0.86	×	16.15	×	0.76	×	0.7	] =	6.65	(76)				
East	0.9x	1	x	2.19	x	16.15	x	0.76	x	0.7	=	16.94	(76)				
South	0.9x	1	x	0.97	x	46.75	x	0.76	x	0.7	=	21.71	(78)				
South	0.9x	1	x	0.97	×	76.57	×	0.76	×	0.7	] =	35.56	(78)				
South	0.9x	1	x	0.97	x	97.53	x	0.76	x	0.7	=	45.3	(78)				
South	0.9x	1	x	0.97	x	110.23	x	0.76	x	0.7	=	51.2	(78)				
South	0.9x	1	x	0.97	x	114.87	x	0.76	x	0.7	=	53.35	(78)				
South	0.9x	1	x	0.97	x	110.55	x	0.76	x	0.7	=	51.34	(78)				
South	0.9x	1	x	0.97	x	108.01	x	0.76	x	0.7	=	50.16	(78)				
South	0.9x	1	x	0.97	x	104.89	x	0.76	x	0.7	=	48.72	(78)				
South	0.9x	1	x	0.97	x	101.89	x	0.76	x	0.7	=	47.32	(78)				
South	0.9x	1	x	0.97	×	82.59	x	0.76	x	0.7	] =	38.36	(78)				
South	0.9x	1	x	0.97	x	55.42	x	0.76	x	0.7	] =	25.74	(78)				
South	0.9x	1	x	0.97	x	40.4	x	0.76	x	0.7	] =	18.76	(78)				
West	0.9x	1	x	1.76	×	19.64	x	0.76	×	0.7	] =	16.55	(80)				
West	0.9x	1	x	3.52	x	19.64	x	0.76	x	0.7	=	33.1	(80)				
West	0.9x	1	x	3.41	×	19.64	x	0.76	x	0.7	] =	32.07	(80)				
West	0.9x	1	x	1.32	×	19.64	x	0.76	×	0.7	] =	12.41	(80)				
West	0.9x	1	x	1.76	x	38.42	x	0.76	x	0.7	] =	32.38	(80)				
West	0.9x	1	x	3.52	x	38.42	x	0.76	x	0.7	=	64.75	(80)				
West	0.9x	1	x	3.41	×	38.42	x	0.76	×	0.7	] =	62.73	(80)				
West	0.9x	1	x	1.32	×	38.42	x	0.76	x	0.7	] =	24.28	(80)				
West	0.9x	1	x	1.76	x	63.27	x	0.76	x	0.7	] =	53.32	(80)				
West	0.9x	1	x	3.52	×	63.27	x	0.76	x	0.7	] =	106.64	(80)				
West	0.9x	1	x	3.41	×	63.27	×	0.76	×	0.7	] =	103.31	(80)				
West	0.9x	1	x	1.32	×	63.27	×	0.76	×	0.7	] =	39.99	(80)				
West	0.9x	1	x	1.76	×	92.28	×	0.76	×	0.7	] =	77.76	(80)				
West	0.9x	1	x	3.52	×	92.28	×	0.76	×	0.7	=	155.53	(80)				
West	0.9x	1	x	3.41	×	92.28	×	0.76	×	0.7	=	150.67	(80)				
West	0.9x	1	x	1.3	32	x	9	2.28	x	0.76	6	x	0.7	-	- [	58.32	(80)
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West	0.9x	1	x	1.7	76	x	1	13.09	×	0.76	6	x	0.7		- [	95.3	(80)
West	0.9x	1	x	3.5	52	x	1	13.09	x	0.76	6	×	0.7	=	- [	190.6	(80)
West	0.9x	1	x	3.4	41	x	1	13.09	x	0.76	6	×	0.7		- [	184.65	(80)
West	0.9x	1	x	1.3	32	x	1	13.09	×	0.76	6	×	0.7		- [	71.48	(80)
West	0.9x	1	x	1.7	76	x	1	15.77	×	0.76	6	x	0.7	=	- [	97.56	(80)
West	0.9x	1	x	3.5	52	x	1	15.77	×	0.76	6	x	0.7		- [	195.12	(80)
West	0.9x	1	x	3.4	41	x	1	15.77	×	0.76	6	×	0.7		- [	189.02	(80)
West	0.9x	1	x	1.3	32	x	1	15.77	×	0.76	6	x	0.7	-	- [	73.17	(80)
West	0.9x	1	x	1.7	76	x	1	10.22	×	0.76	6	x	0.7		- [	92.88	(80)
West	0.9x	1	x	3.5	52	x	1	10.22	×	0.76	3	×	0.7		- [	185.76	(80)
West	0.9x	1	x	3.4	41	x	1	10.22	×	0.76	6	x	0.7	-	- [	179.95	(80)
West	0.9x	1	x	1.3	32	x	1	10.22	×	0.76	6	x	0.7		- [	69.66	(80)
West	0.9x	1	x	1.7	76	x	9	4.68	×	0.76	3	×	0.7		- [	79.78	(80)
West	0.9x	1	x	3.5	52	x	9	4.68	×	0.76	6	x	0.7	-	- [	159.56	(80)
West	0.9x	1	x	3.4	41	x	9	4.68	x	0.76	6	×	0.7		- [	154.58	(80)
West	0.9x	1	x	1.3	32	x	9	4.68	×	0.76	6	x	0.7		- [	59.84	(80)
West	0.9x	1	x	1.7	76	x	7	3.59	×	0.76	6	x	0.7	-	- [	62.01	(80)
West	0.9x	1	x	3.5	52	x	7	3.59	x	0.76	6	×	0.7		- [	124.03	(80)
West	0.9x	1	x	3.4	41	x	7	3.59	×	0.76	6	x	0.7		- [	120.15	(80)
West	0.9x	1	x	1.3	32	x	7	3.59	x	0.76	6	×	0.7		- [	46.51	(80)
West	0.9x	1	x	1.7	76	x	4	5.59	×	0.76	6	×	0.7	=	- [	38.42	(80)
West	0.9x	1	x	3.5	52	x	4	5.59	x	0.76	6	x	0.7	= -	- [	76.83	(80)
West	0.9x	1	x	3.4	41	x	4	5.59	x	0.76	6	×	0.7		- [	74.43	(80)
West	0.9x	1	x	1.3	32	x	4	5.59	×	0.76	6	×	0.7		- [	28.81	(80)
West	0.9x	1	x	1.7	76	x	2	4.49	×	0.76	6	x	0.7		- [	20.64	(80)
West	0.9x	1	x	3.5	52	x	2	4.49	x	0.76	6	×	0.7		- [	41.27	(80)
West	0.9x	1	x	3.4	41	x	2	4.49	×	0.76	6	x	0.7		- [	39.98	- (80)
West	0.9x	1	x	1.3	32	x	2	4.49	×	0.76	6	x	0.7	=	- [	15.48	(80)
West	0.9x	1	x	1.7	76	x	1	6.15	x	0.76	3	- X	0.7	=	- [	13.61	_ (80)
West	0.9x	1	x	3.5	52	x	1	6.15	x	0.76	3	- X	0.7	=	- [	27.22	_ (80)
West	0.9x	1	x	3.4	41	x	1	6.15	×	0.76	6	x	0.7	=	- [	26.37	(80)
West	0.9x	1	x	1.3	32	x	1	6.15	] ×	0.76	6	x	0.7	=	- [	10.21	(80)
Solar	gains in	watts, ca	alculated	for eac	h month			0.40.40	(83)m	n = Sum(74)	4)m	.(82)m		404.0			(00)
(83)m=	161.78	309.35	496.68	/11.88	866.17	88	55.03	843.19	/27	.64 572.	.92	363.20	200.32	134.01	1		(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts															
(84)m=	727.41	870.46	1036.04	1217.74	1337.71	1325.66	1266.03	1159.2	1023.94	847.98	722.51	684.41			(84)
7. Mean internal temperature (heating season)															
7. Mean internal temperature (heating season)         Temperature during heating periods in the living area from Table 9, Th1 (°C)         21         (85)															
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	rom Tab	ole 9, Th	1 (°C)				2	1	(85)
Temp Utilisa	erature ation fac	during h tor for g	eating p ains for I	eriods ir iving are	n the livir ea, h1,m	ng area f (see Ta	rom Tab ble 9a)	ole 9, Th	1 (°C)				2	1	(85)

(86)m=	0.99	0.97	0.91	0.76	0.57	0.4	0.29	0.33	0.55	0.86	0.97	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	r in Table	e 9c)					
(87)m=	20.16	20.37	20.65	20.89	20.98	21	21	21	20.99	20.83	20.44	20.11		(87)
Temp	erature	durina h	eating p	eriods ir	n rest of	dwellina	from Ta	ble 9. Ti	h2 (°C)					
(88)m=	20.03	20.03	20.03	20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.04	20.04		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.98	0.96	0.88	0.72	0.52	0.34	0.23	0.26	0.48	0.81	0.96	0.99		(89)
Mean	interna	temper	ature in	the rest	of dwelli	na T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.94	19.24	19.62	19.93	20.03	20.05	20.05	20.05	20.04	, 19.87	19.35	18.88		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.4	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = fl	A x T1	+ (1 – fl	A) x T2					
(92)m=	19.42	19.69	20.03	20.31	20.4	20.43	20.43	20.43	20.42	20.25	19.78	19.37		(92)
Apply	adjustn	nent to th	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.27	19.54	19.88	20.16	20.25	20.28	20.28	20.28	20.27	20.1	19.63	19.22		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	i to the r	mean int	ernal tei	mperatur	re obtair	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a					_		_		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
Utilisa	ation fac	tor for g	ains, hm		0.50	0.05			0.5	0.00	0.00	0.00		(04)
(94)m=	0.98	0.95	0.88	0.72	0.53	0.35	0.24	0.28	0.5	0.82	0.96	0.98	I	(94)
Usetu	II gains,	nmGm,	VV = (94)	4)m x (84	4)m	470.40	205 47	221.40	507.02	602.25	600.12	670.00		(05)
(95)m=	711.45	027.40	910.49	0/0.09	105.51	470.49	305.47	321.49	507.93	692.25	690.13	072.03	ļ.	(93)
	ily avera						16.6	16.4	14.1	10.6	7 1	12		(96)
	4.5	4.9	0.5			14.0	-[(20)m	v [(02)m	(06)m	10.0	7.1	4.2	1	(00)
(97)m-	1275 81	1244.6	1135 44	945 78	717.06	471 57	305 57	321 7	- (90)m 514.02	J 796.07	1054 58	1268.9		(97)
Space	heatin		ment fo	r each m	$r_{17.00}$	//h/mont	h = 0.02	$24 \times [(97)]$	m = (95)	)ml x $(4^{\prime})$	1)m	1200.5		(0.)
(98)m=	419.88	280.3	167.36	48.3	8.59	0			0	77.24	262.4	443.48		
(/						-		Tota	l per vear	(kWh/vear	) = Sum(9)	8)1 59 12 =	1707.56	(98)
Snoo	- hootin		montin	k\//b/m2	2 hoor				. poi jou	(, ) ca.	) can(c	<b>C</b> )1	04.04	
Space	e neatin	g require	ement in	KVVN/m²	year								21.34	(99)
9a. En	ergy rec	luiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space	e heatir	ng:	t from o	aaaadam	Vounalo	monton	avetam							(204)
Fracti	on or sp	ace nea	IL HOM S	econdar	y/supple	mentary	system	(000) 1	(004)				0	(201)
Fracti	on of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (20	02) × [1 – (	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.8	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above	)							-	
	419.88	280.3	167.36	48.3	8.59	0	0	0	0	77.24	262.4	443.48		
(211)m	n = {[(98	)m x (20	4)] } x 1	00 ÷ (20	)6)									(211)
	462.42	308.7	184.32	53.2	9.47	0	0	0	0	85.07	288.99	488.41		
								Tota	l (kWh/yea	ar) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>	=	1880.57	(211)

Space heating fuel (secondary), kWh/month

$= \{[(98)m \times (201)]\} \times 100 \div (208)$										
(215)m= 0 0 0 0	0	0	0	0	0	0	0	0	]	
			-	Tota	l (kWh/yea	ar) =Sum(:	215) <sub>15,1012</sub>	2=	0	(215)
Water heating										
Output from water heater (calculate           202.17         177.47         184.65         163.	d above) .77 158.56	139.65	133.8	149.15	150.8	171.71	183.3	197.39	1	
Efficiency of water heater									81.5	(216)
(217)m= 87.55 86.95 85.67 83.4	45 81.93	81.5	81.5	81.5	81.5	84.17	86.73	87.72		(217)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$			•						_	
(219)m= 230.91 204.1 215.53 196.	.26 193.53	171.35	164.17	183.01	185.03	204	211.35	225.04		_
				Tota	I = Sum(2	19a) <sub>112</sub> =			2384.26	(219)
Annual totals Space heating fuel used main syste	≏m 1					k	Wh/year	ſ	kWh/year	1
Water heating fuel used									2384.26	」 ]
Electricity for pumps, fans and elect	tric keep-hot									1
central heating pump:	·							30	]	(230c)
boiler with a fan-assisted flue								45	]	(230e)
Total electricity for the above, kWh/	year			sum	of (230a).	(230g) =	:		75	(231)
Electricity for lighting									345.49	(232)
Electricity generated by PVs									-647.71	(233)
10a. Fuel costs - individual heating	g systems:									-
		<b>Fu</b> kW	<b>el</b> /h/year			<b>Fuel P</b> (Table	<b>Price</b> 12)		<b>Fuel Cost</b> £/year	
Space heating - main system 1		(211	1) x			3.4	18	x 0.01 =	65.44	(240)
Space heating - main system 2		(213	3) x			C	)	x 0.01 =	0	(241)
Space heating - secondary		(21	5) x			13.	19	x 0.01 =	0	(242)
Water heating cost (other fuel)		(219	9)			3.4	18	x 0.01 =	82.97	(247)
Pumps, fans and electric keep-hot		(23	1)			13.	19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) Energy for lighting	to (230g) se	parately (232	y as app <sup>2)</sup>	licable a	nd apply	/ fuel pri 13.	ce accor	ding to x 0.01 =	Table 12a 45.57	(250)
Additional standing charges (Table	12)								120	(251)
		one	of (233) to	o (235) x)		13.	19	x 0.01 =	-85.43	](252)
Appendix Q items: repeat lines (253	3) and (254)	as need	ded						L	-
Total energy cost	(245)(2	247) + (25	50)(254)	=					238.45	(255)
11a. SAP rating - individual heating	g systems									
Energy cost deflator (Table 12)									0.42	(256)
Energy cost factor (ECF)	[(255) x (	[256)] ÷ [(	(4) + 45.0]	=					0.8	] (257)

SAP rating (Section 12)			88.82 (258)
12a. CO2 emissions – Individual heating systems	including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	406.2 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	515 (264)
Space and water heating	(261) + (262) + (263) + (26	4) =	921.2 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	179.31 (268)
Energy saving/generation technologies Item 1		0.519 =	-336.16 (269)
Total CO2, kg/year		sum of (265)(271) =	803.28 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	10.04 (273)
El rating (section 14)			91 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	2294.3 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2908.8 (264)
Space and water heating	(261) + (262) + (263) + (26	4) =	5203.09 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25 (267)
Electricity for lighting	(232) x	0 =	1060.67 (268)
Energy saving/generation technologies Item 1		3.07 =	-1988.48 (269)
'Total Primary Energy		sum of (265)(271) =	4505.52 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =	56.32 (273)

			User D	etails:						
Assessor Name: Software Name:	Anthony Wing-ł Stroma FSAP 2	King 2012	:	Stroma Softwa	a Num Ire Ver	ber: sion:		STRO Versio	002972 n: 1.0.3.15	
		Pr	operty A	Address:	Flat 9					
Address :										
1. Overall dwelling dime	ensions:		<u> </u>							
Ground floor			Area	1 <b>(m²)</b> ′0.8	(1a) x	Av. He	<b>ight(m)</b> 2.4	(2a) =	169.92	<b>)</b> (3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+	(1e)+(1n	) 7	0.8	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	169.92	(5)
2. Ventilation rate:	-									
	main heating	secondary heating	<b>y</b>	other		total			m <sup>3</sup> per hou	r
Number of chimneys	0 +	0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	ī + 🗖	0	i = Г	0	x2	20 =	0	(6b)
Number of intermittent fa	ins	L			' <u>-</u>	3	x	0 =	30	(7a)
Number of passive vents	3					0	x ^	0 =	0	(7b)
Number of flueless gas f	ires				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimne	vs_flues and fans =	(6a)+(6b)+(7a	a)+(7b)+(7	7c) =	Г	20		- (5) -	0.19	(8)
If a pressurisation test has k	been carried out or is inte	ended, proceed	l to (17), o	, herwise c	ontinue fro	om (9) to (	(16)	. (0) –	0.18	
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timb	er frame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are p	resent, use the value col	rresponding to	the greate	er wall area	a (after					
If suspended wooden	floor, enter 0.2 (uns	ealed) or 0.	1 (seale	d), else	enter 0				0	<b>(12)</b>
If no draught lobby, en	ter 0.05, else enter	0	,	,,				·	0	(13)
Percentage of window	s and doors draugh	t stripped							0	(14)
Window infiltration			(	0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in a	cubic metres	s per ho	ur per so	quare m	etre of e	nvelope	area	4	(17)
If based on air permeabi	lity value, then (18) =	= [(17) ÷ 20]+(8	), otherwis	se (18) = (	16)				0.38	(18)
Air permeability value applie	es if a pressurisation test	has been don	e or a deg	ree air pei	meability	s being u	sed			
Shelter factor	ed			(20) = 1 - [	0.075 x (1	9)] =			2	(19)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =	/-			0.03	(20)
Infiltration rate modified f	for monthly wind spe	eed		. , . ,					0.52	(=1)
Jan Feb	Mar Apr Ma	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	beed from Table 7	<u> </u>					•			
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (2)$	2)m ÷ 4						1			
(22a)m= 1.27 1.25	1.23 1.1 1.08	3 0.95	0.95	0.92	1	1.08	1.12	1.18		

,	ed infiltra	ation rate	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x (	(22a)m					
	0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.38		
<i>Calcul</i> If m	ate ettec echanica	<i>tive air (</i> I ventila	change	rate for t	he appli	cable cas	se					1	0	(23a)
lf exh	aust air he	at pump i	using App	endix N, (2	3b) = (23a	a) × Fmv (e	quation (I	√5)), other	wise (23b)	) = (23a)		l I	0	(23b)
If bal	anced with	heat reco	overy: effic	ciency in %	allowing f	or in-use fa	actor (from	n Table 4h)	=			L [	0	(23c)
a) If	balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	)m = (22	2b)m + (2	23b) × [*	ו (23c) – 1	÷ 100]	(
, (24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mecha	anical ve	entilation	without	heat rec	overy (N	/IV) (24b	)m = (22	2b)m + (2	23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole ho if (22b)m	ouse ex i < 0.5 ×	tract ver : (23b), 1	ntilation o then (24o	or positiv c) = (23b	ve input v b); otherw	ventilatio vise (24	on from o c) = (22b	utside ) m + 0.	5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural v if (22b)m	ventilation $1 = 1$ , the	on or wh en (24d)	iole hous m = (221	e positiv b)m othe	ve input v erwise (24	ventilatio 4d)m =	on from lo 0.5 + [(22	oft 2b)m² x	0.5]				
(24d)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24c	c) or (24	d) in box	(25)					
(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
3. He	at losses	s and he	at loss	paramete	er:									
ELEN	IENT	Gros area	ss (m²)	Openin m	gs <sup>2</sup>	Net Are A ,m	ea 1²	U-valu W/m2	ie K	A X U (W/H	()	k-value kJ/m²⋅ł	e A K k	A X k J/K
Windo	ws Type	1				1.31	x1.	/[1/( 1.1 )+	0.04] =	1.38				(27)
Windo	ws Type	2				1.31	x1.	/[1/( 1.1 )+	0.04] =	1.38				(27)
Windo	ws Type	3				1.31	x1.	/[1/( 1.1 )+	0.04] =	1.38				(27)
Windo	ws Type	4				1.49	x1.	/[1/( 1.1 )+	0.04] =	1.57				(27)
Windo	ws Type	5				1.49	x1.	/[1/( 1.1 )+	0.04] =	1.57				(27)
Windo	ws Type	6				1.31	x1.	/[1/( 1.1 )+	0.04] =	1.38				(27)
Windo	ws Type	7				3.52	x1.	/[1/( 1.1 )+	0.04] =	3.71				(27)
Walls	Type1	14.8	5	4.83		10.02	x	0.13	] = [	1.3				(29)
Walls	Type2	32.4	4	2.98		29.42	x	0.13	_ = [	3.82				(29)
Walls	ТуреЗ	22.1	4	3.93		18.21	x	0.13	_ = [	2.37				(29)
Walls	Type4	22.4	1	0		22.41	x	0.12		2.63	- - -		$\neg$	(29)
Walls	Type5	0.99	Э	0		0.99	x	0.13		0.13	- - -		$\neg$	(29)
Total a	area of el	ements	, m²			92.79								(31)
* for wir	dows and le the area	roof winde s on both	ows, use e sides of ii	effective wi nternal wal	ndow U-va Is and par	alue calcula titions	ated using	formula 1/	[(1/U-valu	e)+0.04] a	s given in	paragraph	3.2	
** includ								(20) $(20)$	(00)			г		
** <i>incluc</i> Fabric	heat los	s, W/K =	= S (A x	U)				(20)(30)	+ (32) =				22.63	(33)
** <i>incluc</i> Fabric Heat c	heat los apacity (	s, W/K = Cm = S(	= S (A x (A x k )	U)				(20)(30)	+ (32) = ((28)	.(30) + (32	) + (32a).	(32e) =	22.63 15399.12	(33)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K

if details	s of therma	al bridging	are not kr	10wn (36) =	= 0.15 x (3	1)								_
Total f	abric he	at loss							(33) +	(36) =			29.01	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	у		1		(38)m	= 0.33 × (	25)m x (5)		I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	32.71	32.52	32.35	31.51	31.36	30.63	30.63	30.49	30.91	31.36	31.67	32		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	61.71	61.53	61.35	60.52	60.36	59.64	59.64	59.5	59.92	60.36	60.68	61.01		
		•	•		•				1	Average =	Sum(39)1	12 /12=	60.52	(39)
Heat lo	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)	1	I	
(40)m=	0.87	0.87	0.87	0.85	0.85	0.84	0.84	0.84	0.85	0.85	0.86	0.86		<b>-</b>
Numb	er of day	ys in mo	nth (Tab	le 1a)	-		-	-		Average =	Sum(40)1	12 /12=	0.85	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
-		Ŭ												
		Jpancy, o N – 1	N ⊥176 v				-130	)2)] ± 0 (	)013 v ( <sup>-</sup>	TFA -13	2.	27		(42)
if TF	A £ 13.	9, N = 1	+ 1.70 ×	li - evb	(-0.0000	H 3 X (11	A-13.3	/2/] + 0.0		II A -13.	.3)			
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	iy Vd,av	erage =	(25 x N)	+ 36		8	38		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed :	to achieve	a water us	se target o	f			
ποι πιοι		illies per j	person per T	i uay (ali w	laier use, r		1 1					1	I	
	Jan	Feb	Mar	Apr	May	Jun		Aug	Sep	Oct	Nov	Dec		
HOT WAT	er usage i r	n litres pei 1	r day for ea T	acn montn 1	va,m = ta		i able 1c x	(43)		I	I	1	I	
(44)m=	96.8	93.28	89.76	86.24	82.72	79.2	79.2	82.72	86.24	89.76	93.28	96.8		<b>-</b>
Energy	content of	f hot water	used - ca	culated m	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	Total = Su hth (see Ta	m(44) <sub>112</sub> = ables 1b, 1	= c, 1d)	1056.04	(44)
(45)m=	143.56	125.56	129.56	112.96	108.38	93.53	86.67	99.45	100.64	117.28	128.02	139.03		
			•							Total = Su	m(45) <sub>112</sub> =	=	1384.63	(45)
lf instan	taneous v	vater heati	ng at point	t of use (no	o hot water	storage),	enter 0 in	boxes (46)	) to (61)					
(46)m=	21.53	18.83	19.43	16.94	16.26	14.03	13	14.92	15.1	17.59	19.2	20.85		(46)
Storage	storage	IOSS:	) includir		alar or M		ctorago	within or		col		-		(47)
Storag				iy ariy so		ntor 110	Sillaye	(47)		501		0		(47)
Other	nunity i vise if n	n stored	hot wate	arik iri uw er (this ir	venng, e scludes i	nstantar		(47) mbi boil	ers) ente	r '0' in <i>(</i>	47)			
Water	storage	loss:	not wat			notantai	10003 00							
a) If n	nanufac	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Enera	v lost fro	om watei	r storade	. kWh/ve	ear			(48) x (49)	=			0		(50)
b) If n	nanufact	turer's de	eclared	cylinder	loss fact	or is not	known:	< - / < - /				0		(00)
Hot wa	ater stor	age loss	factor f	rom Tab	le 2 (kW	h/litre/da	ay)					0		(51)
If com	munity ł	neating s	see secti	on 4.3									I	
Volum	e factor	from Ta	ble 2a	Oh								0		(52)
iempe	erature f	actor fro	nn i adle	ZD								0		(53)
Energ	y lost fro	om water	r storage	e, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter	(50) or	(54) in (5	55)									0		(55)

Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56	)
If cylinde	er contains	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=	0	0	0	0	0	0	0	0	0	0	0	0	(57	)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0	(58	)
Primar	y circuit	loss cal	culated	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	olar wat	er heati	ng and a	cylinde	r thermo	ostat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59	)
Combi	loss ca	lculated	for each	n month (	(61)m =	(60) ÷ 36	65 × (41	)m						
(61)m=	49.33	42.94	45.74	42.53	42.15	39.06	40.36	42.15	42.53	45.74	46	49.33	(61	)
Total h	neat requ	uired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	192.89	168.49	175.3	155.49	150.54	132.59	127.03	141.61	143.17	163.03	174.03	188.36	(62	)
Solar DH	HW input o	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	tion 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=	192.89	168.49	175.3	155.49	150.54	132.59	127.03	141.61	143.17	163.03	174.03	188.36		
								Outp	out from w	ater heate	r (annual)₁	12	1912.5 <mark>(64</mark>	)
Heat g	ains fro	m water	heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m=	60.07	52.48	54.51	48.19	46.58	40.86	38.91	43.61	44.09	50.43	54.07	58.56	(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 fi	rom com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a	):									
5. Int Metabo	ternal ga olic gain	ains (see Is (Table	e Table 5 e 5), Wat	5 and 5a tts	):									
5. Int Metabo	ternal ga olic gain Jan	ains (see s (Table Feb	e Table 5 e 5), Wat Mar	5 and 5a tts Apr	): May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5. Int Metabo (66)m=	ternal ga olic gain Jan 135.92	ains (see s (Table Feb 135.92	Table 5 5), Wat Mar 135.92	and 5a tts Apr 135.92	): May 135.92	Jun 135.92	Jul 135.92	Aug 135.92	Sep 135.92	Oct 135.92	Nov 135.92	Dec 135.92	(66	)
5. Int Metabo (66)m= Lightin	ternal ga olic gain Jan 135.92 ng gains	ains (see s (Table Feb 135.92 (calcula	e Table 5 5), Wat Mar 135.92 ted in Ap	5 and 5a tts Apr 135.92 opendix	): May 135.92 L, equati	Jun 135.92 ion L9 o	Jul 135.92 r L9a), a	Aug 135.92 Iso see	Sep 135.92 Table 5	Oct 135.92	Nov 135.92	Dec 135.92	(66	)
5. Int Metabo (66)m= Lightin (67)m=	ternal ga olic gain Jan 135.92 ng gains 44.71	ains (see s (Table Feb 135.92 (calcula 39.71	• Table 5 • 5), Wat Mar 135.92 ted in Ap 32.29	5 and 5a tts Apr 135.92 opendix 24.45	): May 135.92 L, equati 18.27	Jun 135.92 ion L9 oi 15.43	Jul 135.92 r L9a), a 16.67	Aug 135.92 Iso see - 21.67	Sep 135.92 Table 5 29.08	Oct 135.92 36.93	Nov 135.92 43.1	Dec 135.92 45.95	(66	)
5. Int Metabo (66)m= Lightin (67)m= Applia	ternal ga olic gain Jan 135.92 og gains 44.71 nces ga	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc	e Table 5 5), Wat Mar 135.92 ted in Ap 32.29 sulated ir	5 and 5a tts Apr 135.92 opendix 24.45	): May 135.92 L, equati 18.27 dix L, eq	Jun 135.92 ion L9 of 15.43 uation L	Jul 135.92 r L9a), a 16.67 13 or L1	Aug 135.92 Iso see <sup>-</sup> 21.67 3a), also	Sep 135.92 Table 5 29.08 9 see Ta	Oct 135.92 36.93 ble 5	Nov 135.92 43.1	Dec 135.92 45.95	(66	)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m=	olic gain Jan 135.92 ng gains 44.71 nces ga 297.25	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc 300.33	e Table 5 e 5), Wat Mar 135.92 ted in Ap 32.29 sulated in 292.56	5 and 5a tts 135.92 opendix 24.45 Append 276.01	): May 135.92 L, equati 18.27 dix L, eq 255.12	Jun 135.92 ion L9 of 15.43 uation L 235.49	Jul 135.92 r L9a), a 16.67 13 or L1 222.38	Aug 135.92 Iso see 21.67 3a), also 219.29	Sep 135.92 Table 5 29.08 see Ta 227.07	Oct 135.92 36.93 ble 5 243.61	Nov 135.92 43.1 264.5	Dec 135.92 45.95 284.13	(66 (67 (68	))
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir	ternal ga olic gain Jan 135.92 og gains 44.71 nces ga 297.25 ng gains	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc 300.33 (calcula	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>135.92</li> <li>ted in Ap</li> <li>32.29</li> <li>sulated ir</li> <li>292.56</li> <li>ated in A</li> </ul>	5 and 5a tts Apr 135.92 opendix 24.45 Append 276.01 ppendix	): May 135.92 L, equati 18.27 dix L, eq 255.12 L, equat	Jun 135.92 ion L9 or 15.43 uation L 235.49 ion L15	Jul 135.92 r L9a), a 16.67 13 or L1 222.38 or L15a	Aug 135.92 Iso see 21.67 3a), also 219.29 ), also se	Sep 135.92 Table 5 29.08 9 see Ta 227.07 22 Table	Oct 135.92 36.93 ble 5 243.61 5	Nov 135.92 43.1 264.5	Dec 135.92 45.95 284.13	(66 (67 (68	)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m=	ternal ga olic gain Jan 135.92 ng gains 44.71 nces ga 297.25 ng gains 50.86	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc 300.33 (calcula 50.86	e Table 5 5), Wat Mar 135.92 ted in Ap 32.29 culated in 292.56 ated in A 50.86	5 and 5a tts Apr 135.92 opendix 24.45 Appendix 276.01 ppendix 50.86	): May 135.92 L, equati 18.27 dix L, eq 255.12 L, equat 50.86	Jun 135.92 ion L9 of 15.43 uation L 235.49 ion L15 50.86	Jul 135.92 r L9a), a 16.67 13 or L1 222.38 or L15a) 50.86	Aug 135.92 Iso see 21.67 3a), also 219.29 ), also se 50.86	Sep 135.92 Table 5 29.08 9 see Ta 227.07 ee Table 50.86	Oct 135.92 36.93 ble 5 243.61 5 50.86	Nov 135.92 43.1 264.5 50.86	Dec 135.92 45.95 284.13 50.86	(66 (67 (68	)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps	iernal ga olic gain Jan 135.92 og gains 44.71 nces ga 297.25 ng gains 50.86 s and fai	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc 300.33 (calcula 50.86 ns gains	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>135.92</li> <li>ted in Ap</li> <li>32.29</li> <li>sulated in</li> <li>292.56</li> <li>ated in A</li> <li>50.86</li> <li>(Table 5</li> </ul>	5 and 5a tts Apr 135.92 opendix 24.45 n Append 276.01 ppendix 50.86 5a)	): May 135.92 L, equati 18.27 dix L, eq 255.12 L, equat 50.86	Jun 135.92 ion L9 of 15.43 uation L 235.49 ion L15 50.86	Jul 135.92 r L9a), a 16.67 13 or L1 222.38 or L15a) 50.86	Aug 135.92 Iso see 21.67 3a), also 219.29 ), also se 50.86	Sep 135.92 Table 5 29.08 see Ta 227.07 ee Table 50.86	Oct 135.92 36.93 ble 5 243.61 55 50.86	Nov 135.92 43.1 264.5 50.86	Dec 135.92 45.95 284.13 50.86	(66 (67 (68	)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m=	ternal ga olic gain Jan 135.92 og gains 44.71 nces ga 297.25 og gains 50.86 s and far 3	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc 300.33 (calcula 50.86 ns gains 3	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>135.92</li> <li>ted in Ap</li> <li>32.29</li> <li>sulated in</li> <li>292.56</li> <li>ated in A</li> <li>50.86</li> <li>(Table \$</li> <li>3</li> </ul>	5 and 5a tts Apr 135.92 opendix 24.45 Appendix 276.01 ppendix 50.86 5a) 3	): May 135.92 L, equati 18.27 dix L, equati 255.12 L, equati 50.86	Jun 135.92 ion L9 of 15.43 uation L 235.49 ion L15 50.86	Jul 135.92 r L9a), a 16.67 13 or L1 222.38 or L15a 50.86	Aug 135.92 Iso see 21.67 3a), also 219.29 ), also se 50.86	Sep 135.92 Table 5 29.08 9 see Ta 227.07 9 Table 50.86	Oct 135.92 36.93 ble 5 243.61 5 50.86	Nov 135.92 43.1 264.5 50.86	Dec 135.92 45.95 284.13 50.86	(66 (67 (68 (69	) ) )
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses	ternal ga olic gain Jan 135.92 ag gains 44.71 nces ga 297.25 ng gains 50.86 s and fai 3 s e.g. ev	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc 300.33 (calcula 50.86 ns gains 3 vaporatic	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>135.92</li> <li>ted in Ap</li> <li>32.29</li> <li>sulated in Ap</li> <li>292.56</li> <li>ated in A</li> <li>50.86</li> <li>(Table 5</li> <li>3</li> <li>on (nega</li> </ul>	5 and 5a tts Apr 135.92 ppendix 24.45 Appendix 276.01 ppendix 50.86 5a) 3 tive valu	): May 135.92 L, equati 18.27 dix L, eq 255.12 L, equat 50.86 3 es) (Tab	Jun 135.92 ion L9 of 15.43 uation L 235.49 ion L15 50.86 3 le 5)	Jul 135.92 r L9a), a 16.67 13 or L1 222.38 or L15a 50.86	Aug 135.92 Iso see 21.67 3a), also 219.29 ), also se 50.86	Sep 135.92 Table 5 29.08 see Ta 227.07 ee Table 50.86	Oct 135.92 36.93 ble 5 243.61 50.86 3	Nov 135.92 43.1 264.5 50.86 3	Dec 135.92 45.95 284.13 50.86	(66 (67 (68 (69	)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	ternal ga olic gain Jan 135.92 og gains 44.71 nces ga 297.25 ng gains 50.86 s and fai 3 s e.g. ev -90.62	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc 300.33 (calcula 50.86 ns gains 3 vaporatic -90.62	Table 5 5), Wat Mar 135.92 ted in Ap 32.29 sulated in 292.56 ated in A 50.86 (Table 5 3 on (nega -90.62	5 and 5a tts Apr 135.92 opendix 24.45 Appendix 276.01 ppendix 50.86 5a) 3 tive valu -90.62	): May 135.92 L, equati 18.27 dix L, eq 255.12 L, equat 50.86 3 es) (Tab -90.62	Jun 135.92 ion L9 of 15.43 uation L 235.49 ion L15 50.86 3 le 5) -90.62	Jul 135.92 r L9a), a 16.67 13 or L1 222.38 or L15a) 50.86 3 -90.62	Aug 135.92 Iso see 21.67 3a), also 219.29 ), also se 50.86 3 -90.62	Sep 135.92 Table 5 29.08 See Ta 227.07 ee Table 50.86 3 -90.62	Oct 135.92 36.93 ble 5 243.61 50.86 3 -90.62	Nov 135.92 43.1 264.5 50.86 3 -90.62	Dec 135.92 45.95 284.13 50.86 3 -90.62	(66 (67 (68 (69 (70	) ) )
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water	lernal ga olic gain Jan 135.92 og gains 44.71 nces ga 297.25 og gains 50.86 s and far 3 s e.g. ev -90.62 heating	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc 300.33 (calcula 50.86 ns gains 3 vaporatic -90.62 gains (T	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>135.92</li> <li>ted in Ap</li> <li>32.29</li> <li>sulated in Ap</li> <li>292.56</li> <li>ated in A</li> <li>50.86</li> <li>(Table 5)</li> <li>an (nega</li> <li>-90.62</li> <li>able 5)</li> </ul>	5 and 5a tts Apr 135.92 opendix 24.45 Appendix 276.01 ppendix 50.86 5a) 3 tive valu -90.62	): May 135.92 L, equat 18.27 dix L, equat 255.12 L, equat 50.86 3 es) (Tab -90.62	Jun 135.92 ion L9 o 15.43 uation L 235.49 ion L15 50.86 3 le 5) -90.62	Jul 135.92 r L9a), a 16.67 13 or L1 222.38 or L15a 50.86 3 -90.62	Aug 135.92 Iso see 21.67 3a), also 219.29 ), also se 50.86 3 -90.62	Sep 135.92 Table 5 29.08 29.08 227.07 227.07 20 Table 50.86 3 -90.62	Oct 135.92 36.93 ble 5 243.61 50.86 3 -90.62	Nov 135.92 43.1 264.5 50.86 3 -90.62	Dec 135.92 45.95 284.13 50.86 3 -90.62	(66) (67) (68) (69) (70) (71)	))))))))
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ternal ga olic gain Jan 135.92 ng gains 44.71 nces ga 297.25 ng gains 50.86 s and fai 3 s e.g. ev -90.62 heating 80.73	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calcula 300.33 (calcula 50.86 ns gains 3 vaporatic -90.62 gains (T 78.1	<ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>135.92</li> <li>ted in Ap</li> <li>32.29</li> <li>sulated in A</li> <li>292.56</li> <li>ated in A</li> <li>50.86</li> <li>(Table 5)</li> <li>73.27</li> </ul>	5 and 5a tts Apr 135.92 ppendix 24.45 Appendix 276.01 ppendix 50.86 5a) 3 tive valu -90.62 66.93	): May 135.92 L, equati 18.27 dix L, eq 255.12 L, equat 50.86 3 es) (Tab -90.62 62.6	Jun 135.92 ion L9 of 15.43 uation L 235.49 ion L15 50.86 3 le 5) -90.62 56.75	Jul 135.92 r L9a), a 16.67 13 or L1 222.38 or L15a 50.86 3 -90.62 52.29	Aug 135.92 Iso see 21.67 3a), also 219.29 ), also se 50.86 3 -90.62	Sep 135.92 Table 5 29.08 See Ta 227.07 ee Table 50.86 3 -90.62 61.24	Oct 135.92 36.93 ble 5 243.61 50.86 3 -90.62 67.79	Nov 135.92 43.1 264.5 50.86 3 -90.62 75.1	Dec 135.92 45.95 284.13 50.86 3 -90.62 78.71	(66) (67) (68) (69) (70) (71) (72)	)))))))))))))))))))))))))))))))))))))))
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= <b>Total i</b>	iernal ga olic gain Jan 135.92 og gains 44.71 nces ga 297.25 ng gains 50.86 s and fai 3 s e.g. ev -90.62 heating 80.73	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc 300.33 (calcula 50.86 ns gains 3 raporatic -90.62 gains (T 78.1 <b>gains =</b>	Table 5         45), Wat         Mar         135.92         ted in Ag         32.29         culated in Ag         292.56         ated in A         50.86         (Table 5)         3         on (nega         -90.62         Table 5)         73.27	5 and 5a tts Apr 135.92 opendix 24.45 Appendix 276.01 ppendix 50.86 5a) 3 tive valu -90.62 66.93	): May 135.92 L, equati 18.27 dix L, eq 255.12 L, equat 50.86 3 es) (Tab -90.62 62.6	Jun 135.92 ion L9 of 15.43 uation L 235.49 ion L15 50.86 3 le 5) -90.62 56.75 (66)	Jul 135.92 r L9a), a 16.67 13 or L1 222.38 or L15a) 50.86 3 -90.62 52.29 m + (67)m	Aug 135.92 Iso see 21.67 3a), also 219.29 ), also se 50.86 3 -90.62 58.61 n + (68)m -	Sep 135.92 Table 5 29.08 9 see Ta 227.07 ee Table 50.86 3 -90.62 61.24 - (69)m +	Oct 135.92 36.93 ble 5 243.61 50.86 3 -90.62 67.79 (70)m + (7	Nov 135.92 43.1 264.5 50.86 3 -90.62 75.1 '1)m + (72)	Dec 135.92 45.95 284.13 50.86 3 -90.62 78.71 m	(66) (67) (68) (69) (70) (71) (72)	)))))))))))
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (70)m= Losses (71)m= Water (72)m= <b>Total i</b> (73)m=	ternal ga olic gain Jan 135.92 og gains 44.71 nces ga 297.25 og gains 50.86 s and fan 3 s e.g. ev -90.62 heating 80.73 internal 521.85	ains (see s (Table Feb 135.92 (calcula 39.71 ins (calc 300.33 (calcula 50.86 ns gains 3 raporatic -90.62 gains (T 78.1 gains = 517.3	Table 5         4 5), Wat         Mar         135.92         ted in Ag         32.29         culated in Ag         292.56         ated in A         50.86         (Table 5)         3         -90.62         able 5)         73.27         497.29	5 and 5a tts Apr 135.92 ppendix 24.45 Appendix 276.01 ppendix 50.86 5a) 3 tive valu -90.62 66.93 466.56	): May 135.92 L, equati 18.27 dix L, equati 255.12 L, equati 50.86 3 es) (Tab -90.62 62.6 435.17	Jun 135.92 ion L9 of 15.43 uation L 235.49 ion L15 50.86 3 le 5) -90.62 56.75 (66) 406.84	Jul 135.92 r L9a), a 16.67 13 or L1 222.38 or L15a) 50.86 3 -90.62 52.29 m + (67)m 390.51	Aug 135.92 Iso see - 21.67 3a), also 219.29 ), also se 50.86 3 -90.62 58.61 1 + (68)m - 398.74	Sep 135.92 Table 5 29.08 9 see Ta 227.07 9 Table 50.86 3 -90.62 61.24 (69)m + 416.56	Oct 135.92 36.93 ble 5 243.61 5 50.86 3 -90.62 67.79 (70)m + (7 447.49	Nov 135.92 43.1 264.5 50.86 3 -90.62 75.1 '1)m + (72) 481.86	Dec 135.92 45.95 284.13 50.86 3 -90.62 78.71 m 507.96	(66) (67) (68) (69) (70) (71) (72) (73)	)))))))))))))))))))))))))))))))))))))))

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

Orienta	tion:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	1	x	1.31	×	19.64	×	0.76	×	0.7	] =	12.32	(76)
East	0.9x	1	x	1.31	x	19.64	x	0.76	x	0.7	] =	12.32	(76)
East	0.9x	1	x	1.31	×	19.64	x	0.76	x	0.7	=	12.32	(76)
East	0.9x	1	x	1.31	x	38.42	x	0.76	x	0.7	=	24.1	(76)
East	0.9x	1	x	1.31	x	38.42	x	0.76	x	0.7	] =	24.1	(76)
East	0.9x	1	x	1.31	×	38.42	x	0.76	x	0.7	] =	24.1	(76)
East	0.9x	1	x	1.31	x	63.27	x	0.76	x	0.7	] =	39.69	(76)
East	0.9x	1	x	1.31	x	63.27	x	0.76	x	0.7	] =	39.69	(76)
East	0.9x	1	x	1.31	×	63.27	x	0.76	x	0.7	] =	39.69	(76)
East	0.9x	1	x	1.31	×	92.28	x	0.76	x	0.7	] =	57.88	(76)
East	0.9x	1	x	1.31	×	92.28	x	0.76	x	0.7	] =	57.88	(76)
East	0.9x	1	x	1.31	×	92.28	x	0.76	×	0.7	] =	57.88	(76)
East	0.9x	1	x	1.31	x	113.09	x	0.76	x	0.7	] =	70.93	(76)
East	0.9x	1	x	1.31	x	113.09	x	0.76	x	0.7	] =	70.93	(76)
East	0.9x	1	x	1.31	x	113.09	x	0.76	x	0.7	] =	70.93	(76)
East	0.9x	1	x	1.31	x	115.77	x	0.76	x	0.7	] =	72.61	(76)
East	0.9x	1	x	1.31	x	115.77	x	0.76	x	0.7	] =	72.61	(76)
East	0.9x	1	x	1.31	x	115.77	x	0.76	x	0.7	] =	72.61	(76)
East	0.9x	1	x	1.31	x	110.22	x	0.76	x	0.7	=	69.13	(76)
East	0.9x	1	x	1.31	x	110.22	x	0.76	x	0.7	=	69.13	(76)
East	0.9x	1	x	1.31	×	110.22	x	0.76	x	0.7	] =	69.13	(76)
East	0.9x	1	x	1.31	x	94.68	x	0.76	x	0.7	] =	59.38	(76)
East	0.9x	1	x	1.31	x	94.68	x	0.76	x	0.7	=	59.38	(76)
East	0.9x	1	x	1.31	×	94.68	x	0.76	x	0.7	] =	59.38	(76)
East	0.9x	1	x	1.31	x	73.59	x	0.76	x	0.7	=	46.16	(76)
East	0.9x	1	x	1.31	x	73.59	x	0.76	x	0.7	] =	46.16	(76)
East	0.9x	1	x	1.31	x	73.59	x	0.76	x	0.7	] =	46.16	(76)
East	0.9x	1	x	1.31	x	45.59	x	0.76	x	0.7	] =	28.59	(76)
East	0.9x	1	x	1.31	×	45.59	x	0.76	×	0.7	] =	28.59	(76)
East	0.9x	1	x	1.31	x	45.59	x	0.76	x	0.7	] =	28.59	(76)
East	0.9x	1	x	1.31	×	24.49	x	0.76	×	0.7	] =	15.36	(76)
East	0.9x	1	x	1.31	×	24.49	x	0.76	×	0.7	] =	15.36	(76)
East	0.9x	1	x	1.31	x	24.49	x	0.76	x	0.7	] =	15.36	(76)
East	0.9x	1	x	1.31	×	16.15	x	0.76	x	0.7	] =	10.13	(76)
East	0.9x	1	x	1.31	x	16.15	x	0.76	x	0.7	] =	10.13	(76)
East	0.9x	1	x	1.31	×	16.15	x	0.76	×	0.7	] =	10.13	(76)
South	0.9x	1	x	1.49	×	46.75	x	0.76	×	0.7	] =	33.35	(78)
South	0.9x	1	x	1.49	×	46.75	x	0.76	×	0.7	] =	33.35	(78)
South	0.9x	1	x	1.49	x	76.57	x	0.76	x	0.7	=	54.62	(78)

South	0.9x	1	x	1.49	x	76.57	x	0.76	x	0.7	=	54.62	(78)
South	0.9x	1	x	1.49	x	97.53	x	0.76	x	0.7	] =	69.58	(78)
South	0.9x	1	x	1.49	x	97.53	x	0.76	x	0.7	] =	69.58	(78)
South	0.9x	1	x	1.49	x	110.23	x	0.76	x	0.7	=	78.64	(78)
South	0.9x	1	x	1.49	x	110.23	x	0.76	x	0.7	] =	78.64	 [(78)
South	0.9x	1	x	1.49	x	114.87	x	0.76	x	0.7	=	81.95	(78)
South	0.9x	1	x	1.49	x	114.87	<b>x</b>	0.76	x	0.7	=	81.95	(78)
South	0.9x	1	x	1.49	x	110.55	x	0.76	x	0.7	=	78.87	(78)
South	0.9x	1	x	1.49	x	110.55	x	0.76	x	0.7	=	78.87	(78)
South	0.9x	1	x	1.49	x	108.01	x	0.76	x	0.7	=	77.06	(78)
South	0.9x	1	x	1.49	x	108.01	x	0.76	x	0.7	=	77.06	(78)
South	0.9x	1	x	1.49	x	104.89	x	0.76	x	0.7	=	74.83	(78)
South	0.9x	1	x	1.49	x	104.89	x	0.76	x	0.7	=	74.83	(78)
South	0.9x	1	x	1.49	x	101.89	x	0.76	x	0.7	=	72.69	(78)
South	0.9x	1	x	1.49	x	101.89	x	0.76	x	0.7	=	72.69	(78)
South	0.9x	1	x	1.49	x	82.59	x	0.76	x	0.7	=	58.92	(78)
South	0.9x	1	x	1.49	x	82.59	x	0.76	x	0.7	=	58.92	(78)
South	0.9x	1	x	1.49	x	55.42	x	0.76	x	0.7	] =	39.54	(78)
South	0.9x	1	x	1.49	x	55.42	x	0.76	x	0.7	] =	39.54	(78)
South	0.9x	1	x	1.49	x	40.4	x	0.76	x	0.7	] =	28.82	(78)
South	0.9x	1	x	1.49	x	40.4	x	0.76	x	0.7	] =	28.82	(78)
West	0.9x	1	x	1.31	x	19.64	x	0.76	x	0.7	=	12.32	(80)
West	0.9x	1	x	3.52	x	19.64	x	0.76	x	0.7	=	33.1	(80)
West	0.9x	1	x	1.31	x	38.42	x	0.76	x	0.7	] =	24.1	(80)
West	0.9x	1	x	3.52	x	38.42	x	0.76	x	0.7	=	64.75	(80)
West	0.9x	1	x	1.31	x	63.27	x	0.76	x	0.7	] =	39.69	(80)
West	0.9x	1	x	3.52	x	63.27	x	0.76	x	0.7	] =	106.64	(80)
West	0.9x	1	x	1.31	x	92.28	x	0.76	x	0.7	=	57.88	(80)
West	0.9x	1	x	3.52	x	92.28	x	0.76	x	0.7	] =	155.53	(80)
West	0.9x	1	x	1.31	x	113.09	x	0.76	x	0.7	=	70.93	(80)
West	0.9x	1	x	3.52	x	113.09	x	0.76	x	0.7	] =	190.6	(80)
West	0.9x	1	x	1.31	x	115.77	x	0.76	x	0.7	] =	72.61	(80)
West	0.9x	1	x	3.52	x	115.77	x	0.76	x	0.7	=	195.12	(80)
West	0.9x	1	x	1.31	x	110.22	x	0.76	x	0.7	=	69.13	(80)
West	0.9x	1	x	3.52	x	110.22	x	0.76	x	0.7	] =	185.76	(80)
West	0.9x	1	x	1.31	x	94.68	x	0.76	x	0.7	] =	59.38	(80)
West	0.9x	1	x	3.52	x	94.68	x	0.76	x	0.7	=	159.56	(80)
West	0.9x	1	x	1.31	x	73.59	x	0.76	x	0.7	=	46.16	(80)
West	0.9x	1	x	3.52	x	73.59	x	0.76	x	0.7	=	124.03	(80)
West	0.9x	1	x	1.31	x	45.59	x	0.76	x	0.7	=	28.59	(80)
West	0.9x	1	x	3.52	x	45.59	x	0.76	x	0.7	=	76.83	(80)

West	0.9x	1	x	1.3	31	хГ	2	4 49	x	0.76	ר × ו	0.7	=	15.36	(80)
West	0.9x	1	x	3.5	52	x [	2	4.49	x	0.76		0.7		41.27	(80)
West	0.9x	1	x	1 3	1	x [	1	6 15		0.76		0.7		10.13	(80)
West	0.9x	1		34	52	× [	1	6 15		0.76		0.7	╡_	27.22	(80)
	L	I	^	0.0		٦L		0.10		0.70		0.7		21.22	(00)
Solar	ains in	watts ca	alculated	d for eac	h month				(83)m = S	Sum(74)m .	(82)m				
(83)m=	149.08	270.4	404.55	544.33	638.24	64	13.31	616.4	546.76	454.03	309.05	181.78	125.38	]	(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m ·	+ (8	33)m	, watts				- <b>I</b>	<u> </u>	1	
(84)m=	670.94	787.7	901.84	1010.89	1073.41	10	50.15	1006.91	945.5	870.59	756.54	663.65	633.34		(84)
7. Me	an inter	nal temp	berature	(heating	season	1)				•		•	•	•	
Temp	erature	during h	eating p	periods in	n the livi	ng a	area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for a	ains for	living are	ea. h1.m	ı (se	ee Ta	ble 9a)	,	~ /					
	Jan	Feb	Mar	Apr	Mav	Ť,	Jun	Jul	Aua	Sep	Oct	Nov	Dec	]	
(86)m=	0.98	0.94	0.86	0.7	0.52	0	).36	0.26	0.29	0.47	0.77	0.94	0.98		(86)
Moon	intorno	l tompor	oturo in	living or	L		w oto	no 2 to 7	l in Tobl					1	
(87)m-	20 47	20.65	20.84			T	21	21 21	21	21	20.94	20.7	20.44	1	(87)
(07)11-	20.47	20.00	20.04	20.00	20.00	<u> </u>	21	21	21	21	20.04	20.7	20.44	J	()
Temp	erature	during h	eating p	periods in	n rest of	dw	elling	from Ta	ble 9, T	h2 (°C)		1		1	(00)
(88)m=	20.19	20.19	20.2	20.21	20.21	20	0.22	20.22	20.22	20.21	20.21	20.2	20.2		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)						
(89)m=	0.97	0.93	0.83	0.66	0.48	0	).32	0.21	0.24	0.42	0.73	0.93	0.98		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing	T2 (fo	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	19.52	19.76	20.01	20.17	20.2	2	0.22	20.22	20.22	20.21	20.15	19.84	19.47		(90)
										f	LA = Liv	ing area ÷ (	4) =	0.38	(91)
Mean	interna	l temper	ature (fr	or the wh	ole dwe	llind	ר) – fl	Δ 🗙 Τ1	+ (1 – fl	A) x T2					
(92)m=	19.88	20.1	20.32	20.47	20.5	2	9, — 11 0.51	20.51	20.51	20.51	20.45	20.16	19.83	]	(92)
Apply	adiustr	l nent to t	L he mear	interna	l temper	atu	re fro	m Table	4e. whe	I ere appro	L opriate	1	I	1	
(93)m=	19.73	19.95	20.17	20.32	20.35	2	0.36	20.36	20.36	20.36	20.3	20.01	19.68	]	(93)
8. Sp	ace hea	ting requ	uiremen	t	l									1	
Set T	i to the i	mean int	ernal te	mperatu	re obtair	ned	at ste	ep 11 of	Table 9	b, so tha	t Ti,m=	(76)m an	d re-cald	culate	
the ut	ilisation	factor fo	or gains	using Ta	able 9a						·			1	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Utilisa	ation fac	tor for g	ains, hr	n: I a aa										1	(0.4)
(94)m=	0.96	0.92	0.83	0.66	0.48	0	).33	0.22	0.25	0.43	0.73	0.93	0.97		(94)
Usefu	Il gains,	hmGm	, W = (9)	4)m x (84	4)m		12 55	004.45	225.00	274.44		614.00	616.11	1	(05)
(95)m=	047.30	720.02	749.15	070.75	from T		+3.55	224.40	235.69	374.14	555.55	614.09	010.11		(93)
(96)m-			65				±0 46	16.6	16.4	14.1	10.6	7 1	4.2	1	(96)
Heat	loss rate	for me	n interr	al temp		'   m	 W -	-[(39)m ·	v [(03)m	' <sup></sup> '  - (96)m	1	/.1	7.2	J	(00)
(97)m=	952.18	926.03	838.97	691	522.33	34	, <u>, , , , , , , , , , , , , , , , , , </u>	224.46	235.91	375.06	585.47	783.6	944.68	]	(97)
Space	e heatin	a require	ement fo	r each n	nonth k	Wh	/mont	h = 0.02	4 x [(97	)m – (95	)ml x (	41)m		1	
(98)m=	226.79	133.87	66.83	14.58	1.95	<u> </u>	0	0	0		22.26	122.04	244.46	]	
-				I		-			Tota	al per year	ı (kWh/ye	ar) = Sum(9	98) <sub>15,912</sub> =	832.79	(98)
Snac	e heatin	a require	ement in	∖kW/h/m²	?∕vear					-	-			11 76	(99)
Space	- nouin	groquit			, ,									1 1.70	(00)

9a. En	erav rec	uiremen	its – Ind	ividual h	eating s	vstems i	ncluding	micro-C	HP)					
Spac	e heatir	ng:				,	J		/					
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)						
Efficie	Efficiency of main space heating system 1								90.8	(206)				
Efficiency of secondary/supplementary heating system, %								0	(208)					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Spac	e heatin	g require	ement (c	alculate	d above)	)						ı —	•	
	226.79	133.87	66.83	14.58	1.95	0	0	0	0	22.26	122.04	244.46	J	
(211)n	n = {[(98	)m x (20	4)] } x 1	100 ÷ (20	)6)								1	(211)
	249.77	147.44	73.6	16.05	2.15	0	0	0	0	24.52	134.41	269.23		-
								Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	7	917.17	(211)
Spac	e heatin	g fuel (se	econdar	y), kWh/	month									
$= \{[(98) (215)]$	)m x (20	01)]}X1	00 ÷ (20	18) 1 0	0	0	0	0	0	0	0	0	1	
(213)11-	0	0	0	0	0	0	0	Tota	l (kWh/vea	ar) =Sum(2	215)	=		<b>1</b> (215)
Wator	hosting									, ,	/ 10,1012	2		
Output	from wa	ı ater heat	ter (calc	ulated a	bove)									
•	192.89	168.49	175.3	155.49	150.54	132.59	127.03	141.61	143.17	163.03	174.03	188.36		
Efficie	ncy of w	ater hea	ter										81.5	(216)
(217)m=	86.28	85.37	83.87	82.22	81.61	81.5	81.5	81.5	81.5	82.52	85.09	86.5		(217)
Fuel fo	or water	heating,	kWh/m	onth										
(219)n (219)m=	1 = (64)	197.36	209.02	)m 189.11	184.47	162.68	155.86	173.75	175.67	197.57	204.52	217.74	1	
(,								Tota	I = Sum(2'	19a) <sub>112</sub> =			2291.31	(219)
Annua	al totals									k	Wh/year		kWh/year	
Space	heating	fuel use	d, main	system	1								917.17	]
Water	heating	fuel use	d										2291.31	Ī
Electri	city for p	oumps, fa	ans and	electric	keep-ho	t								J
centra	al heatin	g pump:										30	1	(230c)
boiler with a fan-assisted flue						1 1	(230e)							
Total electricity for the above kWh/year $sum of (230a)(230a) = $							75	) ](231)						
Electricity for lighting						315.8	](232)							
Electricity generated by PVs							-647 71	](233)						
102			vidual be	ating ev	etome:								047.71	
10a. I	ruer cos		nuuai ne	eating sy	stems.									
				<b>Fu</b> kW	<b>el</b> /h/year			Fuel P (Table	<b>rice</b> 12)		<b>Fuel Cost</b> £/year			
Space heating - main system 1				(211	1) x			3.4	.8	x 0.01 =	31.92	(240)		

(213) x

(215) x

Space heating - main system 2

Space heating - secondary

0

0

(241)

(242)

x 0.01 =

x 0.01 =

0

13.19

Water heating cost (other fuel)	(219)	3.48 × 0.01 =	79.74 (247)					
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	9.89 (249)					
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a								
Energy for lighting	(232)	13.19 × 0.01 =	41.65 (250)					
Additional standing charges (Table 12)			120 (251)					
	one of (233) to (235) x)	13.19 × 0.01 =	0 (252)					
Appendix Q items: repeat lines (253) and (2 Total energy cost (24	254) as needed 5)(247) + (250)(254) =		283.2 (255)					
11a. SAP rating - individual heating system	ns							
Energy cost deflator (Table 12)			0.42 (256)					
Energy cost factor (ECF) [(25	55) x (256)] ÷ [(4) + 45.0] =		1.03 (257)					
SAP rating (Section 12)			85.67 (258)					
12a. CO2 emissions – Individual heating s	ystems including micro-CHP							
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year					
Space heating (main system 1)	(211) x	0.216 =	198.11 (261)					
Space heating (secondary)	(215) x	0.519 =	0 (263)					
Water heating	(219) x	0.216 =	494.92 (264)					
Space and water heating	(261) + (262) + (263) + (264)	=	693.03 (265)					
Electricity for pumps, fans and electric keep	-hot (231) x	0.519 =	38.93 (267)					
Electricity for lighting	(232) x	0.519 =	163.9 (268)					
Energy saving/generation technologies Item 1		0.519 =	-336.16 (269)					
Total CO2, kg/year	s	sum of (265)(271) =	559.69 (272)					
CO2 emissions per m <sup>2</sup>	(	272) ÷ (4) =	7.91 (273)					
EI rating (section 14)			94 (274)					
13a. Primary Energy								
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year					
Space heating (main system 1)	(211) x	1.22 =	1118.95 (261)					
Space heating (secondary)	(215) x	3.07 =	0 (263)					
Energy for water heating	(219) x	1.22 =	2795.4 (264)					
Space and water heating	(261) + (262) + (263) + (264)	=	3914.34 (265)					
Electricity for pumps, fans and electric keep	n-hot (231) x	3.07 =	230.25 (267)					
Electricity for lighting	(232) x	0 =	969.52 (268)					
Energy saving/generation technologies Item 1		3.07 =	-1988.48 (269)					

'Total Primary Energy Primary energy kWh/m²/year sum of (265)...(271) =

(272) ÷ (4) =

31	3125.63				
4	4.15		(273)		



Date	02/11/2016
Reference	35 York Way
Author	Emma Jolly
Approver	Umer Uzair
Subject	Addendum to Energy Strategy Report (Ref: 14-1230)

In response to the above policy guidance the proposed development has been designed to incorporate the water efficiency measures in order to minimise the water consumption as 105 litres per person per day. This will be achieved by installing water efficient sanitary-ware fittings such as low flush WCs, spray showers, aerated taps and flow restrictors on the baths and showers. The table below provides the details of the proposed water efficient fittings and the calculations to verify that the target water savings of 105 litres/ person/ day can be achieved. The calculations below is in accordance with BRE Water calculator and also in accordance with Building Regulations Approved Document Part G.

Installation Type	Unit of Measure	Capacity/ flow rate (1)	Use factor (2)	Fixed use (litres/head/day) (3)	Total Consumption Litres/head/day [(1)x(2)]+(3)	
wc	Full Flush Volume (litres)	4.5	1.46	0	6.57	
(dual flush)	Part flush Volume (litres)	3	2.96	0	8.88	
Taps (excluding kitchen/ utility room taps)	Flow rate (litres/minute)	3	1.58	1.58	6.32	
Bath (where shower also present)	Capacity to overflow (litres)	160	0.11	0	17.6	
Shower (where bath also present)	Flow rate (litres/minute)	7	4.37	0	30.59	
Kitchen / utility room sink taps	Flow rate (litres/minute)	5	0.44	10.36	12.56	
Washing machine	Litres/kg dry load	8	2.1	0	16.8	
Dishwasher	Litres/place setting	1.5	3.6	0	5.4	
				Total	104.72 (Litres/head/day)	

The above table confirms that the development can meet the requirements as the total Water consumption will be less than 105 litres/ head/ day.

smarta100

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