MECSERVE

Energy & Sustainability Statement

for

S2S Architects

238 Kilburn High Road

London Borough of Camden London NW6 2BS

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EXECUTIVE SUMMARY

Mecserve Ltd have been appointed by S2S Architects to prepare an Energy and Sustainability Statement to support the planning application for the construction of a mixed-use development at 238 Kilburn High Road in the London Borough of Camden. The proposed scheme comprises a Class E unit on the ground floor with 7 no. apartments on 1st to 4th floors.

This Energy and Sustainability Statement, prepared in line with the Energy Assessment Guidance (April 2020) published by the Greater London Authority, outlines the key features and strategies adopted by the development team to enhance the energy performance of the proposed development at 238 Kilburn High Road. The scheme complies with all relevant policies with regards to energy and carbon emissions, set by the Camden Local Plan (2017). Sections 2 and 3 review these policies and demonstrate how the proposed design meets the planning targets and requirements to minimise its environmental impact.

The strategy for reducing energy use and associated carbon emissions through the design of the scheme follows the London Plan energy hierarchy, namely:

- Be Lean Reduce energy demand through passive design strategies and best practice design of building services, lighting and controls;
- Be Clean Reduce energy consumption further by connecting to an existing district heating system and exploit provision of Combined Heat and Power (CHP) systems;
- Be Green Generate power on site through Renewable Energy Technologies.

The following passive and active energy efficiency features have been considered in the proposed strategy for 238 Kilburn High Road:

- High performance building fabric of low U-values that exceed Part L minimum standards;
- Double-glazed windows of low U-values will help reduce the heating demand further;
- All junctions will conform to Accredited Construction Details thus eliminating thermal bridging;
- Individual gas-fired condensing boilers of high efficiency will provide heating and domestic hot water to the newly built apartments;
- All apartments will feature Mechanical Ventilation with Heat Recovery (MVHR) to make use of wasted heat of the exhaust air by preheating the incoming air;
- Light fittings will be of low energy types;

The following Low/Zero Carbon technologies are proposed for the scheme:

• Photovoltaic (PV) panels will be installed to generate renewable energy on site.

Following the proposed energy strategy, the new-built residential units achieve significant carbon savings over the Target Emission Rate (TER) set by Part L of current Building Regulations, in line with the Council's carbon reduction target i.e. a 19% reduction over 2013 TER.

Table 1 demonstrates the overall reduction in the regulated carbon emission of the development after each stage of the London Plan Energy Hierarchy.

Table 1 Regulated carbon dioxide en	missions after each stage	of the energy hierarchy for	domestic buildings

	Regulated domestic carbon dioxide emissions (Tonnes CO2 per annum)
Baseline CO2 emissions (Part L 2013 of the Building Regulations Compliant Development)	8.5
CO2 emissions after energy demand reduction (be lean)	8.2
CO2 emissions after energy demand reduction (be lean) AND heat network (be clean)	8.2
CO2 emissions after energy demand reduction (be lean) AND heat network (be clean) AND renewable energy (be green)	6.3

Table 2 demonstrates the total regulated CO₂ savings from each stage of the Energy Hierarchy. As demonstrated below, an overall 26% reduction in carbon emissions can be achieved over Part L 2013 TER when applying the proposed strategy, which exceeds the carbon reduction target set in the Camden Local Plan.

 Table 2 Regulated carbon dioxide savings from each stage of the energy hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: Savings from energy demand reduction	0.3	4%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	1.9	23%
Cumulative on-site savings	2.2	26%

The energy performance of the Class E unit on the ground floor has been also assessed. The following sections show that compliance with Part L of the 2013 Building Regulations is achieved.



Figure 1 below illustrates the total carbon savings achieved for the domestic elements of the scheme at each stage of the London Plan Energy Hierarchy for 238 Kilburn High Road. Overall, the apartments exceed the 19% carbon reduction required by the Camden Council.



Figure 1 Total carbon savings achieved over Baseline Emissions



1. INTRODUCTION

Over recent years, global public opinion has been increasingly concerned with the state of the environment and the impact of climate change. Buildings are responsible for a significant proportion of the world's energy consumption. In the United Kingdom, domestic, commercial buildings and industry contribute 43%¹ of the total CO2 emissions. These figures highlight the need for building owners, developers and designers to design environmentally sustainable buildings.

This report provides a review of the sustainability and efficiency benchmarks for the scheme and sets out targets for the development in terms of both sustainability and energy. An overview of different sustainability and energy-efficiency technologies that are likely to be appropriate for the development are also included in this statement.

As the design progresses, the strategies outlined in this report will be further developed and subjected to detailed financial feasibility studies. The environmental strategies and options outlined in this report are based on the current information available and are likely to evolve with the design.

The energy calculations presented in this report will need to be continually updated through the detailed design stages to reflect any changes. The energy analysis presented here should be treated as preliminary information based on the currently available data.

1.1 PROPOSED DEVELOPMENT

The proposal is for the construction of a 5-storey building at 238 Kilburn High Road in the London Borough of Camden. The scheme comprises a Class E unit on the ground floor with 7 no. residential units (3no. 1-Bed units, 3no. 2-Bed units and 1no. 3-Bed unit) on the 1st to 4th floors.

For a detailed description of the proposed design, please refer to the Design and Access Statement prepared by S2S Architects.

¹ Department for Environment, Food and Rural Affairs, http://www.defra.gov.uk/, 2008





Figure 2 Bird's eye view of existing Building



Figure 3 Proposed elevation (S2S Architects)



2. OVERVIEW OF ENVIRONMENTAL STANDARDS, TARGETS AND POLICIES

2.1 NATIONAL POLICIES

ENERGY WHITE PAPER

The Energy White Paper: Our Energy Future – Creating a Low Carbon Economy² is an energy policy in response to the increasing challenges faced by the UK, including climate change, decreasing domestic supplies of fossil fuel and escalating energy prices. The Energy White Paper sets four priorities:

- Cutting the UK's carbon dioxide emissions the main contributor to global warming by some 60% by about 2050, with real progress by 2020;
- Security of supply;
- A competitive market for the benefit of businesses, industries and households;
- Affordable energy for the poor.

CLIMATE CHANGE ACT 2008

Published in 2008 by the UK Government, Climate Change Act³ is the world's first long-term legally binding framework to mitigate against climate change. The Act sets legally binding targets to increase greenhouse gas emission reductions through action in the UK and abroad from the 60% target to 80% by 2050.

In addition to the standards, targets and policies discussed above, the relevant British Standards and CIBSE Guidelines were used to assist in determining the most appropriate Ecologically Sustainable Design (ESD) initiatives for the development.

² Dti, (2003); Energy White Paper Our Energy Future - Creating a Low Carbon Economy. TSO.

³ OPSI, (2008); Climate Change Act. HMSO.

NATIONAL PLANNING POLICY FRAMEWORK (NPPF) (JULY 2021)

The Government has developed the National Planning Policy Framework (NPPF) which plays a key role in delivering the Government's objectives on sustainable development. The framework encourages ownership at the local level and provides guidance to promote effective environmental protection, economic growth and ensuring a better quality of life for all, both now and in future generations. Some of the main objectives of the Governments planning framework in relation to sustainability are:

- Build prosperous communities with opportunities for employment and economic growth across all areas of society;
- Reduce the need for car dependency and provide easy access to public transport;
- Maintain, and enhance or restore biodiversity and geological interests;
- Protect the condition of land, its use, and its development from potential hazards;
- Ensure that all new developments contribute to the Governments targets of carbon emission reductions.

2.2 REGIONAL POLICY

THE LONDON PLAN 2021

The London Plan 2021 is the Spatial Development Strategy for Greater London. It sets out a framework for how London will develop over the next 20-25 years and the Mayor's vision for Good Growth. Good Growth - growth that is socially and economically inclusive and environmentally sustainable – underpins the whole of the London Plan and each policy. It is the way in which sustainable development in London is to be achieved.

Chapter 9 'Sustainable Infrastructure', sets the policies to address climate change and help London become a more efficient and resilient city by:

- seeking to improve energy efficiency and support the move towards a low carbon circular economy, contributing towards London becoming a zero-carbon city by 2050;
- ensuring buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, while mitigating and avoiding contributing to the urban heat island effect.

Supplementary Planning Guidance, Sustainable Design and Construction (April 2014) provides framework for implementing the London policies. This Energy and Sustainability Statement, has been prepared in line with the Energy Assessment Guidance (April 2020) published by the Greater London Authority.









2.3 LOCAL POLICIES

CAMDEN LOCAL PLAN (2017)

The Camden Local Plan sets out the Council's planning policies and replaces the Core Strategy and Development Policies planning documents (adopted in 2010). This sets out the key elements of the Council's planning vision and strategy of the borough.

Through its Camden Planning Guidance (CPG) on Energy efficiency and adaptation (Draft November 2018) the council provides additional information on key energy and resource issues within the borough.



The following is the review of the Camden Planning Policies for Climate

Change mitigation and Climate Change Adaptation followed by measures implemented in the proposed development to meet the applicable policy requirements.



3. CLIMATE CHANGE MITIGATION AND ADAPTATION STRATEGY

Climate Change is the rise in average global temperature due to increasing levels of greenhouse gases in the earth's atmosphere (primarily CO2) that prevent the radiation of heat into space.

Buildings and spaces built today should respond to climate change issues and adapt to mitigation and adaptation measures. The London Plan through its policies addresses these issues and will require London Boroughs to consider how their developments will function in the future in the context of changing climate.

Through various policies, Camden Council encourages developments to meet the highest feasible environmental standards, where feasible and possible, in order to minimise the effects of and adapt to climate change. The climate change risks for the London Borough of Camden are summarised below:

- Hotter, drier summers;
- Milder, wetter winters;
- More frequent extreme high temperatures;
- More frequent heavy downpours of rain;
- Significant decreases in soil moisture content in summer;
- Sea level rise and increases in storm surge height;
- Possible higher wind speeds.



3.1 CLIMATE CHANGE MITIGATION

As per the definition of United Nations Environment Programme (UNEP), Climate Change Mitigation refers to efforts to reduce or prevent emission of greenhouse gases. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behaviour.

The following policies from Camden's Local Plan relate to Climate Change Mitigation, in the context of this proposed development.

Policy CC1 Climate change mitigation

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

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

For decentralised energy networks, we will promote decentralised energy by:

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

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



Measures being considered in the project to meet the above policy requirements

According to the Camden Planning Guidance Energy efficiency and adaptation, the carbon reduction target set for a medium development applies to the domestic elements of the scheme, comprising 7 no. apartments. The carbon target set for a minor development applies to the single Class E unit on the ground floor. The energy strategy developed for the scheme follows the London Plan Energy Hierarchy and this report is written in line with GLA Energy Assessment Guidance.

In order to design an energy efficient, low carbon development, the design team has followed the London Plan Energy Hierarchy i.e.

- The development is designed to have highly efficient envelope and passive strategies, e.g. building fabric of high thermal performance and applying Accredited Construction Details to minimise thermal bridging, have been incorporated in the design where possible. Efficient building services including MVHR and low energy lighting are proposed to reduce energy consumption;
- The design team has carried out a feasibility study to assess the potential of connecting the scheme to a district heating network or provide a Combined Heat and Power to meet heating demand;
- A feasibility study to identify the most suitable renewable energy technologies has been carried out and presented in this report.

As a result of the proposed strategy, the apartments achieve an overall reduction of 26% over the 2013 TER, exceeding the reduction target set by the Camden Council. The Class E unit exceed the 2013 TER by 9%.

The scheme is expected to have a low heating demand due to its size, the high performance building fabric performance proposed and the low water use fittings to be specified. According to the London Heat Map (Figure 4), the site is not within a district heating opportunity area and there is no existing network in close proximity or one to become available in the future. Therefore, given also the small scale of the scheme, it is not feasible or viable to connect to a district heat network.

Installation of a Combined Heat and Power (CHP) unit has been also considered. However, there is not high heating and hot water demand throughout the year to enable the CHP unit to run continuously for long period thus ensuring maximum carbon and cost savings. As per GLA guidance on energy assessments, a higher number of residential units is required to justify installation of a CHP unit.

A feasibility study has been carried out to assess those renewable energy technologies that could be appropriate for the proposed development – please refer to Section 4 of the report. Photovoltaic panels are proposed to generate renewable energy on site. A VRF system comprising an Air Source Heat Pump is also proposed for the Class E unit to provide space heating.



Figure 4 Image of London Heat Map (https://maps.london.gov.uk/heatmap)

The development makes efficient use of land within the borough by providing additional residential units within the existing site. The site is well served by public transportation links thus reducing car usage.

The design and construction of the scheme will promote resource efficiency by prioritising use of recycled/reclaimed materials and specifying environmentally friendly materials of low embodied carbon where reuse is not feasible. Resource efficiency will be also promoted during construction by reducing waste, energy and water use on site.

More information can be found in the Design and Access Statement prepared by S2S Architects.



3.2 CLIMATE CHANGE ADAPTATION

For a long time, the main focus of climate change has been on mitigation, making sure we minimise our impact on the environment. Adaptation strategies are those that take into account climate change and ensure that the building is capable of dealing with future change in climate. Given the time lag associated with climate change, even if we change the way we live, there is likely to be noticeable change in the climate during the life of the building.

To ensure that buildings maintain their relevance, it is essential that adaptation strategies are addressed during the design phase. Adoption of these strategies will mean that, even as we undergo climate change, the buildings can still function as required.

The following policies from Camden's Local Plan relate to Climate Change Adaptation, in the context of this proposed development.

Policy CC2 Adapting to climate change

The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

- a. the protection of existing green spaces and promoting new appropriate green infrastructure;
- b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;
- c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
- d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures

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

- e. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;
- f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;
- g. encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and



h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.

Measures being considered in the project to meet the above policy requirements

Even though the scheme is not classified as a major development, measures to eliminate the risk of overheating have been considered and integrated in the design of the new apartments. The following will be applied to ensure comfort during summer within the main living areas of the units:

- well insulated fabric elements and high airtightness to prevent heat transfer from the external environment.
- Openable windows to allow for natural cross ventilation.
- Windows will be of low g-value to avoid heat transmittance during summer but allow for passive heating in the winter.
- When required, additional flow rates can be provided through whole house mechanical ventilation, bypassing heat recovery.
- Energy efficiency light fittings that emit less heat than standard types thus reducing overheating will be also specified.
- Tenants will be advised to purchase A-rated appliances of low energy consumption to reduce internal heat gains.

Good practice sustainable development principles will be incorporated in the design to minimise the environmental impact of the scheme. A green roof is proposed for the scheme to enhance the ecological value of the site while reducing urban island heat effect and water runoff.

All new apartments will have low water use fittings to reduce water consumption on site. Installation of low flow rate showers, taps and dual flush toilets, together with smaller baths (where applicable) will mean that all apartments will achieve a maximum internal water use of 105 litres per person/day, with an additional 5 litres person/day for external water use.

For more information please refer to the Design and Access Statement prepared by S2S Architects.

Policy CC3 Water and flooding

The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible.

We will require development to:

- a. incorporate water efficiency measures;
- b. avoid harm to the water environment and improve water quality;



- c. consider the impact of development in areas at risk of flooding (including drainage);
- d. incorporate flood resilient measures in areas prone to flooding;
- e. utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and
- f. not locate vulnerable development in flood-prone areas.

Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable.

The Council will protect the borough's existing drinking water and foul water infrastructure, including the reservoirs at Barrow Hill, Hampstead Heath, Highgate and Kidderpore.

Measures being considered in the project to meet the above policy requirements

The site is in a low flood risk zone according to the Environmental Agency Flood Map (Figure 5) below.

Based on Map 6: Historic flooding and Local Flood Risk Zones of the Local Plan, the site is close to those parts that have experienced significant sewer or surface water flooding and therefore considered to have the potential to be at risk of surface water flooding.



Figure 5 Environment Agency Flood Map





Figure 6 Map 6: Historic flooding and Local Flood Risk Zones of Camden's Local Plan

Policy CC4 Air quality

The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough.

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air



quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.

Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.

Measures being considered in the project to meet the above policy requirements

The proposed scheme will provide 7no. dwellings. Low NOx individual gas-fired boilers are proposed to provide heating to the new apartments, therefore, any impact on the air quality will be minimal.

Policy CC5 Waste

The Council will seek to make Camden a low waste borough.

We will:

- a. aim to reduce the amount of waste produced in the borough and increase recycling and the reuse of materials to meet the London Plan targets of 50% of household waste recycled/composted by 2020 and aspiring to achieve 60% by 2031;
- b. deal with North London's waste by working with our partner boroughs in North London to produce a Waste Plan, which will ensure that sufficient land is allocated to manage the amount of waste apportioned to the area in the London Plan;
- c. safeguard Camden's existing waste site at Regis Road unless a suitable compensatory waste site is provided that replaces the maximum throughput achievable at the existing site; and
- d. make sure that developments include facilities for the storage and collection of waste and recycling.

Measures being considered in the project to meet the above policy requirements

Recycling and composting will be promoted by e.g. providing relevant facilities and information to the future tenants through a Home User Guide.



4. ENERGY ASSESSMENT

The energy performance of the proposed scheme has been assessed in line with the Standard Assessment Procedure (SAP) and the National Calculation Methodology (NCM) for the domestic and non-domestic elements of the scheme respectively.

This section, prepared in line with the GLA Energy Assessment Guidance (April 2020), outlines the energy strategy developed for the scheme and shows how significant carbon savings can be achieved by integrating energy efficiency measures and using renewable energy technologies on site. Appendices B-G provide the SAP 2012 Worksheets for the sample units assessed and the BRUKL output documents for the Class E unit.

4.1 BUILDING REGULATION COMPLIANCE

Part L (Conservation of Fuel and Power) of the Building Regulations applies to all components of the development. This was updated in 2013 and came into effect in April 2014.

All components of the development will be designed to exceed the requirements of the Building Regulations Part L. Compliance with Part L 2013 will be demonstrated by completing carbon emission calculations in line with the SAP 2012 and NCM methodologies. The energy assessment details a number of energy efficiency improvements and includes a renewable energy analysis which leads to a reduced carbon emission rate for the development.

Meeting the requirements of Part L will be achieved through:

- 1. Efficient Thermal Elements and Controlled fittings: the building fabric will be designed to improve on minimum Part L 2013 requirements;
- 2. Building Services and Lighting: The new building services will be designed and specified to perform better than the minimum standards detailed in both Domestic & Non-Domestic Building Services Compliance Guide (2013 edition).

4.2 ENERGY MODELLING

The Standard Assessment Procedure (SAP 2012) was used to model the residential elements of the scheme. The ground floor Class E unit has been modelled in IES-VE software (version 2021.1.0.0, Compliance 7.0.13.0).

The energy assessment has been completed by Mecserve's energy modelling team who are accredited On Construction Domestic Energy Assessors and Low Carbon Energy Assessors (Level 3-4-5).



4.3 BASELINE CARBON EMISSION RATE

According to GLA's Energy Assessment Guidance, the Building Regulations Part L1A and Part L2A Target Emission Rate (TER) should be used to determine the baseline CO_2 emissions for the domestic and non-domestic elements of the scheme respectively. Table 3 below presents the baseline CO_2 emissions for the scheme.

Table 3 Baseline Carbon Dioxide emissions

Regulated Carbon dioxide emissions (Tonnes CO ₂ per annum)	Domestic	Non-Domestic
Total Floor Area (sqm)	437.3	76.5
GLA Baseline: Part L 2013 of the Building Regulations Compliant Development	8.5	2.9

From 6 April 2014, Approved Document L1A has introduced a fabric energy efficiency target (FEE). This is the maximum space heating and cooling energy demand for a new home. It is measured as the amount of energy which would normally be needed to maintain comfortable internal temperatures in a home and is measured in kWh per m² per annum.

The table below presents the Target Fabric Energy Efficiency (TFEE) calculated by FSAP 2012 software.

Table 4 Dwellings Fabric Energy Efficiency

Fabric Energy Efficiency (kWh/sqm per annum)	Dwellings
Part L1A Target Fabric Energy Efficiency (TFEE) Rate	53.8



4.4 LONDON PLAN ENERGY HIERARCHY

To meet the requirements of Policy 5.2 Minimising Carbon Dioxide Emissions development proposals should minimise carbon dioxide emissions in accordance with the following energy hierarchy:

- Be lean: use less energy;
- Be clean: supply energy efficiently;
- Be green: use renewable energy.

The hierarchy provides the mechanism through which the carbon dioxide (CO₂) emission reduction targets in Policy 5.2 of the London Plan are achieved. It also contributes to the implementation of strategic energy policies relating to decentralised networks and ensures opportunities for building occupants to receive efficient, secure and affordable energy.

GLA Energy Assessment Guidance states that the energy assessment must clearly identify the carbon footprint of the development after each stage of the energy hierarchy. Regulated emissions must be provided and, separately, those emissions associated with uses not covered by Building Regulations i.e. unregulated energy uses.

According to the Camden Planning Guidance Energy efficiency and adaptation, the carbon reduction target set for a medium development applies to the domestic elements of the scheme, comprising 7 no. apartments. The carbon target set for a minor development applies to the single Class E unit on the ground floor. The following sections demonstrate the carbon savings achieved at each step of the London Plan Energy Hierarchy.

4.5 BE LEAN – DEMAND REDUCTION

At the first 'Be Lean' stage of the Energy Hierarchy, the energy demand of the scheme is reduced through passive design measures such as optimising the orientation and form of the building and specifying building fabric of high thermal performance as well as proposing building services systems of high energy efficiency (active design).

The 'Be Lean' measures should demonstrate the extent to which the energy demand meets or exceeds the requirements of Part L of the Building Regulations. The following sections demonstrate how the proposed development will achieve energy and CO₂ savings over the GLA Baseline emission rate.



PASSIVE DESIGN

Passive design measures, including optimising orientation and site layout, natural ventilation and lighting, thermal mass and solar shading have been integrated in the design.

Energy demand reduction will be achieved through:

- **Building Orientation**: Most of the windows are facing due SE/SW. The majority of the units are dual aspect thus enjoying high daylight and sunlight levels throughout the year.
- **Passive Solar Design and Daylight**: The make-up of the proposed façades has balanced proportion of solid wall to glazing, thus providing optimum amount of daylight and sunlight, for winter passive heating, while limiting excessive solar gains in summer. High performance glass is proposed throughout the scheme for additional solar control. Combined with the shading effect of the balconies, the apartments receive lower solar gains.
- **Thermal performance of the fabric**: the proposed building fabric exceeds the requirements set in the Part L of the Building Regulations with regards to U-values to reduce heat losses.
- Thermal bridging (domestic elements): where available, the psi values equivalent of that of Accredited Construction Details (ACD) have been used in the SAP calculation. An improvement over the Part L guidance is proposed for two specific junctions i.e. window lintels and bolt on balconies as shown in the following table. The psi values targeted for this development are not challenging and can be achieved via appropriate detailed design to allow for continuous insulation, in line with the building regulations and available guidance on Accredited Construction Details provided by the government.
- Airtightness: Robust construction details will be used to reduce heat losses through infiltration thus improving the air tightness of both the residential units and the commercial elements. An air permeability rate of 3 m³/m²hr @50Pa is targeted for the dwellings, which is achievable for a new construction of this standard.

Table 5 below shows initial assumptions on building fabric specifications including air permeability. These will be thoroughly reviewed by the design team at later stage.

BUILDING FABRIC		
U-VALUE WALL [W/m ² K] FLOOR		 0.18 – External walls 0.24 – Semi exposed walls (between apartments and communal areas, assumed to be unheated) 0.0 – Party walls (between apartments, assuming a fully filled cavity with effective sealing at all exposed edges and in line with insulation layers in abutting elements)
		0.13 – Ground floor 0.25 – Party floor (between apartments and unheated communal areas/ GF retail unit)
	ROOF	0.13 – Green roof 0.12 – Terraces

Table 5 Proposed building fabric specifications



	WINDOWS/	1.20 (g-value: 0.40) – Apartments		
	GLAZED DOORS	1.60 (g-value: 0.40) – Class E unit		
	SOLID DOORS	1.00 – Flats' main entrance door		
AIR PERMEABILITY	3 m ³ /m ² hr @50Pa	a – Domestic elements		
	5 m ³ /m ² hr @50Pa	a – Non-domestic elements		
THERMAL BRIDGING	We have assume	d that Psi values in line with the Accredited Construction Details will be		
(Residential units)	achievable for th	is development. These values are achievable if the relevant guidance is		
	followed and the	insulation is continuous in line with Part L of the Building Regulations.		
	The design team	will complete the detailing of each junction at the next design phase during		
	the detailed desig	n stage in line with the relevant guidance provided by Part L of the Building		
	Regulations on A	Accredited Construction Details (ACDs) – as shown in Table K1 of SAP 2012		
	with regards to eliminating thermal bridging.			
	An improvement	n improvement over the Part L guidance is proposed for two specific junctions i.e. window		
	lintels and bolt or	It on balconies.		
	EU1 Lintel	tel High performance lintel with pre-fitted expanded polystyrene insulation		
		e.g. Hi-therm+ lintel or similar		
		(Psi < 0.05 W/mK)		
	E23 Balcony	The following product (or better) is proposed to reduce heat losses:		
	between	e.g. Schoeck - Isokorb KS 14 thermal break or similar		
	dwellings	(Psi < 0.287 W/mK)		

Achieving the above values will reduce the energy demand of the development prior to considering further energy efficiency measures and renewable energy systems for the development.



ACTIVE DESIGN

After reducing the energy demand of the development, the next stage would be to use energy efficient building services systems, low energy lighting and controls throughout the scheme to reduce fuel consumption.

Our proposed energy strategy includes the following:

- **Space Heating and Hot Water:** Individual gas-fired boilers of high efficiency will be installed within each flat to provide space heating via radiators and domestic hot water.
- Ventilation: Fresh air will be provided to the dwellings via Mechanical Ventilation with Heat Recovery. All windows can be fully openable and the MVHR unit can be set on summer bypass mode during the warmer months.
- Lighting: Low energy light fittings of LED types will be used throughout the scheme.

 Table 6 Proposed domestic building services systems

DOMESTIC BUILDING SERVICES SYSTEMS					
SPACE HEATING	Space heating and hot water will be pro-	Space heating and hot water will be provided by individual condensing gas-fired boilers			
& DHW	SEDBUK 2009 efficiency: 88.6%				
HEATING CONTROLS	- Programmer, Thermostat & TRVs				
	- Boiler interlock				
WATER	Dwellings designed to achieve a water use target less than 125 litres/person/day				
CONSUMPTION					
MECHANICAL	Whole house balanced mechanical ventilation with heat recovery (Approved installation				
VENTILATION	scheme) with summer bypass				
	No. of wet fans (excl. kitchen) SFP (W/l/s) Efficiency (%)				
	1 0.42 91%				
	3 0.52 90%				
LIGHTING	All light fittings will be dedicated low energy types i.e. LED fittings				

Table 7 Non-domestic building services systems (Shell & Core)

BUILDING SERVICES SYSTEMS (SHELL & CORE)		
HEATING & COOLING SYSTEMS	A Variable Refrigerant Flow (VRF) system, utilising reverse cycle heat pumps, will provide cooling and heating to the Class E unit.	
DOMESTIC HOT WATER	Point of use direct electric heaters (100% efficiency)	
MECHANICAL	Central AHU	AHU SFP: 1.6 W/I/s
VENTILATION	Heat Recovery	75% efficiency
METERING	All systems and lighting systems have provision for metering	
POWER FACTOR	> 0.95	
LIGHTING (SHELL & CORE)		
LIGHTING EFFICACY & CONTROLS	General Lighting	80 Luminaire Im/W Daylight sensors (Dimming/Addressable)
	Display Lighting	22 Lamp lm/W Time switch



SAVINGS FROM 'BE LEAN' MEASURES

After implementing all the passive and active energy efficiency measures listed above, the carbon dioxide emissions of the proposed scheme are reduced by 4% and 7% for the domestic and non-domestic elements respectively. Subsequently, the reduction in Fabric Energy Efficiency of the domestic elements is 1%, as the following table demonstrates.

Table 8 Carbon Dioxide emissions reduction – Lean Stage

Regulated Carbon dioxide emissions (Tonnes CO ₂ per annum)	Domestic	Non-Domestic
GLA Baseline Emissions	8.5	2.9
Be Lean: After energy demand reduction	8.2	2.7
Carbon Savings over Baseline	0.3	0.2
Carbon Reduction over Baseline	4%	7%

Table 9 Dwellings Fabric Energy Efficiency

Fabric Energy Efficiency (kWh/sqm per annum)	Dwellings
Part L1A Target Fabric Energy Efficiency (TFEE) Rate	53.8
Area-weighted average Dwelling Fabric Energy Efficiency (DFEE) Rate	53.1
Improvement over Part L1A 2013 TFEE	1.3%



4.6 OVERHEATING AND COOLING ASSESSMENT

The project design has followed the overheating and cooling hierarchy described in the London Plan Policy 5.9 Overheating and Cooling. The cooling hierarchy has been addressed to reduce potential overheating risk and reduce demand for active cooling.

Measures to eliminate the risk of overheating have been considered and integrated in the design of the apartments. The following will be applied along with the passive measure proposed to maintain thermal comfort during summer within the main living areas of the units:

- Openable windows to allow for natural cross ventilation. Windows can be left open during the night in hot summer periods to allow for night-time cooling for cooling down the structure by taking advantage of the lower external temperatures.
- Well insulated thermal envelope for preventing heat transfer during heat waves.
- High performance windows of low g-value combined with the shading effect of balconies for reducing solar gains.
- When required, additional flow rates can be provided through whole house mechanical ventilation, bypassing heat recovery.
- Tenants will be advised to purchase A-rated appliances of low energy consumption to reduce internal heat gains.
- Energy efficiency light fittings that emit less heat than standard types thus reducing overheating will be also specified.

4.7 NON-REGULATED ENERGY USE

Camden's Local Plan requires that the energy demand and carbon dioxide emissions of the nonregulated end uses should also be calculated and reported as part of the energy assessment.

In accordance with BRE SAP calculation and NCM methodology for estimating the non-regulated carbon emissions, the total carbon emissions from non-regulated energy are 8.4 tnCO₂ and 0.8 tnCO₂ for the residential units and the non-domestic elements of the scheme respectively.

The following strategies are proposed to reduce the non-regulated energy demand of the development:

- Information on energy efficiency of appliances will be provided to the future tenants along with recommendations on how to save energy by responsible behaviour.
- Within the flats, the kitchens will be fitted out with highly efficient A-rated appliances or alternatively information about high efficiency units will be provided to future owners.
- Installation of energy meters with display monitors for each flat. This will encourage the occupants to become more interested and involved in how energy is being used in their flat.



• Information will be provided to occupants which will explain the operations of the installed systems and PV panels and how energy efficient behaviour can reduce the cost/carbon emissions of the development.

It is estimated that proposed strategies may reduce the unregulated carbon emission by at least 10%. However, at this stage, this can only be an assumption as small power consumption depends mainly on occupant's behaviour.

4.8 BE CLEAN – SUPPLYING LOW CARBON ENERGY

As required by Camden's Local Plan, connection to existing district heat networks and incorporation of communal heating system in the buildings have been considered for the scheme.

DISTRICT ENERGY NETWORK

According to the London Heat Map (Figure 4) there is no existing district heating system currently available in close proximity to the site and this is not within a Heat Network Priority Area.

COMBINED HEAT AND POWER (CHP)

Installation of a Combined Heat and Power unit for the scheme has also been considered. According to the GLA guidance in relation to CHPs, due to the ongoing decarbonisation of the grid the carbon savings achieved from gas-engine CHP, has diminished. Accounting also for the potential impact of the technology on air quality, the option of utilising a CHP unit has been disregarded.

Due to the scale of the scheme and its low heating demand throughout the year, individual gas-fired boilers are proposed for each flat.



4.9 BE GREEN- RENEWABLE ENERGY TECHNOLOGIES

In order to further reduce emissions from the development in accordance with Camden's Local Plan and London Plan Energy Hierarchy, it is necessary to consider the introduction of renewable energy systems on site. A high-level assessment of the following renewable technologies was carried out as part of the feasibility study:

- Biomass Boilers;
- Wind Turbines;
- Heat Pumps (Ground/Water/Air);
- Solar Hot Water Heating;
- Photovoltaic panels.

Photovoltaic (PV) panels and Air Source Heat Pumps (ASHPs) were identified as the most appropriate technology for dwellings and the Class E unit respectively. Appendix A of this report provides brief commentary on the technologies not considered appropriate for the scheme.

PHOTOVOLTAIC (PV) PANELS

Installation of Photovoltaic panels on the roof has been considered. As there are no taller buildings or other topographical features in close proximity that could overshadow the roof, the installed PV panels would receive maximum solar energy throughout the day.

The proposed configuration of the PV array should allow enough space between the panels to avoid overshadowing during winter when the sun is at its lowest altitude (minimum 1m). A distance of at least 1m should be kept from the roof edge to provide access and address safety issues during installation and maintenance but also avoid the higher wind loads occurring closer to the roof edge and reduce the impact of wind uplift.

The details of the proposed PV panels will be confirmed at the detailed design stage by a Microgeneration Certification Scheme (MCS) accredited body responsible for design and installation of the PV array.

RENEWABLE ENERGY TECHNOLOGIES		
PHOTOVOLTAIC	No.	18
(PV) PANELS	Power output	4.5 kWp (250Wp per panel)
	Area	29.3 sqm (circa 1.63sqm per panel)
	Orientation	Southeast facing
	Inclination	15 degrees (to allow for self-cleaning)

Table 10 Proposed Renewable Energy Technology (PV panels)

The energy output of the PV panels, circa 3.7MWh, will be used to meet the demand of the development. PV panels will offer carbon savings of circa 1.9tnCO₂ per year, achieving a further reduction of 23%, in excess of Camden's Local Plan target of 20%.





Figure 7 Indicative PV array

AIR SOURCE HEAT PUMP

A VRF system comprising an Air-Source Heat Pump is proposed for the Class E unit to provide space heating and comfort cooling.

Table 11 Class E unit (Shell & Core)

RENEWABLE ENERG	Y TECHNOLOGIES	
AIR SOURCE HEAT PUMP (ASHP)	SCOP	3.0
	SEER	4.0

The following table presents the carbon savings achieved after proposing renewable energy technologies on site.

Table 12 Carbon Dioxide emissions reduction for the development

Regulated Carbon dioxide emissions	Domestic	Non-Domestic
(Tonnes CO ₂ per annum)		
GLA Baseline Emissions	8.5	2.9
Be Lean: After energy demand reduction	8.2	2.7
Be Clean: After heat network / CHP	8.2	2.7
Be Green: After renewable energy technologies	6.3	2.7
Carbon Savings over Clean stage	1.9	0.1
Carbon Reduction over Clean stage	23%	3%



5. CONCLUSION

This Energy Statement outlines the key features and strategies adopted by the development team to reduce energy use and carbon emissions for the scheme and demonstrate compliance with the London Borough of Camden Climate Change Mitigation and Adaptation Policies.

The strategy for reducing energy use and associated carbon emissions through the design of the scheme follows a three-step approach in line with the London Plan Energy Hierarchy.

- Reducing the energy demand through passive design strategies and provision of high-quality building envelope;
- Reducing the energy consumption through best practice design of building services, lighting and controls; and,
- Installation of on-site renewable energy technologies.

Passive and active energy efficiency features include:

- Building fabric of high thermal performance, in terms of U-values and air tightness, and use of Accredited Construction Details;
- Building services systems of high efficiency, including condensing boilers and MVHR units, and light fitting of low energy types;
- Photovoltaic (PV) panels will be installed to generate renewable energy on site.

Following the proposed energy strategy, the new-built residential units achieve significant carbon savings over the Target Emission Rate (TER) set by Part L of current Building Regulations, in line with the Council's carbon reduction target i.e. a 19% reduction over 2013 TER.

Table 13demonstrates the overall reduction in the regulated carbon emission of the development after each stage of the London Plan Energy Hierarchy.

Table 13 Regulated carbon dioxide emissions after each stage of the energy hierarchy for domestic buildings

	Regulated domestic carbon dioxide emissions (Tonnes CO2 per annum)
Baseline CO2 emissions (Part L 2013 of the Building Regulations	8.5
Compliant Development)	
CO2 emissions after energy demand reduction (be lean)	8.2
CO2 emissions after energy demand reduction (be lean) AND heat network (be clean)	8.2
CO2 emissions after energy demand reduction (be lean) AND heat network (be clean) AND renewable energy (be green)	6.3

Table 14demonstrates the total regulated CO_2 savings from each stage of the Energy Hierarchy. As demonstrated below, an overall 26% reduction in carbon emissions can be achieved over Part L 2013 TER when applying the proposed strategy, which exceeds the carbon reduction target set in the Camden Local Plan.

Table 14 Regulated carbon dioxide savings from each stage of the energy hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: Savings from energy demand reduction	0.3	4%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	1.9	23%
Cumulative on-site savings	2.2	26%

The energy performance of the Class E unit on the ground floor has been also assessed. The following sections show that compliance with Part L of the 2013 Building Regulations is achieved.

Figure 1 below illustrates the total carbon savings achieved for the domestic elements of the scheme at each stage of the London Plan Energy Hierarchy for 238 Kilburn High Road. Overall, the apartments exceed the 19% carbon reduction required by the Camden Council.



238 Kilburn High Road

Figure 8 Total carbon savings achieved over Baseline Emissions



APPENDIX A. LOW/ZERO CARBON TECHNOLOGIES

BIOMASS BOILER

A biomass boiler works effectively against a consistent heating load, however, adequate space dedicated for storing the fuel is required. Within inner London areas, there are concerns about the effect of small scale biomass systems on air-quality particularly with respect to particulates released through the boiler flue. For this reason, we would not recommend a biomass boiler for this development.

• WIND TURBINES

Wind turbines' performance in urban areas is normally not very good and unpredictable due to turbulences on air movement caused by the surrounding built environment. Wind turbines may also raise issues due to noise disturbance and their visual impact. Therefore, this technology is not suitable for this site.

• GROUND SOURCE HEAT PUMP

Ground source heat pumps have been considered for the development. With a closed loop borehole system, it would be possible to drop loops beneath the proposed extension. However, given that the heating demand for this development is low, the cost of installing a ground source heat pump would not make this system financially viable. Therefore, given that a ground source system would be complex, technically risky, costly and deliver limited carbon emissions savings, we would not recommend this approach for the development.

• SOLAR HOT WATER HEATING

Solar thermal hot water systems can work well on residential developments. However, compared to PV panels, they require higher maintenance and more space inside the apartments for risers and hot water storage. Therefore, we would recommend that the available roof space is utilised for the installation of a PV array.



APPENDIX B. TER WORKSHEETS


User Details:	
Assessor Name: Panagiotis Dalapas Stroma Number: STRO	030082
Software Name. Stroma FSAF 2012 Software version. Versio	11. 1.0.3.41
Address : 238 KII BURN HIGH ROAD ONDON NW6 2BS	
1. Overall dwelling dimensions:	
Area(m²) Av. Height(m) Ground floor 50.18 (1a) x 2.5 (2a) =	Volume(m³) 125.45 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 50.18 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	125.45 (5)
2. Ventilation rate:	
Number of chimneys $\begin{bmatrix} main \\ heating \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \times 40 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$	m ³ per hour
Number of open flues $0 + 0 + 0 = 0 \times 20 =$	0 (6b)
Number of intermittent fans 2 x 10 =	20 (7a)
Number of passive vents $0 \times 10 =$	0 (7b)
Number of flueless gas fires 0 × 40 =	0 (7c)
Air ch	lenges per bour
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)	0.16 (8)
Number of storeys in the dwelling (ns)	0 (9)
Additional infiltration [(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0 (12)
If no draught lobby, enter 0.05, else enter 0	0 (13)
Percentage of windows and doors draught stripped	0 (14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ Infiltration $(12) \div (12) \div (12) \div (12) \div (12) =$	0 (15)
Inflitration rate $(0) + (10) + (11) + (12) + (13) =$	0 (16)
All permeability value, qoo, expressed in cubic metres per nour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] \pm (8)$, otherwise $(18) = (16)$	5 (17)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.41 (10)
Number of sides sheltered	4 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7 (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$	0.29 (21)
Infiltration rate modified for monthly wind speed	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed from Table 7	
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	
Wind Factor (22a)m = (22)m \div 4	
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	



Adjuste	ed infiltra	ation rate	e (allowi	ng for sł	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]	
Calcula If me	ate effec ochanica	tive air o I ventila	change . ition:	rate for t	he appli	cable ca	se							(235)
If exh	aust air he	eat pump (usina Appe	endix N. (2	3b) = (23a	a) × Fmv (e	equation (1	N5)) . othe	rwise (23b) = (23a)			0	(23b)
lf bala	inced with	heat reco	overy: effic	iency in %	allowing	for in-use fa	actor (fron	n Table 4h) =	, (,			0	(230)
a) If	halance	d mech:	anical ve	ntilation	with he	at recove	⊃rv (M\/I	-IR) (24a) m = (22	2h)m + ('	23h) 🗙 [ʻ	1 – (23c)	0 . ∸ 1001	(200)
(24a)m=	0	0		0	0	0	0	0	0	0	0	0]	(24a)
b) If	balance	d mecha	L anical ve	entilation	without	heat rec	L coverv (N	I //V) (24b	m = (22)	L 2b)m + (;	1 23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If y	whole h	ouse ex	ract ver	tilation o	or positiv	/e input v	ı ventilatio	n from o	utside				1	
i	f (22b)m	n < 0.5 ×	(23b), t	hen (240	c) = (23b	o); otherv	wise (24	c) = (22k	o) m + 0.	5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If i	natural v f (22b)m	ventilation $= 1$, the	on or wh en (24d)	ole hous m = (22t	e positi	ve input v erwise (2	ventilatio 4d)m =	on from I 0.5 + [(2	oft 2b)m² x	0.51				
(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)
Effec	tive air	change	rate - er	nter (24a) or (24	b) or (24	L c) or (24	d) in boy	(25)				1	
(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)
		a a sa al da s				I	I	1	1		I	1	1	
		s and ne	eat loss		er: ac	Not Ar	<u></u>		10			k volu	<u></u>	
		area	(m²)	r	95 1 ²	A ,n	n ²	W/m2	:K	(W/I	<)	kJ/m²·	K	kJ/K
Doors						2.15	x	1	=	2.15				(26)
Window	ws Type	1				2.77	x1	/[1/(1.4)+	0.04] =	3.67				(27)
Window	ws Type	2				2.77	x1	/[1/(1.4)+	0.04] =	3.67				(27)
Window	ws Type	3				1.7	x1	/[1/(1.4)+	0.04] =	2.25				(27)
Window	ws Type	4				1.45	x1	/[1/(1.4)+	0.04] =	1.92				(27)
Window	ws Type	5				1.7	x1	/[1/(1.4)+	0.04] =	2.25				(27)
Floor						50.18	3 X	0.13	=	6.5234				(28)
Walls T	ype1	53.6	8	10.3	Э	43.29) X	0.18	= =	7.79	T T		$\exists \vdash$	(29)
Walls 1	ype2	14.7	'3	0		14.73	3 X	0.18	= [2.65	īĒ		$\exists \vdash$	(29)
Walls 1	уре3	3.34	4	2.15		1.19	x	0.18		0.21	i F		- -	(29)
Total a	rea of e	lements	, m²	L		121.9	3							(31)
Party w	vall					22.09) x	0	=	0				(32)
* for wind	dows and e the area	roof winde s on both	ows, use e sides of ir	effective wi	ndow U-v Is and par	alue calcula titions	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	n 3.2	
Fabric	heat los	s, W/K =	= S (A x	U)	,			(26)(30)) + (32) =				33.1	1 (33)
Heat ca	apacity (Cm = S((Axk)	-					((28)	.(30) + (32	2) + (32a).	(32e) =	10852	.79 (34)
Therma	al mass	parame	ter (TMI	⊃ = Cm ÷	- TFA) iı	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
For desig can be u	gn assess sed instea	ments wh ad of a dei	ere the de tailed calc	tails of the ulation.	construct	tion are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f	L	
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	opendix ł	<						14.4	5 (36)
if details	of therma	l bridging	are not kn	own (36) =	= 0.05 x (3	81)								



Total fa	abric he	at loss							(33) +	(36) =			47.55	(37)
Ventila	ition hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5)		41.00	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	23.46	23.36	23.25	22.76	22.66	22.23	22.23	22.15	22.4	22.66	22.85	23.05		(38)
Heat tr	ansfer o	coefficie	nt, W/K	-		-			(39)m	= (37) + (3	- 38)m			
(39)m=	71.02	70.91	70.8	70.31	70.22	69.79	69.79	69.71	69.95	70.22	70.4	70.6		
		mater (l		/					(10)	Average =	Sum(39)1.	12 /12=	70.31	(39)
(40)m=	1.42		1_P), VV	1.4	1.4	1.39	1.39	1.39	(40)m	= (39)m - 1.4	1.4	1.41]	
()										Average =	Sum(40)1.		1.4	(40)
Numbe	er of day	/s in mo	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ene	rgy <mark>r</mark> equ	irement:								kWh/ye	ear:	
Assum	ied occu	ipancy,	N								1	.7		(42)
if TF	A > 13.	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	9)		1	
Annua	A£13.9 Laverad	9, N = 1 ie hot wa	ater usad	ne in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		74	17	1	(43)
Reduce	the annua	al average	hot water	usage by	5% if the c	welling is	designed	to achieve	a water us	se target o	f74	.47	l	(10)
not more	e that 125	litres per	person pe	r day (all w	ater use, l	hot and co	ld)						1	
11-4	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	ay for ea		va,m = ra			(43)					1	
(44)m=	81.91	78.93	75.96	72.98	70	67.02	67.02	70	72.98	75.96	78.93	81.91	000.50	
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E)))))))))))))))))))) kWh/mor	fotal = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	893.59	(44)
(45)m=	121.47	106.24	109.63	95.58	91.71	79.14	73.33	84.15	85.16	99.24	108.33	117.64		
										Total = Su	m(45) ₁₁₂ =		1171.64	(45)
If instan	taneous w	/ater heati I	ng at point I	t of use (no	hot water	r storage), I	enter 0 in	boxes (46,) to (61)				1	
(46)m= Water	18.22 storage	15.94	16.44	14.34	13.76	11.87	11	12.62	12.77	14.89	16.25	17.65		(46)
Storag	e volum	ie (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0]	(47)
If com	munity h	neating a	ind no ta	ink in dw	velling, e	nter 110) litres in	(47)				-	1	
Otherv	vise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:				. /1 \ \ /1	. / .]						1	
a) if m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kvvr	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	20				(40) (40)				0		(49)
b) If m	anufact	urer's de	eclared (e, kvvn/ye cvlinder l	ear loss fact	or is not	known:	(48) X (49)	=			0		(50)
Hot wa	ater stor	age loss	factor fi	om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If com	munity h	heating s	ee secti	on 4.3									1	
Volum	e tactor	trom Ta	ble 2a m Tabla	2h								0		(52)
Enorm	/ lost fre				oor			(17) ~ (54)	V (50) V (53) -		0]	(53)
Enter	(50) or ((54) in (5	55)	, r.vvi // yt	201			(10) × (11)	~ (JZ) X (0		(54) (55)
	. ,	. , .	,									-	1	



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	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v 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	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) ÷ 36	65 × (41)m						
(61)m=	41.74	36.33	38.71	35.99	35.67	33.05	34.15	35.67	35.99	38.71	38.93	41.74		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	163.22	142.57	148.34	131.57	127.38	112.19	107.49	119.82	121.15	137.95	147.26	159.38		(62)
Solar Dł	HW input	calculated	using App	endix G o	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	t from w	ater hea	ter										_	
(64)m=	163.22	142.57	148.34	131.57	127.38	112.19	107.49	119.82	121.15	137.95	147.26	159.38		-
								Outp	out from w	ater heate	r (annual)	112	1618.31	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	50.83	44.41	46.13	40.78	39.41	34.58	32.92	36.9	37.31	42.67	45.75	49.55		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Int	ternal ga	ains (see	Tahle P	and Fa	١.									
Metab				o anu ba).									
	<u>olic gain</u>	<u>is (Table</u>	5), Wat	ts).									
	olic gain Jan	s (Table Feb	5), Wat	ts Apr). May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m=	olic gair Jan 84.77	ns (Table Feb 84.77	5), Wat Mar 84.77	ts Apr 84.77	May 84.77	Jun 84.77	Jul 84.77	Aug 84.77	Sep 84.77	Oct 84.77	Nov 84.77	Dec 84.77		(66)
(66)m= Lightin	olic gain Jan 84.77 g gains	ns (Table Feb 84.77 (calcula	5), Wat Mar 84.77 ted in Ap	Apr Apr 84.77	May 84.77 L, equat	Jun 84.77 ion L9 o	Jul 84.77 r L9a), a	Aug 84.77 Iso see	Sep 84.77 Table 5	Oct 84.77	Nov 84.77	Dec 84.77		(66)
(66)m= Lightin (67)m=	olic gain Jan 84.77 ng gains 13.22	ns (Table Feb 84.77 (calcula 11.74	5), Wat Mar 84.77 ted in Ap 9.55	ts Apr 84.77 opendix 7.23). May 84.77 L, equat 5.4	Jun 84.77 ion L9 of 4.56	Jul 84.77 r L9a), a 4.93	Aug 84.77 Iso see ⁻ 6.41	Sep 84.77 Table 5 8.6	Oct 84.77	Nov 84.77 12.74	Dec 84.77 13.59]	(66)
(66)m= Lightin (67)m= Applia	olic gain Jan 84.77 ng gains 13.22 nces ga	ns (Table Feb 84.77 (calcula 11.74 ins (calc	ted in Ap 9.55 ulated ir	ts Apr 84.77 ppendix 7.23). May 84.77 L, equat 5.4 dix L, eq	Jun 84.77 ion L9 of 4.56 uation L	Jul 84.77 r L9a), a 4.93 13 or L1	Aug 84.77 Iso see ⁻ 6.41 3a), also	Sep 84.77 Table 5 8.6 see Ta	Oct 84.77 10.92 ble 5	Nov 84.77 12.74	Dec 84.77 13.59]	(66) (67)
(66)m= Lightin (67)m= Applian (68)m=	olic gain Jan 84.77 ng gains 13.22 nces ga 147.7	rs (Table Feb 84.77 (calcula 11.74 ins (calc 149.23	5), Wat Mar 84.77 ted in Ap 9.55 ulated ir 145.37	ts Apr 84.77 opendix 7.23 Append 137.15). May 84.77 L, equat 5.4 dix L, eq 126.77	Jun 84.77 ion L9 of 4.56 uation L 117.02	Jul 84.77 r L9a), a 4.93 13 or L1 110.5	Aug 84.77 Iso see 6.41 3a), also 108.97	Sep 84.77 Table 5 8.6 see Ta 112.83	Oct 84.77 10.92 ble 5 121.05	Nov 84.77 12.74 131.43	Dec 84.77 13.59 141.18]	(66) (67) (68)
(66)m= Lightin (67)m= Appliat (68)m= Cookir	olic gain Jan 84.77 ng gains 13.22 nces ga 147.7 ng gains	ns (Table Feb 84.77 (calcula 11.74 ins (calc 149.23 (calcula	5), Wat Mar 84.77 ted in Ap 9.55 ulated ir 145.37 ted in A	ts Apr 84.77 opendix 7.23 Append 137.15 ppendix). May 84.77 L, equat 5.4 dix L, eq 126.77 L, equat	Jun 84.77 ion L9 o 4.56 uation L 117.02 tion L15	Jul 84.77 r L9a), a 4.93 13 or L1 110.5 or L15a)	Aug 84.77 Iso see 6.41 3a), also 108.97), also se	Sep 84.77 Table 5 8.6 9 see Ta 112.83 9e Table	Oct 84.77 10.92 ble 5 121.05 5	Nov 84.77 12.74 131.43	Dec 84.77 13.59 141.18]	(66) (67) (68)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	olic gain Jan 84.77 Ig gains 13.22 Inces ga 147.7 Ing gains 31.48	s (Table Feb 84.77 (calcula 11.74 ins (calc 149.23 (calcula 31.48	5), Wat Mar 84.77 ted in Ap 9.55 ulated ir 145.37 ted in A 31.48	ts Apr 84.77 ppendix 7.23 Appendix 137.15 ppendix 31.48	May 84.77 L, equat 5.4 dix L, eq 126.77 L, equat 31.48	Jun 84.77 ion L9 of 4.56 uation L 117.02 tion L15 31.48	Jul 84.77 r L9a), a 4.93 13 or L1 110.5 or L15a) 31.48	Aug 84.77 Iso see 6.41 3a), also 108.97), also se 31.48	Sep 84.77 Table 5 8.6 9 see Ta 112.83 ee Table 31.48	Oct 84.77 10.92 ble 5 121.05 5 31.48	Nov 84.77 12.74 131.43 31.48	Dec 84.77 13.59 141.18 31.48]]]	(66) (67) (68) (69)
(66)m= Lightin (67)m= Appliar (68)m= Cookir (69)m= Pumps	olic gain Jan 84.77 ng gains 13.22 nces ga 147.7 ng gains 31.48 s and fai	ns (Table Feb 84.77 (calcula 11.74 ins (calc 149.23 (calcula 31.48 ns gains	5), Wat Mar 84.77 ted in Ap 9.55 ulated ir 145.37 ted in A 31.48 (Table \$	ts Apr 84.77 opendix 7.23 Appendix 137.15 ppendix 31.48 5a)	May 84.77 L, equat 5.4 dix L, eq 126.77 L, equat 31.48	Jun 84.77 ion L9 o 4.56 uation L 117.02 tion L15 31.48	Jul 84.77 r L9a), a 4.93 13 or L1 110.5 or L15a) 31.48	Aug 84.77 Iso see 6.41 3a), also 108.97), also se 31.48	Sep 84.77 Table 5 8.6 5 see Ta 112.83 5 e Table 31.48	Oct 84.77 10.92 ble 5 121.05 5 31.48	Nov 84.77 12.74 131.43 31.48	Dec 84.77 13.59 141.18 31.48]]]	(66) (67) (68) (69)
(66)m= Lightin (67)m= Appliae (68)m= Cookir (69)m= Pumps (70)m=	olic gain Jan 84.77 ng gains 13.22 nces ga 147.7 ng gains 31.48 s and fan 3	ns (Table Feb 84.77 (calcula 11.74 ins (calc 149.23 (calcula 31.48 ns gains 3	5), Wat Mar 84.77 ted in Ap 9.55 ulated ir 145.37 ted in A 31.48 (Table \$ 3	ts Apr 84.77 opendix 7.23 Appendix 137.15 ppendix 31.48 5a) 3	May 84.77 L, equat 5.4 dix L, eq 126.77 L, equat 31.48	Jun 84.77 ion L9 o 4.56 uation L 117.02 tion L15 31.48	Jul 84.77 r L9a), a 4.93 13 or L1 110.5 or L15a 31.48	Aug 84.77 Iso see 6.41 3a), also 108.97), also se 31.48	Sep 84.77 Table 5 8.6 5 see Ta 112.83 5 Table 31.48	Oct 84.77 10.92 ble 5 121.05 2 5 31.48 3	Nov 84.77 12.74 131.43 31.48	Dec 84.77 13.59 141.18 31.48 3		(66) (67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses	olic gain Jan 84.77 Ig gains 13.22 Inces ga 147.7 Ing gains 31.48 Is and fai 3 Is e.g. ev	s (Table Feb 84.77 (calcula 11.74 ins (calc 149.23 (calcula 31.48 ns gains 3 vaporatic	5), Wat Mar 84.77 ted in Ay 9.55 ulated in Ay 145.37 ted in A 31.48 (Table s 3 on (nega	ts Apr 84.77 opendix 7.23 Appendix 137.15 ppendix 31.48 5a) 3 tive valu). May 84.77 L, equat 5.4 dix L, eq 126.77 L, equat 31.48 3 es) (Tab	Jun 84.77 ion L9 of 4.56 uation L 117.02 tion L15 31.48 3 ule 5)	Jul 84.77 r L9a), a 4.93 13 or L1 110.5 or L15a) 31.48	Aug 84.77 Iso see 6.41 3a), also 108.97), also se 31.48	Sep 84.77 Table 5 8.6 5 see Ta 112.83 ee Table 31.48	Oct 84.77 10.92 ble 5 121.05 5 31.48	Nov 84.77 12.74 131.43 31.48	Dec 84.77 13.59 141.18 31.48 3		(66) (67) (68) (69) (70)
(66)m= Lightin (67)m= Appliar (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	olic gain Jan 84.77 og gains 13.22 nces ga 147.7 ng gains 31.48 s and fai 3 s e.g. ev -67.82	s (Table Feb 84.77 (calcula 11.74 ins (calc 149.23 (calcula 31.48 ns gains 3 /aporatic -67.82	5), Wat Mar 84.77 ted in Ap 9.55 ulated ir 145.37 ted in A 31.48 (Table 9 3 on (nega -67.82	ts Apr 84.77 opendix 7.23 Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82	May 84.77 L, equat 5.4 dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82	Jun 84.77 ion L9 o 4.56 uation L 117.02 tion L15 31.48 3 .148 3 .148 -67.82	Jul 84.77 r L9a), a 4.93 13 or L1 110.5 or L15a) 31.48 3 -67.82	Aug 84.77 Iso see 6.41 3a), also 108.97), also se 31.48 3	Sep 84.77 Table 5 8.6 9 see Ta 112.83 ee Table 31.48 3 -67.82	Oct 84.77 10.92 ble 5 121.05 5 31.48 3 -67.82	Nov 84.77 12.74 131.43 31.48 3 -67.82	Dec 84.77 13.59 141.18 31.48 3 -67.82		(66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water	olic gain Jan 84.77 ng gains 13.22 nces ga 147.7 ng gains 31.48 s and fan 3 s e.g. ev -67.82 heating	is (Table Feb 84.77 (calcula 11.74 ins (calc 149.23 (calcula 31.48 ins gains 3 vaporatic -67.82 gains (T	5), Wat Mar 84.77 ted in Ap 9.55 ulated ir 145.37 ted in A 31.48 (Table \$ 3 on (nega -67.82 Table 5)	tts Apr 84.77 opendix 7.23 Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82). May 84.77 L, equat 5.4 dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82	Jun 84.77 ion L9 o 4.56 uation L 117.02 tion L15 31.48 3 le 5) -67.82	Jul 84.77 r L9a), a 4.93 13 or L1 110.5 or L15a 31.48 3 -67.82	Aug 84.77 Iso see 6.41 3a), also 108.97), also se 31.48 3 -67.82	Sep 84.77 Table 5 8.6 5 see Ta 112.83 5 Table 31.48 3 -67.82	Oct 84.77 10.92 ble 5 121.05 5 31.48 3 -67.82	Nov 84.77 12.74 131.43 31.48 3 -67.82	Dec 84.77 13.59 141.18 31.48 3 -67.82		(66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	olic gain Jan 84.77 Ing gains 13.22 Inces ga 147.7 Ing gains 31.48 Is and fai 3 Is e.g. ev -67.82 heating 68.31	s (Table Feb 84.77 (calcula 11.74 ins (calc 149.23 (calcula 31.48 ns gains 3 vaporatic -67.82 gains (T 66.08	5), Wat Mar 84.77 ted in Ay 9.55 ulated in Ay 145.37 ted in A 31.48 (Table 5 3 on (nega -67.82 Table 5) 62	ts Apr 84.77 opendix 7.23 Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82). May 84.77 L, equat 5.4 dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82	Jun 84.77 ion L9 of 4.56 uation L 117.02 tion L15 31.48 3 le 5) -67.82 48.02	Jul 84.77 r L9a), a 4.93 13 or L1 110.5 or L15a) 31.48 3 -67.82 44.25	Aug 84.77 Iso see 6.41 3a), also 108.97), also se 31.48 3 -67.82 49.59	Sep 84.77 Table 5 8.6 5 see Ta 112.83 2 e Table 31.48 3 -67.82 51.82	Oct 84.77 10.92 ble 5 121.05 5 31.48 3 -67.82 57.36	Nov 84.77 12.74 131.43 31.48 3 -67.82 63.54	Dec 84.77 13.59 141.18 31.48 3 -67.82 66.6		(66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	olic gain Jan 84.77 og gains 13.22 nces ga 147.7 ng gains 31.48 s and fai 3 s e.g. ev -67.82 heating 68.31	s (Table Feb 84.77 (calcula 11.74 ins (calc 149.23 (calcula 31.48 ns gains 3 /aporatic -67.82 gains (T 66.08	5), Wat Mar 84.77 ted in Ap 9.55 ulated in 145.37 ted in A 31.48 (Table 5 3 on (nega -67.82 Table 5) 62	ts Apr 84.77 opendix 7.23 Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82 56.64	May 84.77 L, equat 5.4 dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82 52.97	Jun 84.77 ion L9 o 4.56 uation L 117.02 tion L15 31.48 3 le 5) -67.82 48.02 (66)	Jul 84.77 r L9a), a 4.93 13 or L1 110.5 or L15a) 31.48 3 -67.82 44.25 m + (67)m	Aug 84.77 Iso see 6.41 3a), also 108.97), also se 31.48 3 -67.82 49.59 n + (68)m -	Sep 84.77 Table 5 8.6 9 see Ta 112.83 9 e Table 31.48 3 -67.82 51.82 + (69)m +	Oct 84.77 10.92 ble 5 121.05 5 31.48 3 -67.82 57.36 (70)m + (7	Nov 84.77 12.74 131.43 31.48 3 -67.82 63.54 1)m + (72)	Dec 84.77 13.59 141.18 31.48 3 -67.82 66.6		(66) (67) (68) (69) (70) (71) (72)
(66)m= Lightin (67)m= Appliau (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	olic gain Jan 84.77 ng gains 13.22 nces ga 147.7 ng gains 31.48 s and fai 3 s e.g. ev -67.82 heating 68.31 internal 280.66	s (Table Feb 84.77 (calcula 11.74 ins (calc 149.23 (calcula 31.48 ns gains (calcula 31.48 ns gains 3 /aporatic -67.82 gains (T 66.08 gains = 278.49	5), Wat Mar 84.77 ted in Ay 9.55 ulated in Ay 145.37 ited in A 31.48 (Table 9 3 n (nega -67.82 -able 5) 62	ts Apr 84.77 opendix 7.23 Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82 56.64	May 84.77 L, equat 5.4 dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82 52.97	Jun 84.77 ion L9 o 4.56 uation L 117.02 tion L15 31.48 3 ole 5) -67.82 48.02 (66) 221.03	Jul 84.77 r L9a), a 4.93 13 or L1 110.5 or L15a 31.48 3 -67.82 44.25 m + (67)m 211.11	Aug 84.77 Iso see 6.41 3a), also 108.97), also se 31.48 3 -67.82 49.59 1 + (68)m - 216.4	Sep 84.77 Table 5 8.6 5 see Ta 112.83 51.48 3 -67.82 51.82 + (69)m + 224.68	Oct 84.77 10.92 ble 5 121.05 2 5 31.48 3 -67.82 57.36 (70)m + (7 240.76	Nov 84.77 12.74 131.43 31.48 3 -67.82 63.54 1)m + (72) 259.15	Dec 84.77 13.59 141.18 31.48 3 -67.82 66.6 m 272.8		(66) (67) (68) (69) (70) (71) (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	1.45	x	11.28	×	0.63	x	0.7	=	5	(75)
Northeast 0.9x	0.77	x	1.45	x	22.97	x	0.63	x	0.7	i =	10.18	(75)
Northeast 0.9x	0.77	x	1.45	x	41.38	×	0.63	x	0.7	=	18.34	(75)
Northeast 0.9x	0.77	x	1.45	x	67.96	×	0.63	x	0.7	=	30.11	(75)
Northeast 0.9x	0.77	x	1.45	x	91.35	×	0.63	x	0.7	=	40.48	(75)
Northeast 0.9x	0.77	x	1.45	x	97.38	x	0.63	x	0.7	=	43.15	(75)
Northeast 0.9x	0.77	x	1.45	x	91.1	×	0.63	x	0.7	=	40.37	(75)
Northeast 0.9x	0.77	x	1.45	x	72.63	x	0.63	x	0.7	=	32.18	(75)
Northeast 0.9x	0.77	x	1.45	x	50.42	×	0.63	x	0.7	=	22.34	(75)
Northeast 0.9x	0.77	x	1.45	x	28.07	×	0.63	x	0.7	=	12.44	(75)
Northeast 0.9x	0.77	x	1.45	x	14.2	x	0.63	x	0.7	 =	6.29	(75)
Northeast 0.9x	0.77	x	1.45	x	9.21	×	0.63	x	0.7	=	4.08	(75)
Southeast 0.9x	0.77	x	2.77	x	36.79	×	0.63	x	0.7	İ =	31.15	(77)
Southeast 0.9x	0.77	x	2.77	x	36.79	×	0.63	x	0.7	=	31.15	(77)
Southeast 0.9x	0.77	x	1.7	x	36.79	×	0.63	x	0.7	i =	19.12	– (77)
Southeast 0.9x	0.77	x	1.7	x	36.79	×	0.63	x	0.7	=	19.12	(77)
Southeast 0.9x	0.77	x	2.77	x	62.67	x	0.63	x	0.7	 =	53.06	(77)
Southeast 0.9x	0.77	x	2.77	x	62.67	×	0.63	x	0.7	=	53.06	(77)
Southeast 0.9x	0.77	x	1.7	x	62.67	×	0.63	x	0.7	İ =	32.56	(77)
Southeast 0.9x	0.77	x	1.7	x	62.67	×	0.63	x	0.7	=	32.56	(77)
Southeast 0.9x	0.77	x	2.77	x	85.75	×	0.63	x	0.7	=	72.59	(77)
Southeast 0.9x	0.77	x	2.77	x	85.75	×	0.63	x	0.7	=	72.59	(77)
Southeast 0.9x	0.77	x	1.7	x	85.75	x	0.63	x	0.7	=	44.55	(77)
Southeast 0.9x	0.77	x	1.7	x	85.75	×	0.63	x	0.7	=	44.55	(77)
Southeast 0.9x	0.77	x	2.77	x	106.25	×	0.63	x	0.7	=	89.95	(77)
Southeast 0.9x	0.77	x	2.77	x	106.25	×	0.63	x	0.7	=	89.95	(77)
Southeast 0.9x	0.77	x	1.7	x	106.25	×	0.63	x	0.7	=	55.2	(77)
Southeast 0.9x	0.77	x	1.7	x	106.25	×	0.63	x	0.7	=	55.2	(77)
Southeast 0.9x	0.77	x	2.77	x	119.01	×	0.63	x	0.7	=	100.75	(77)
Southeast 0.9x	0.77	x	2.77	x	119.01	×	0.63	x	0.7	=	100.75	(77)
Southeast 0.9x	0.77	x	1.7	x	119.01	×	0.63	x	0.7	=	61.83	(77)
Southeast 0.9x	0.77	x	1.7	x	119.01	×	0.63	x	0.7	=	61.83	(77)
Southeast 0.9x	0.77	x	2.77	x	118.15	×	0.63	x	0.7	=	100.02	(77)
Southeast 0.9x	0.77	x	2.77	x	118.15	×	0.63	x	0.7	=	100.02	(77)
Southeast 0.9x	0.77	x	1.7	x	118.15	×	0.63	x	0.7	=	61.38	(77)
Southeast 0.9x	0.77	x	1.7	x	118.15	x	0.63	x	0.7	=	61.38	(77)
Southeast 0.9x	0.77	x	2.77	x	113.91	×	0.63	x	0.7	=	96.43	(77)
Southeast 0.9x	0.77	x	2.77	×	113.91	×	0.63	×	0.7	=	96.43	(77)
Southeast 0.9x	0.77	x	1.7	x	113.91	×	0.63	×	0.7	=	59.18	(77)



Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	1	13.91	x		0.63	x	0.7		=	59.18	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	1	04.39	x		0.63	x	0.7		=	88.37	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	1	04.39	x		0.63	x	0.7		=	88.37	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	1	04.39	x		0.63	x	0.7		=	54.24	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	1	04.39	x		0.63	x	0.7		=	54.24	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	2.7	'7	x	g	2.85	x		0.63	x	0.7		=	78.6	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	2.7	'7	x	g	2.85	Īx		0.63	x	0.7	_	=	78.6	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	g	2.85	x		0.63	x	0.7	_	=	48.24	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	g	2.85	x		0.63	x	0.7		=	48.24	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	6	9.27	x		0.63	×	0.7		=	58.64	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	6	9.27	x		0.63	x	0.7		=	58.64	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	6	9.27	x		0.63	×	0.7		=	35.99	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	6	9.27	x		0.63	×	0.7		=	35.99	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	4	4.07	x		0.63	×	0.7		=	37.31	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	4	4.07	x		0.63	×	0.7		=	37.31	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	4	4.07	x		0.63	×	0.7		=	22.9	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	4	4.07	x		0.63	x	0.7		=	22.9	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	3	31.49	x		0.63	x	0.7		=	26.66	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	3	31.49	x		0.63	×	0.7		=	26.66	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	3	31.49	x		0.63	×	0.7		=	16.36	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.	7	x	3	31.49	x		0.63	×	0.7		=	16.36	(77)
Solar g	pains in	watts, ca	alcula	ated	for eac	h mont	h			(83)m	n = Su	m(74)m	(82)m				1	
(83)m=	105.53	181.41	252	.63	320.41	365.64	3	65.96	351.59	317	7.4	276.03	201.69	9 126.7	90.	.11		(83)
Total g	jains – i	nternal a	and s	olar	(84)m =	= (73)m) + (83)m	, watts					-i			1	
(84)m=	386.19	459.9	520	.98	572.86	602.21	5	86.99	562.7	533	.79	500.71	442.4	5 385.85	362	2.92	İ	(84)
7. Me	an inter	rnal temp	perat	ure ((heating	seaso	n)											
Temp	erature	during h	neatir	ng p	eriods ir	n the liv	/ing	area	from Tal	ble 9	, Th1	(°C)					21	(85)
Utilisa	ation fac	ctor for g	ains	for li	iving are	ea, h1,i	m (s	ee Ta	ble 9a)	-					<u> </u>		1	
	Jan	Feb	M	lar	Apr	Мау	′	Jun	Jul	A	ug	Sep	Oct	Nov)ec		
(86)m=	0.99	0.99	0.9	97	0.93	0.84		0.69	0.53	0.5	57	0.8	0.95	0.99	Ĺ	1	ĺ	(86)
Mean	interna	l temper	ature	e in l	iving are	ea T1 (follo	w ste	ps 3 to 7	7 in T	able	9c)						
(87)m=	19.57	19.77	20.	07	20.43	20.74	2	20.92	20.98	20.	97	20.85	20.45	19.93	19.	.53		(87)
Temp	erature	during h	neatir	ng p	eriods ir	n rest o	of dw	/elling	from Ta	able 9	9, Th	2 (°C)						
(88)m=	19.75	19.75	19.	75	19.76	19.76	1	19.77	19.77	19.	77	19.77	19.76	19.76	19	.76		(88)
Utilisa	ation fac	ctor for a	ains	for r	est of d	wellina	, h2	,m (se	e Table	9a)								
(89)m=	0.99	0.98	0.9	96	0.91	0.79	<u> </u>	0.58	0.39	0.4	13	0.71	0.93	0.98	0.9	99		(89)
Mean	interna	l temper	atur		he rest	of dwe	llina	T2 (f	nllow sta	205 3	to 7	in Tabl	a 9c)				I	
(90)m=	17.88	18.18	18.	61	19.12	19.52		19.72	19.76	19.	76	19.66	19.15	18.42	17	.83		(90)
		I	I				_			I		fl	LA = Liv	/ing area ÷ (4) =		0.48	(91)
																	-	

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$



(92)m=	18.7	18.95	19.31	19.75	20.11	20.3	20.35	20.35	20.23	19.78	19.15	18.64		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate			I	
(93)m=	18.7	18.95	19.31	19.75	20.11	20.3	20.35	20.35	20.23	19.78	19.15	18.64		(93)
8. Sp	ace hea	tina rea	uirement											
Set T	i to the i	mean int	ternal ter	mperatu	re obtair	ned at ste	ep 11 of	Table 9	b. 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		
Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	0.99	0.98	0.96	0.91	0.8	0.63	0.46	0.5	0.74	0.93	0.98	0.99		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	382.41	450.66	499.18	519.68	483.86	370.62	256.54	267.24	372.76	410.68	378.63	360.13		(95)
Month	nly aver	age exte	ernal terr	perature	e from Ta	able 8		-	-		-			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	-			
(97)m=	1022.31	996.1	907.29	763.14	590.35	397.85	261.72	275	428.92	644.3	848.25	1019.8		(97)
Space	e heatin	g require	ement fo	r each n	honth, k	Wh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	476.09	366.54	303.63	175.29	79.23	0	0	0	0	173.82	338.13	490.8		
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	2403.53	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								47.9	(99)
0a En	orav roa	uiromor	nte – Ind	ividual h	eating s	veteme i	ncluding	micro-C	чр)					
Snac	o hoatir			madarm	cating 5	yotomon	nordanig		, ,					
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system					1	0	(201)
Fracti	on of sr	ace hea	at from m	nain svst	em(s)	,		(202) = 1 ·	- (201) =				1	(202)
Fracti	ion of to	tal baati	na from		stom 1			(204) - (2)	02) ~ [1 _	(203)] -			1	
								(204) - (2	02) ~ [1	(200)] =		-	I	
Efficie	ency of i	main spa	ace heat	ing syste	em 1								93.4	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	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)		_		_				
	476.09	366.54	303.63	175.29	79.23	0	0	0	0	173.82	338.13	490.8		
(211)m	n = {[(98)m x (20	04)] } x 1	00 ÷ (20)6)									(211)
	509.73	392.44	325.09	187.68	84.83	0	0	0	0	186.1	362.03	525.48		
								Tota	il (kWh/yea	ar) =Sum(2	211) _{15,1012}	-	2573.37	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month									
= {[(98)m x (20	01)]}x1	00 ÷ (20	8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	_	0	(215)
Water	heating	1												
Output	from w	ater hea	ter (calc	ulated al	bove)			_		-				
	163.22	142.57	148.34	131.57	127.38	112.19	107.49	119.82	121.15	137.95	147.26	159.38		
Efficier	ncy of w	ater hea	ater										80.3	(216)
(217)m=	87.59	87.32	86.82	85.77	83.89	80.3	80.3	80.3	80.3	85.63	87.08	87.7		(217)
Fuel fo	or water	heating,	kWh/m	onth		•	•	•	•	•				
(219)m	n = (64)	m x 100) ÷ (217)	m	454.54	400 = :	400.00	4 40 00	450.00	404.55	400 **	404 - 1		
(219)m=	186.35	163.27	170.86	153.39	151.84	139.71	133.86	149.22	150.87	161.09	169.11	181.74		_
								l ota	u = Sum(2	19a) _{1 12} =			1911.3	(219)



968.69

38.93

121.15

1128.77

22.49

(265)

(267)

(268)

(272)

(273)

TER WorkSheet: New dwelling design stage

Annual totals		kWh/year	kWh/year
Space heating fuel used, main system 1			2573.37
Water heating fuel used			1911.3
Electricity for pumps, fans and electric keep-hot			
central heating pump:		30	(230c)
boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (23	0a)(230g) =	75 (231)
Electricity for lighting			233.43 (232)
Total delivered energy for all uses (211)(221) + (2	231) + (232)(237b) =		4793.11 (338)
12a. CO2 emissions – Individual heating systems	including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	555.85 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	412.84 (264)

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

0.519

0.519

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

=

=

(231) x

(232) x

TER =

Space and water heating

Electricity for lighting

Total CO2, kg/year

Electricity for pumps, fans and electric keep-hot



			User D	etails:						
Assessor Name:	Panagiotis	Dalapas		Strom	a Num	ber:		STRO	030082	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.41	
		Р	roperty .	Address:	Be Lea	n-Secon	nd Floor	Flat		
Address :	238 KILBUR	RN HIGH ROAD	LOND	ON, NWE	6 2BS					
1. Overall dwelling dime	nsions:		A	- (A 11a			Malana (m. 2)	
Ground floor			Area 6	a(m²) 1.28	(1a) x		ignt(m) 2.5	(2a) =	153.2	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+((1d)+(1e)+(1r	n) 6	1.28	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	153.2	(5)
2. Ventilation rate:									<u> </u>	
	main heating	secondar heating	У	other		total			m ³ per hour	
Number of chimneys	0	+ 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	_ + _	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				- -	2	x ′	10 =	20	(7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fi	res				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	
Le Classifica de la constitución	. ()		(-) · (-) · (7-)						
Infiltration due to chimney	/S, flues and fa een carried out or	ans = (ba) + (bb) + (bb)	a)+(7b)+(/C) = otherwise (continue fro	20 om (9) to ((16)	÷ (5) =	0.13	(8)
Number of storeys in th	ne dwelling (ns	6)				(-) (,		0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or	timber frame or	0.35 fo	r masonr	y constr	uction			0	(11)
if both types of wall are pr deducting areas of openir	esent, use the va ligs); if equal user	lue corresponding to 0.35	the great	er wall are	a (after					
If suspended wooden f	loor, enter 0.2	(unsealed) or 0	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else e	enter 0							0	(13)
Percentage of windows	s and doors dr	aught 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, expresse	ed in cubic metre	s per ho	our per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ity value, then	$(18) = [(17) \div 20] + (3)$	3), otherwi	se (18) = (16)	:			0.38	(18)
Air permeability value applies	s ir a pressurisatio d	on test has been dor	ie or a deg	gree air pei	meability	is being us	sea		4	7(19)
Shelter factor	u			(20) = 1 -	[0.075 x (1	9)] =			0.7	(10)
Infiltration rate incorporat	ing shelter fac	tor		(21) = (18)) x (20) =				0.27	(21)
Infiltration rate modified for	or monthly wir	nd speed								_ · ·
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tabl	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind 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]	



· · ·	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.34	0.33	0.33	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31		
Calcula If me	ate effec	ctive air	change	rate for t	he appli	cable ca	se							(220)
lf exha	aust air he	eat pump	usina App	endix N. (2	3b) = (23a	a) x Fmv (e	equation (N	(15)) . other	wise (23b) = (23a)			0	(23b)
lf bala	inced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h)) =	, (,			0	(230)
a) If I	balance	d mech	, anical ve	ntilation	with he	at recove	∍rv (MV⊦	- - - - R) (24a	n)m = (22)	2b)m + (23h) x [1	1 – (23c)	0 ∸ 1001	(200)
(24a)m=	0	0		0	0	0	0	0	0	0	0	0]	(24a)
b) If I	balance	d mech	ı anical ve	I entilation	without	heat rec	coverv (N	L /IV) (24b)m = (22	1 2b)m + (;	1 23b)		I	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If v	whole h	ouse ex	tract ver	ntilation of	or positiv	ve input v	/entilatio	n from c	outside				1	
, i	f (22b)n	า < 0.5 >	(23b), t	then (24	c) = (23b); otherv	vise (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	e positiv	/e input	ventilatio	on from I	oft				-	
i I	f (22b)n	n = 1, th	en (24d) I	m = (22l	o)m othe	erwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55		(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24k	o) or (240	c) or (24	d) in box	(25)				1	
(25)m=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55		(25)
3. Hea	at losse	s and he	eat loss	paramet	er:									
ELEN	IENT	Gros area	ss (m²)	Openin rr	gs I ²	Net Ar A ,r	ea n²	U-valı W/m2	le K	A X U (W/ł	≺)	k-value kJ/m²·ł	e K	A X k kJ/K
Doors						2.15	x	1	=	2.15				(26)
Window	ws Type	e 1				1.43	x1/	/[1/(1.4)+	0.04] =	1.9				(27)
Window	ws Type	2				1.43	x1/	/[1/(1.4)+	0.04] =	1.9				(27)
Window	ws Type	3				1.43	x1/	/[1/(1.4)+	0.04] =	1.9				(27)
Window	ws Type	e 4				1.43	x1/	/[1/(1.4)+	0.04] =	1.9				(27)
Window	ws Type	5				2.36	x1/	/[1/(1.4)+	0.04] =	3.13	_			(27)
Window	ws Type	6				1.43	x1/	/[1/(1.4)+	0.04] =	1.9	=			(27)
Window		7				2.36	x1/	/[1/(1.4)+	0.04] =	3.13				(27)
vvinuov	ws rype	; /							L					
Window	ws Type ws Type	e 8				1.27	x1/	/[1/(1.4)+	0.04] =	1.68				(27)
Window Walls T	ws ⊺ype ws Type ⊺ype1	8 59.8	38	13.1	4	1.27	x1/	/[1/(1.4)+ 0.18	0.04] =	1.68 8.41				(27)
Window Walls T Walls T	ws Type ws Type ſype1 ſype2	8 59.8 5.4	88	13.1	4	1.27 46.74 5.48	x1/	(1/(1.4)+ 0.18 0.18	0.04] = [1.68 8.41 0.99				(27)
Windov Windov Walls T Walls T Walls T	ws Type ws Type Type1 Type2 Type3	8 59.8 5.4 16.3	88 8 87	13.1 0	4	1.27 46.74 5.48	x1/ x x x	([1/(1.4)+ 0.18 0.18 0.18	0.04] = [= [= [1.68 8.41 0.99				(27) (29) (29) (29)
Windov Walls T Walls T Walls T Walls T Total a	ws Type Type1 Type2 Type3 rea of e	 8 59.8 5.4 16.3 lements 	38 8 37	13.1 0 2.15	4	1.27 46.74 5.48 14.22 81.73	x1/ x x x x	<pre>(1/(1.4)+</pre>	0.04] = [= [= [1.68 8.41 0.99 2.56				(27) (29) (29) (29) (29) (31)
Windov Walls T Walls T Walls T Walls T Total a Party w	ws Type Type1 Type2 Type3 rea of e vall	 8 59.8 5.4 16.3 lements 	38 8 37 , m ²	13.1 0 2.15	4	1.27 46.74 5.48 14.22 81.73	x1/ x x x	<pre>(1/(1.4)+</pre>	0.04] = [= [= [= [1.68 8.41 0.99 2.56				(27) (29) (29) (29) (31) (32)

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	31.53	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	7799.88	(34)
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K	Indicative Value: Medium	250	(35)
For design assessments where the details of the construction are not been	a number of the indication values of TMD in Table 46		-

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



can be ι	ised inste	ad of a dei	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						6.59	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			38.12	(37)
Ventila	tion hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	28.19	28.08	27.97	27.45	27.35	26.9	26.9	26.81	27.07	27.35	27.55	27.75		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	66.31	66.2	66.09	65.56	65.47	65.01	65.01	64.93	65.19	65.47	65.66	65.87		
									/	Average =	Sum(39)1.	.12 /12=	65.56	(39)
Heat lo	oss para	meter (F	HLP), W/	/m²K					(40)m	= (39)m ÷	· (4)		I	
(40)m=	1.08	1.08	1.08	1.07	1.07	1.06	1.06	1.06	1.06	1.07	1.07	1.07		_
Numbe	er of day	vs in moi	nth (Tab	le 1a)					1	Average =	Sum(40)1	.12 /12=	1.07	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting ener	gy requ	irement:								kWh/ye	ear:	
Assum	ied occu	ipancy, I	N								2.	02		(42)
if TF	A > 13.9	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9))2)] + 0.0	013 x (1	ΓFA -13.	.9)	-		
Annua	l averag	e hot wa	ater usag	ge in litre	s per da	iy Vd,av	erage =	(25 x N)	+ 36		82	.12		(43)
Reduce	the annua	al average	hot water	usage by :	5% if the d	welling is	designed t	o achieve	a water us	se target o	f			
not more	e that 125	litres per p	person pei	r day (all w	ater use, r	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	day for ea	ach month	Vd,m = factors	ctor from T	Table 1c x	(43)						
(44)m=	90.33	87.04	83.76	80.48	77.19	73.91	73.91	77.19	80.48	83.76	87.04	90.33		
_										Total = Su	m(44) ₁₁₂ =		985.41	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,n	n x nm x D	0Tm / 3600	kWh/mon	oth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	133.96	117.16	120.9	105.4	101.13	87.27	80.87	92.8	93.91	109.44	119.46	129.73		
16 1				- f	h - ((Total = Su	m(45) ₁₁₂ =	:	1292.03	(45)
It instan	taneous w	ater neatil	ng at point	of use (no	not water	storage),	enter 0 in	boxes (46)	to (61)				I	
(46)m=	20.09	17.57	18.13	15.81	15.17	13.09	12.13	13.92	14.09	16.42	17.92	19.46		(46)
Storog	storage	IOSS:	inoludir		lor or M		storage	within or	mayaa					(47)
Sloray		e (illes)		ig any so			slorage		ine ves	Sei	()		(47)
If COM	munity n	eating a	nd no ta	INK IN AW	elling, e	nter 110	litres in	(47) mbi boili	oro) onto	or '0' in (47)			
Water	storado		not wate			istantai	ieous co		ers) erne		47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is knov	wn (kWł	n/dav):					ר ז		(48)
Tempe	erature f	actor fro	m Table	2b		,	, , , , ,					<u>ັ</u>		(49)
Enero	/ lost fro	m water	storage	k\//h/\/	ar			(48) x (49)	_			~ 1		(50)
b) If m	anufact	urer's de	eclared of	cylinder l	oss facto	or is not	known:	(40) X (40)				J		(50)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kWł	h/litre/da	ıy)				(0		(51)
If com	munity h	eating s	ee secti	on 4.3										
Volum	e factor	from Ta	ble 2a								()		(52)
Tempe	erature f	actor fro	m Table	2b							(C		(53)



Enter	y lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) x (41)ı	m		0		(55)
(56)m-						0	0	0	0		0	0	1	(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (0 H11)] ÷ (50	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	(00)
(57)~		0		0	(,		,1 • (*		, (11)	0	,	0		(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(37)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3	50)						0		(58)
Primai (mo	ry circuit dified by	loss cal factor fi	culated i rom Tabl	or each Ie H5 if t	montn (here is s	59)m = (olar wat	(58) ÷ 30 er heatir	5 × (41)	m cylinder	r thermo	stat)			
(110) (59)m=		0			0				0	0	0	0		(59)
Combi					(C1)	$(co) \cdot o($								
	1055 Ca				(01) m =	$(60) \div 30$	27.66)(II) 20.24	20.60	12.69	12.02	46.02		(61)
	40.03	40.00	42.00			50.45	57.00	(00)	0.05	42.00	42.93	40.03	(50)	(01)
						101 eaci		(62)m =	0.85 × (45)m +	(40)111 +	(57)m +	(59)m + (61)m	(62)
	1/9.99		103.30	145.09	140.47	123.72		132.14	133.59	102.12	162.39	1/5./0		(02)
(add a	dditiona	l lines if		and/or \	Appenaix	annlies	ve quantity see Δn	nendix (nir no sola S)	r contributi	on to wate	er neating)		
(auu a										0	0	0		(63)
		ator hoa	tor		Ů	,	Ů	<u> </u>	Ů	<u> </u>	<u> </u>	•		
(64)m=	179.99	157 22	163 58	145 09	140 47	123 72	118 53	132 14	133 59	152 12	162.39	175 76		
(01)		101.22	100.00	110.00	110.11	120.12	110.00	Outr	out from wa	ater heater	(annual)	12	1784.6	(64)
Heato	iaine froi	m water	heating	k\//h/m	onth 0.24	5 ′ [0 85	v (15)m	⊥ (61)m	1 - 0 8 4	(16)m	+ (57)m	⊥ (50)m	1	
(65)m=	56.05	48.97	50.87	44.97	43.46	38.13	36.3	40.69	41.15	47.06	50.45	54.64	1	(65)
inclu	1de (57)	m in cale		of (65)m		vlinder i	s in the c	wolling	or hot w	ator is fr	om com	munity h	eating	
5 10			Julation	51 (05)11	Unity if C	yinnuerik	5 11 116 0	wennig						
<u>э</u> . ш	lemarya		Table 5	and 5a	۱.							,	cating	
Metab		ains (see	Table 5	and 5a):								cating	
	olic gain	ains (see is (Table	e Table 5 e 5), Wat	ts): May	lup	lul	Δυα	Son	Oct	Nov	Dec		
(66)m =	olic gain Jan 100.88	s (Table Feb	Table 5 5), Wat Mar	ts Apr): May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(66)
(66)m=	olic gain Jan 100.88	s (Table Feb 100.88	• Table 5 • 5), Wat Mar 100.88	ts Apr 100.88): May 100.88	Jun 100.88	Jul 100.88	Aug 100.88	Sep 100.88	Oct 100.88	Nov 100.88	Dec 100.88		(66)
(66)m= Lightin	olic gain Jan 100.88 Ig gains	s (Table Feb 100.88 (calcula	• Table 5 • 5), Wat Mar 100.88 ted in Ap	and 5a ts Apr 100.88 opendix): May 100.88 L, equati	Jun 100.88 ion L9 or	Jul 100.88 r L9a), a	Aug 100.88 Iso see	Sep 100.88 Table 5	Oct 100.88	Nov 100.88	Dec 100.88		(66)
(66)m= Lightin (67)m=	olic gain Jan 100.88 Ig gains 15.73	s (Table Feb 100.88 (calcula 13.97	e Table 5 e 5), Wat Mar 100.88 ted in Ap 11.36	and 5a ts Apr 100.88 ppendix 8.6): May 100.88 L, equati 6.43	Jun 100.88 ion L9 of 5.43	Jul 100.88 r L9a), a 5.86	Aug 100.88 Iso see 7.62	Sep 100.88 Table 5 10.23	Oct 100.88 12.99	Nov 100.88 15.16	Dec 100.88 16.16		(66) (67)
(66)m= Lightin (67)m= Applia	olic gain Jan 100.88 g gains 15.73 nces ga	(calcula 13.97 ins (calc	 Table 5 5), Wat Mar 100.88 ted in Ap 11.36 ulated in 173.38 	and 5a ts Apr 100.88 opendix 8.6 Appendix): May 100.88 L, equati 6.43 dix L, eq 151.2	Jun 100.88 ion L9 or 5.43 uation L	Jul 100.88 r L9a), a 5.86 13 or L1	Aug 100.88 Iso see 7.62 3a), also	Sep 100.88 Table 5 10.23 See Tal	Oct 100.88 12.99 ble 5	Nov 100.88 15.16	Dec 100.88 16.16		(66) (67)
(66)m= Lightin (67)m= Applia (68)m=	olic gain Jan 100.88 g gains 15.73 nces ga 176.16	s (Table Feb 100.88 (calcula 13.97 ins (calc 177.99	 Table 5 5), Wat Mar 100.88 ted in Ap 11.36 ulated in 173.38 ted in Ap 	and 5a ts Apr 100.88 ppendix 8.6 Append 163.58): May 100.88 L, equati 6.43 dix L, eq 151.2	Jun 100.88 ion L9 of 5.43 uation L 139.56	Jul 100.88 r L9a), a 5.86 13 or L1 131.79	Aug 100.88 Iso see 7.62 3a), also 129.96	Sep 100.88 Table 5 10.23 See Tal 134.57	Oct 100.88 12.99 ble 5 144.38	Nov 100.88 15.16 156.76	Dec 100.88 16.16		(66) (67) (68)
(66)m= Lightin (67)m= Applia (68)m= Cookir	olic gain Jan 100.88 g gains 15.73 nces ga 176.16 ng gains	(calcula 177.99 (calcula 177.99 (calcula	e Table 5 e 5), Wat Mar 100.88 ted in Ap 11.36 ulated in 173.38 ited in Ap	Apr Apr 100.88 ppendix 8.6 Append 163.58 ppendix 33.09): May 100.88 L, equati 6.43 dix L, equati 151.2 L, equati 33.09	Jun 100.88 ion L9 of 5.43 uation L 139.56 ion L15	Jul 100.88 r L9a), a 5.86 13 or L1 131.79 or L15a)	Aug 100.88 Iso see 7.62 3a), also 129.96 , also se	Sep 100.88 Table 5 10.23 5 see Tal 134.57 5 Table	Oct 100.88 12.99 ble 5 144.38 5	Nov 100.88 15.16 156.76	Dec 100.88 16.16 168.39		(66) (67) (68)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m=	olic gain Jan 100.88 g gains 15.73 nces ga 176.16 ng gains 33.09	(calcula 13.97 ins (calc 177.99 (calcula 33.09	2 Table 5 2 5), Wat Mar 100.88 ted in Ap 11.36 ulated in 173.38 ited in Ap 33.09 (Table 6	and 5a ts Apr 100.88 ppendix 8.6 Appendix 163.58 opendix 33.09): May 100.88 L, equati 6.43 dix L, equat 151.2 L, equat 33.09	Jun 100.88 ion L9 of 5.43 uation L 139.56 ion L15 33.09	Jul 100.88 r L9a), a 5.86 13 or L12 131.79 or L15a) 33.09	Aug 100.88 Iso see 7.62 3a), also 129.96 , also se 33.09	Sep 100.88 Table 5 10.23 See Table 134.57 ee Table 33.09	Oct 100.88 12.99 ble 5 144.38 5 33.09	Nov 100.88 15.16 156.76 33.09	Dec 100.88 16.16 168.39 33.09		(66) (67) (68) (69)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	olic gain Jan 100.88 g gains 15.73 nces ga 176.16 ng gains 33.09 s and fai	(calcula 177.99 (calcula 177.99 (calcula 33.09	 Table 5 5), Wat Mar 100.88 ted in Ap 11.36 ulated in Ap 173.38 tted in Ap 33.09 (Table 5 	and 5a ts Apr 100.88 ppendix 8.6 Append 163.58 ppendix 33.09 5a)): May 100.88 L, equati 6.43 dix L, eq 151.2 L, equat 33.09	Jun 100.88 ion L9 of 5.43 uation L 139.56 ion L15 33.09	Jul 100.88 r L9a), a 5.86 13 or L1 131.79 or L15a) 33.09	Aug 100.88 Iso see 7.62 3a), also 129.96 , also se 33.09	Sep 100.88 Table 5 10.23 See Tal 134.57 ee Table 33.09	Oct 100.88 12.99 ble 5 144.38 5 33.09	Nov 100.88 15.16 156.76 33.09	Dec 100.88 16.16 168.39 33.09		(66) (67) (68) (69)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	olic gain Jan 100.88 Ig gains 15.73 Inces ga 176.16 Ing gains 33.09 Is and fai	s (Table Feb 100.88 (calcula 13.97 ins (calc 177.99 (calcula 33.09 ns gains 3	 Table 5 5), Wat Mar 100.88 ted in Ap 11.36 ulated in 173.38 nted in Ap 33.09 (Table 5 3 	and 5a ts Apr 100.88 opendix 8.6 Appendix 163.58 opendix 33.09 5a) 3): May 100.88 L, equati 6.43 dix L, equati 151.2 L, equati 33.09 3 	Jun 100.88 ion L9 or 5.43 uation L 139.56 ion L15 33.09	Jul 100.88 r L9a), a 5.86 13 or L1 131.79 or L15a) 33.09 3	Aug 100.88 lso see 7.62 3a), also 129.96 , also se 33.09	Sep 100.88 Table 5 10.23 5 see Tal 134.57 5 Table 33.09 3	Oct 100.88 12.99 ble 5 144.38 5 33.09 3	Nov 100.88 15.16 156.76 33.09 3	Dec 100.88 16.16 168.39 33.09 3		(66) (67) (68) (69) (70)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	olic gain Jan 100.88 g gains 15.73 nces ga 176.16 ng gains 33.09 s and fai 3 s e.g. ev	s (Table Feb 100.88 (calcula 13.97 ins (calc 177.99 (calcula 33.09 ns gains 3 raporatic	2 Table 5 2 5), Wat Mar 100.88 ted in Ap 11.36 ulated in Ap 173.38 uted in Ap 33.09 (Table 5 3 on (negation of the second s	and 5a ts Apr 100.88 ppendix 8.6 Appendix 163.58 opendix 33.09 5a) 3 tive valu): May 100.88 L, equati 6.43 dix L, eq 151.2 L, equat 33.09 3 es) (Tab	Jun 100.88 ion L9 of 5.43 uation L 139.56 ion L15 33.09 3 le 5)	Jul 100.88 r L9a), a 5.86 13 or L1: 131.79 or L15a) 33.09 3	Aug 100.88 Iso see 7.62 3a), also 129.96 , also se 33.09 3	Sep 100.88 Table 5 10.23 See Tal 134.57 See Table 33.09 3	Oct 100.88 12.99 ble 5 144.38 5 33.09 3	Nov 100.88 15.16 156.76 33.09 3	Dec 100.88 16.16 168.39 33.09 33.09		 (66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	olic gain Jan 100.88 g gains 15.73 nces ga 176.16 ng gains 33.09 s and fai 3 s e.g. ev -80.7	s (Table Feb 100.88 (calcula 13.97 ins (calc 177.99 (calcula 33.09 ns gains 3 raporatic -80.7	Table 5 a 5), Wat Mar 100.88 ted in Ap 11.36 ulated in Ap 173.38 ited in Ap 33.09 (Table 5 3 on (negat -80.7	and 5a ts Apr 100.88 opendix 8.6 Appendix 163.58 opendix 33.09 5a) 3 tive valu -80.7): May 100.88 L, equati 6.43 dix L, eq 151.2 L, equat 33.09 3 es) (Tab -80.7	Jun 100.88 ion L9 of 5.43 uation L 139.56 ion L15 33.09 3 le 5) -80.7	Jul 100.88 r L9a), a 5.86 13 or L1 131.79 or L15a) 33.09 3 -80.7	Aug 100.88 Iso see 7.62 3a), also 129.96 , also se 33.09 3 -80.7	Sep 100.88 Table 5 10.23 See Tal 134.57 ee Table 33.09 3 -80.7	Oct 100.88 12.99 ble 5 144.38 5 33.09 3 3 -80.7	Nov 100.88 15.16 156.76 33.09 3 -80.7	Dec 100.88 16.16 168.39 33.09 33.09		(66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water	olic gain Jan 100.88 og gains 15.73 nces ga 176.16 ng gains 33.09 s and fai 3 s e.g. ev -80.7 heating	s (Table Feb 100.88 (calcula 13.97 ins (calc 177.99 (calcula 33.09 ns gains 3 raporatic -80.7 gains (T	 Table 5 5), Wat Mar 100.88 ted in Ap 11.36 ulated in Ap 173.38 uted in Ap 33.09 (Table 5 3 on (negation -80.7 able 5) 	and 5a ts Apr 100.88 opendix 8.6 Appendix 163.58 opendix 33.09 5a) 3 tive valu -80.7): May 100.88 L, equati 6.43 dix L, equati 151.2 L, equati 33.09 3 es) (Tab -80.7	Jun 100.88 ion L9 or 5.43 uation L 139.56 ion L15 33.09 3 le 5) -80.7	Jul 100.88 r L9a), a 5.86 13 or L12 131.79 or L15a) 33.09 3 -80.7	Aug 100.88 Iso see 7.62 3a), also 129.96 , also se 33.09 3 -80.7	Sep 100.88 Table 5 10.23 o see Tal 134.57 ce Table 33.09 3 -80.7	Oct 100.88 12.99 ble 5 144.38 5 33.09 3 -80.7	Nov 100.88 15.16 156.76 33.09 3 -80.7	Dec 100.88 16.16 168.39 33.09 33.09 3 3		 (66) (67) (68) (69) (70) (71) (72)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	olic gain Jan 100.88 g gains 15.73 nces ga 176.16 ng gains 33.09 s and fai 3 s e.g. ev -80.7 heating 75.33	s (Table Feb 100.88 (calcula 13.97 ins (calc 177.99 (calcula 33.09 ns gains 3 aporatic -80.7 gains (T 72.87	 Table 5 5), Wat Mar 100.88 ted in Ap 11.36 ulated in Ap 173.38 uted in Ap 33.09 (Table 5) 68.37 	and 5a ts Apr 100.88 opendix 8.6 Appendix 163.58 opendix 33.09 5a) 3 tive valu -80.7 62.45): May 100.88 L, equati 6.43 dix L, eq 151.2 L, equat 33.09 3 es) (Tab -80.7 58.42	Jun 100.88 ion L9 of 5.43 uation L 139.56 ion L15 33.09 3 le 5) -80.7	Jul 100.88 r L9a), a 5.86 13 or L1: 131.79 or L15a) 33.09 3 -80.7 48.8	Aug 100.88 Iso see 7.62 3a), also 129.96 , also se 33.09 3 -80.7 54.69	Sep 100.88 Table 5 10.23 See Tal 134.57 ee Table 33.09 3 -80.7	Oct 100.88 12.99 ble 5 144.38 5 33.09 3 -80.7 63.25	Nov 100.88 15.16 156.76 33.09 3 -80.7 70.07	Dec 100.88 16.16 168.39 33.09 33.09 33 -80.7		 (66) (67) (68) (69) (70) (71) (72)
(66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	olic gain Jan 100.88 og gains 15.73 nces ga 176.16 ng gains 33.09 s and fai 3 s e.g. ev -80.7 heating 75.33	s (Table Feb 100.88 (calcula 13.97 ins (calc 177.99 (calcula 33.09 ns gains 3 aporatic -80.7 gains (T 72.87 gains =	Table 5 • 5), Wat Mar 100.88 ted in Ap 11.36 ulated in 173.38 ited in Ap 33.09 (Table 5 3 on (negat -80.7 able 5) 68.37	and 5a ts Apr 100.88 opendix 8.6 Appendix 163.58 opendix 33.09 5a) 3 tive valu -80.7 62.45): May 100.88 L, equati 6.43 dix L, equati 151.2 L, equati 33.09 3 es) (Tab -80.7 58.42	Jun 100.88 ion L9 or 5.43 uation L 139.56 ion L15 33.09 3 le 5) -80.7 52.96 (66)	Jul 100.88 r L9a), a 5.86 13 or L13 131.79 or L15a) 33.09 3 -80.7 48.8 m + (67)m	Aug 100.88 Iso see 7.62 3a), also 129.96 , also se 33.09 3 -80.7 54.69 + (68)m -	Sep 100.88 Table 5 10.23 5 see Tal 134.57 57 able 33.09 3 -80.7 57.15 (69)m + (Oct 100.88 12.99 ble 5 144.38 5 33.09 3 -80.7 63.25 70)m + (7	Nov 100.88 15.16 156.76 33.09 3 -80.7 70.07 1)m + (72)	Dec 100.88 16.16 168.39 33.09 33.09 3 3 -80.7 73.44 m		 (66) (67) (68) (69) (70) (71) (72) (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	1.27	×	11.28	×	0.63	×	0.7	=	4.38	(75)
Northeast 0.9x	0.77	x	1.27	×	22.97	x	0.63	×	0.7	i =	8.91	(75)
Northeast 0.9x	0.77	x	1.27	×	41.38	×	0.63	×	0.7	=	16.06	(75)
Northeast 0.9x	0.77	x	1.27	×	67.96	×	0.63	×	0.7	=	26.38	(75)
Northeast 0.9x	0.77	x	1.27	×	91.35	×	0.63	×	0.7	=	35.45	(75)
Northeast 0.9x	0.77	x	1.27	×	97.38	×	0.63	×	0.7	=	37.8	(75)
Northeast 0.9x	0.77	x	1.27	×	91.1	×	0.63	×	0.7	=	35.36	(75)
Northeast 0.9x	0.77	x	1.27	x	72.63	x	0.63	x	0.7	=	28.19	(75)
Northeast 0.9x	0.77	x	1.27	×	50.42	×	0.63	×	0.7	i =	19.57	(75)
Northeast 0.9x	0.77	x	1.27	×	28.07	×	0.63	x	0.7	=	10.89	(75)
Northeast 0.9x	0.77	x	1.27	x	14.2	x	0.63	x	0.7	 =	5.51	(75)
Northeast 0.9x	0.77	x	1.27	×	9.21	×	0.63	×	0.7	=	3.58	(75)
Southeast 0.9x	0.77	x	1.43	×	36.79	×	0.63	x	0.7	İ =	16.08	(77)
Southeast 0.9x	0.77	x	2.36	x	36.79	x	0.63	x	0.7	 =	26.54	(77)
Southeast 0.9x	0.77	x	1.43	x	36.79	x	0.63	x	0.7	i =	16.08	(77)
Southeast 0.9x	0.77	x	2.36	×	36.79	×	0.63	x	0.7	İ =	26.54	(77)
Southeast 0.9x	0.77	x	1.43	x	62.67	x	0.63	x	0.7	 =	27.39	(77)
Southeast 0.9x	0.77	x	2.36	×	62.67	×	0.63	×	0.7	=	45.2	(77)
Southeast 0.9x	0.77	x	1.43	×	62.67	x	0.63	x	0.7	İ =	27.39	(77)
Southeast 0.9x	0.77	x	2.36	×	62.67	×	0.63	x	0.7	=	45.2	(77)
Southeast 0.9x	0.77	x	1.43	×	85.75	×	0.63	×	0.7	=	37.48	(77)
Southeast 0.9x	0.77	x	2.36	x	85.75	x	0.63	x	0.7	=	61.85	(77)
Southeast 0.9x	0.77	x	1.43	×	85.75	×	0.63	×	0.7	=	37.48	(77)
Southeast 0.9x	0.77	x	2.36	×	85.75	×	0.63	×	0.7	=	61.85	(77)
Southeast 0.9x	0.77	x	1.43	×	106.25	×	0.63	×	0.7	=	46.43	(77)
Southeast 0.9x	0.77	x	2.36	×	106.25	×	0.63	×	0.7	=	76.63	(77)
Southeast 0.9x	0.77	x	1.43	×	106.25	×	0.63	×	0.7	=	46.43	(77)
Southeast 0.9x	0.77	x	2.36	×	106.25	×	0.63	×	0.7	=	76.63	(77)
Southeast 0.9x	0.77	x	1.43	×	119.01	×	0.63	×	0.7	=	52.01	(77)
Southeast 0.9x	0.77	x	2.36	×	119.01	×	0.63	×	0.7	=	85.84	(77)
Southeast 0.9x	0.77	x	1.43	×	119.01	×	0.63	×	0.7	=	52.01	(77)
Southeast 0.9x	0.77	x	2.36	×	119.01	×	0.63	×	0.7	=	85.84	(77)
Southeast 0.9x	0.77	x	1.43	×	118.15	×	0.63	×	0.7	=	51.63	(77)
Southeast 0.9x	0.77	x	2.36	x	118.15	x	0.63	x	0.7	=	85.22	(77)
Southeast 0.9x	0.77	x	1.43	×	118.15	×	0.63	×	0.7	=	51.63	(77)
Southeast 0.9x	0.77	x	2.36	×	118.15	x	0.63	×	0.7	=	85.22	(77)
Southeast 0.9x	0.77	x	1.43	×	113.91	×	0.63	×	0.7	=	49.78	(77)
Southeast 0.9x	0.77	x	2.36	×	113.91	x	0.63	×	0.7	=	82.16	(77)
Southeast 0.9x	0.77	x	1.43	×	113.91	×	0.63	×	0.7	=	49.78	(77)



Southeast 0.9x	0.77	x	2.36	x	113.91	x	0.63	x	0.7] =	82.16	(77)
Southeast 0.9x	0.77	x	1.43	x	104.39	x	0.63	x	0.7	=	45.62	(77)
Southeast 0.9x	0.77	x	2.36	x	104.39	×	0.63	x	0.7	=	75.29	(77)
Southeast 0.9x	0.77	x	1.43	x	104.39	x	0.63	x	0.7	=	45.62	(77)
Southeast 0.9x	0.77	x	2.36	x	104.39	×	0.63	x	0.7	=	75.29	(77)
Southeast 0.9x	0.77	x	1.43	x	92.85	x	0.63	x	0.7	=	40.58	(77)
Southeast 0.9x	0.77	x	2.36	x	92.85	x	0.63	x	0.7	=	66.97	(77)
Southeast 0.9x	0.77	x	1.43	x	92.85	x	0.63	x	0.7	=	40.58	– (77)
Southeast 0.9x	0.77	x	2.36	x	92.85	x	0.63	x	0.7	=	66.97	(77)
Southeast 0.9x	0.77	x	1.43	x	69.27	×	0.63	x	0.7] =	30.27	(77)
Southeast 0.9x	0.77	x	2.36	x	69.27	x	0.63	x	0.7	=	49.96	(77)
Southeast 0.9x	0.77	x	1.43	x	69.27	x	0.63	x	0.7	=	30.27	(77)
Southeast 0.9x	0.77	x	2.36	x	69.27	x	0.63	x	0.7	=	49.96	(77)
Southeast 0.9x	0.77	x	1.43	x	44.07	x	0.63	x	0.7	=	19.26	(77)
Southeast 0.9x	0.77	x	2.36	x	44.07	x	0.63	x	0.7] =	31.79	(77)
Southeast 0.9x	0.77	x	1.43	x	44.07	x	0.63	x	0.7] =	19.26	(77)
Southeast 0.9x	0.77	x	2.36	x	44.07	x	0.63	x	0.7] =	31.79	(77)
Southeast 0.9x	0.77	x	1.43	x	31.49	x	0.63	x	0.7	=	13.76	(77)
Southeast 0.9x	0.77	x	2.36	x	31.49	x	0.63	x	0.7	=	22.71	(77)
Southeast 0.9x	0.77	x	1.43	x	31.49	x	0.63	x	0.7	=	13.76	(77)
Southeast 0.9x	0.77	x	2.36	x	31.49	×	0.63	x	0.7	=	22.71	(77)
Southwest0.9x	0.77	x	1.43	x	36.79]	0.63	x	0.7	=	16.08	(79)
Southwest0.9x	0.77	x	1.43	x	36.79]	0.63	x	0.7	=	16.08	(79)
Southwest0.9x	0.77	x	1.43	x	36.79]	0.63	x	0.7	=	16.08	(79)
Southwest0.9x	0.77	x	1.43	x	62.67]	0.63	x	0.7	=	27.39	(79)
Southwest0.9x	0.77	x	1.43	x	62.67]	0.63	x	0.7	=	27.39	(79)
Southwest0.9x	0.77	x	1.43	x	62.67]	0.63	x	0.7	=	27.39	(79)
Southwest0.9x	0.77	x	1.43	x	85.75]	0.63	x	0.7	=	37.48	(79)
Southwest0.9x	0.77	x	1.43	x	85.75]	0.63	x	0.7	=	37.48	(79)
Southwest0.9x	0.77	x	1.43	x	85.75]	0.63	x	0.7] =	37.48	(79)
Southwest0.9x	0.77	x	1.43	x	106.25]	0.63	x	0.7	=	46.43	(79)
Southwest0.9x	0.77	x	1.43	x	106.25]	0.63	x	0.7] =	46.43	(79)
Southwest0.9x	0.77	x	1.43	x	106.25]	0.63	x	0.7	=	46.43	(79)
Southwest0.9x	0.77	x	1.43	x	119.01]	0.63	x	0.7] =	52.01	(79)
Southwest0.9x	0.77	x	1.43	x	119.01]	0.63	x	0.7	=	52.01	(79)
Southwest0.9x	0.77	x	1.43	x	119.01]	0.63	x	0.7	=	52.01	(79)
Southwest0.9x	0.77	x	1.43	×	118.15]	0.63	x	0.7	=	51.63	(79)
Southwest0.9x	0.77	×	1.43	x	118.15]	0.63	x	0.7	=	51.63	(79)
Southwest0.9x	0.77	x	1.43	×	118.15]	0.63	×	0.7] =	51.63	(79)
Southwest0.9x	0.77	x	1.43	×	113.91]	0.63	x	0.7	=	49.78	(79)
Southwest0.9x	0.77	x	1.43	x	113.91]	0.63	x	0.7	=	49.78	(79)



Southw	est <mark>0.9x</mark>	0.77	x	1.4	43	x	1	13.91		0.63	x	0.7		= [49.78	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.4	43	x	1	04.39	i T	0.63	x	0.7		=	45.62	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.4	43	x	1	04.39		0.63	x	0.7		= [45.62	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.4	43	x	1	04.39		0.63	×	0.7		= [45.62	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.4	43	x	g	92.85		0.63	x	0.7		= [40.58	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.4	43	x	g	92.85		0.63	x	0.7		= [40.58	(79)
Southw	vest <mark>0.9x</mark>	0.77	x	1.4	43	x	g	92.85		0.63	x	0.7		= [40.58	(79)
Southw	vest <mark>0.9x</mark>	0.77	x	1.4	43	x	6	69.27		0.63	x	0.7		= [30.27	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.4	43	x	6	69.27		0.63	x	0.7		= [30.27	(79)
Southw	vest <mark>0.9x</mark>	0.77	x	1.4	43	x	6	69.27		0.63	x	0.7		= [30.27	(79)
Southw	vest <mark>0.9x</mark>	0.77	x	1.4	43	x	4	14.07		0.63	x	0.7		= [19.26	(79)
Southw	vest <mark>0.9x</mark>	0.77	X	1.4	43	x	4	4.07		0.63	x	0.7		= [19.26	(79)
Southw	vest <mark>0.9x</mark>	0.77	x	1.4	43	x	4	14.07		0.63	x	0.7		= [19.26	(79)
Southw	vest <mark>0.9x</mark>	0.77	x	1.4	43	x	3	31.49		0.63	x	0.7		= [13.76	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	3	31.49		0.63	x	0.7		= [13.76	(79)
Southw	vest <mark>0.9x</mark>	0.77	x	1.4	43	x	3	31.49		0.63	x	0.7		= [13.76	(79)
Solar g	pains in	watts, cal	lculated	for eac	h mont	h			(83)m = S	um(74)m	.(82)m					(00)
(83)m=	137.85	236.27	327.14	411.82	467.18	3 4	466.4	448.58	406.88	356.4	262.1	7 165.38	117.	.8		(83)
(84)m-	A61 24	557 27	626 52	(04)111 =	= (73)11 720 40	$\frac{1+(}{1-7})$	20.61	, walls	655 42	614 61	520.0	162.64	122 (07		(84)
(04)11-	401.04	007.07	000.02	102.11	100.40	<u>'</u>	20.01	001.0	000.42	014.01	000.00	+00.04	452.0	01		(01)
						×										
7. Me	an inter	nal tempe	erature	(heating	j seasc	n)		·		4 (20)				r		- -
7. Me Temp	an inter	nal tempe during he	erature eating p	(heating eriods in	seasc n the liv	on) ving	area	from Tab	ole 9, Th	1 (°C)				[21	(85)
7. Me Temp Utilisa	ean inter perature ation fac	nal tempe during he tor for ga	erature eating p ins for I	(heating eriods in iving are	y seaso n the liv ea, h1,	on) /ing m (s	area t see Ta	from Tab able 9a)	ble 9, Th	1 (°C)	Oat	Nevi]	21	(85)
7. Me Temp Utilisa	erature ation fac	nal tempe during he tor for ga Feb	erature eating p ins for l Mar	(heating eriods in iving are Apr	n the live ea, h1, May	ving m (s	area f see Ta Jun	from Tab able 9a) Jul	ble 9, Th Aug	1 (°C) Sep	Oct	Nov	De) ec	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 livea, h1, ea, h1, May 0.75	on) ving m (s	area f see Ta Jun 0.56	from Tab able 9a) Jul 0.41	ble 9, Th Aug 0.45	1 (°C) Sep 0.69	Oct 0.92	Nov 0.99	De 1) ec	21	(85)
7. Me Temp Utilisa (86)m= Mean	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	(heating eriods in iving are Apr 0.89 living ar	y seaso n the liv ea, h1, 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	Aug 0.45	1 (°C) Sep 0.69 e 9c)	Oct 0.92	Nov 0.99	De 1	ec	21	(85)
7. Me Temp Utilisa (86)m= Mean (87)m=	ean inter perature ation fac Jan 0.99 interna 19.99	nal tempe during he tor for ga Feb 0.98 I tempera 20.2	erature eating p ins for l Mar 0.96 ture in 20.46	(heating eriods in iving are Apr 0.89 living ar 20.74	y seaso n the liv ea, h1, May 0.75 ea T1 (20.92	on) ving m (s / (follo	area f see Ta Jun 0.56 ow ste 20.99	from Tab able 9a) Jul 0.41 ps 3 to 7 21	Die 9, Th Aug 0.45 7 in Tabl 21	1 (°C) Sep 0.69 e 9c) 20.96	Oct 0.92 20.71	Nov 0.99 20.29	De 1	9 C	21	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp	ean inter perature ation fac Jan 0.99 interna 19.99 perature	nal tempe during he tor for ga Feb 0.98 I tempera 20.2 during he	erature eating p ins for l Mar 0.96 ture in 20.46 eating p	(heating eriods in iving are Apr 0.89 living ar 20.74 eriods in	y seaso n the liv ea, h1, May 0.75 ea T1 (20.92 n rest c	on) ving m (s / (follo f dw	area f see Ta Jun 0.56 ow ste 20.99 velling	from Tab able 9a) Jul 0.41 ps 3 to 7 21 from Ta	Aug 0.45 7 in Tabl 21 able 9, T	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C)	Oct 0.92 20.71	Nov 0.99 20.29	De 1 19.9	9C	21	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	ean inter perature ation fac Jan 0.99 interna 19.99 perature 20.02	nal tempe during he tor for ga Feb 0.98 I tempera 20.2 during he 20.02	erature eating p ins for l Mar 0.96 ture in 20.46 eating p 20.02	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03) seaso n the liv ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03	on) ving m (s / (follo 2 of dw	area f see Ta Jun 0.56 20.99 velling 20.03	from Tab able 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03	ole 9, Th Aug 0.45 7 in Tabl 21 able 9, T 20.03	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03	Oct 0.92 20.71 20.03	Nov 0.99 20.29 20.02	De 1 19.9 20.0	9 C 15	21	(85) (86) (87) (88)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac	nal tempe during he tor for ga Feb 0.98 I tempera 20.2 during he 20.02	erature eating p ins for l Mar 0.96 ature in 20.46 eating p 20.02 ins for r	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d	y seaso n the liv ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling	on) ving m (s / (follo (follo 2 v v v v v v v v v v v v v	area f see Ta Jun 0.56 20.99 velling 20.03 ,m (se	from Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table	Die 9, Th Aug 0.45 7 in Tabl 21 able 9, T 20.03 9a)	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03	Oct 0.92 20.71 20.03	Nov 0.99 20.29 20.02	De 1 19.9 20.0	ec 5	21	(85) (86) (87) (88)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac 0.99	nal tempe during he tor for ga 0.98 I tempera 20.2 during he 20.02 tor for ga	erature eating p ins for l Mar 0.96 ture in 20.46 eating p 20.02 ins for r 0.95	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86	y seaso n the liv ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69	n) ving m (s / (follc (follc 1, h2	area 1 see Ta Jun 0.56 ow ste 20.99 velling 20.03 ,m (se 0.48	from Tab able 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32	Die 9, Th Aug 0.45 7 in Tabl 21 able 9, T 20.03 9a) 0.36	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61	Oct 0.92 20.71 20.03 0.89	Nov 0.99 20.29 20.02	De 1 19.9 20.0	ес 95 92 Э	21	(85) (86) (87) (88) (89)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac 0.99	nal temper during he tor for ga Feb 0.98 I tempera 20.2 during he 20.02 tor for ga 0.98 I tempera	erature eating p ins for I Mar 0.96 ature in 20.46 eating p 20.02 ins for r 0.95	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86 the rest	sease n the live ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69 of dwe	n) ving m (s / (follo (follo (follo 1, h2 lling	area 1 see Ta Jun 0.56 20.99 velling 20.03 ,m (se 0.48 1 T2 (fe	from Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32 ollow ste	Aug 0.45 ' in Tabl 21 ble 9, T 20.03 9a) 0.36 ops 3 to 7	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61 7 in Table	Oct 0.92 20.71 20.03 0.89 0.89	Nov 0.99 20.29 20.02 0.98	De 1 19.9 20.0	(95 92	21	(85) (86) (87) (88) (89)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac 0.99 interna 18.69	nal tempe during he itor for ga Feb 0.98 I tempera 20.2 during he 20.02 itor for ga 0.98 I tempera 0.98 I tempera 0.98 I tempera 0.98 I tempera 18.98	erature eating p ins for l Mar 0.96 ature in 20.46 eating p 20.02 ins for r 0.95 ature in 19.36	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86 the rest 19.74	sease n the live ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69 of dwe 19.95	n) ving m (s / (follc (follc (follc 1 2 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	area 1 see Ta Jun 0.56 20.99 velling 20.03 ,m (se 0.48 1 T2 (fe 20.02	from Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32 ollow ste 20.03	Aug 0.45 7 in Tabl 21 able 9, T 20.03 9a) 0.36 eps 3 to 7 20.03	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61 7 in Table 20	Oct 0.92 20.71 20.03 0.89 0.89 € 9c) 19.72	Nov 0.99 20.29 20.02 20.02	De 1 19.9 20.0 0.99	ес 95 92 93	21	(85) (86) (87) (88) (89) (90)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac 0.99 interna 18.69	nal temper during he tor for ga Feb 0.98 I tempera 20.2 during he 20.02 tor for ga 0.98 I tempera 18.98	erature eating p ins for l Mar 0.96 ature in 20.46 eating p 20.02 ins for r 0.95 ature in 19.36	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86 the rest 19.74	sease n the live ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69 of dwe 19.95	n) ving m (s / (follc (follc (follc), h2) llling 2	area 1 see Ta Jun 0.56 20.99 velling 20.03 ,m (se 0.48 1 T2 (fi 20.02	from Tab able 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32 ollow ste 20.03	Aug 0.45 7 in Tabl 21 able 9, T 20.03 9a) 0.36 eps 3 to 7 20.03	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61 7 in Table 20	Oct 0.92 20.71 20.03 0.89 e 9c) 19.72 A = Liv	Nov 0.99 20.29 20.02 20.02 0.98 19.13 ving area ÷ (4)	De 1 19.9 20.0 0.99 18.6 4) =	[эс э5 э2 э3	21	(85) (86) (87) (88) (89) (90) (91)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac 0.99 interna 18.69	nal temper during he tor for ga Feb 0.98 I tempera 20.2 during he 20.02 tor for ga 0.98 I tempera 18.98	erature eating p ins for I Mar 0.96 ature in 1 20.46 eating p 20.02 ins for r 0.95 ature in 1 19.36	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86 the rest 19.74	sease n the live ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69 of dwe 19.95 nole dwe	n) ving m (s / / (follc (follc (follc) (follc) (follc) (follc) (follc) (follc) (follc) (follc)) (follc))) (follc)))) (follc)))))))))))))	area f see Ta Jun 0.56 20.99 velling 20.03 ,m (se 0.48 1 T2 (fe 20.02	from Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32 ollow ste 20.03	Aug 0.45 7 in Tabl 21 able 9, T 20.03 9a) 0.36 eps 3 to 7 20.03	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61 7 in Table 20 fl _A) × T2	Oct 0.92 20.71 20.03 0.89 0.89 9c) 19.72 A = Liv	Nov 0.99 20.29 20.02 0.98 19.13 ving area ÷ (4	De 1 19.9 20.0 0.99 18.6 4) =	9 C 95 92 93	21	(85) (86) (87) (88) (89) (90) (91)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m=	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac 0.99 interna 18.69	nal temper during he itor for ga 0.98 I tempera 20.2 during he 20.02 itor for ga 0.98 I tempera 0.98 I tempera 18.98 I tempera 19.52	erature eating p ins for l Mar 0.96 ature in 20.46 eating p 20.02 ins for r 0.95 ature in 19.36	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86 the rest 19.74 r the wh 20.18	sease n the live ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69 of dwe 19.95 nole dw 20.38	n) ving m (s / (follo (follo (follo 2 velling velling velling	area f see Ta Jun 0.56 20.99 velling 20.03 ,m (se 0.48 1 T2 (fr 20.02	from Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32 ollow ste 20.03	Aug 0.45 7 in Tabl 21 able 9, T 20.03 9a) 0.36 eps 3 to 7 20.03 + (1 – fL 20.46	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61 7 in Table 20 ft A) × T2 20.43	Oct 0.92 20.71 20.03 0.89 e 9c) 19.72 A = Liv 20.16	Nov 0.99 20.29 20.02 0.98 19.13 ving area ÷ (4	De 1 19.9 20.0 0.99 18.6 4) =	(9C 95 92 93 (22	21	(85) (86) (87) (88) (89) (90) (91) (92)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac 0.99 interna 18.69 interna 19.27 r adjustn	nal temper during he tor for ga Feb 0.98 I tempera 20.2 during he 20.02 tor for ga 0.98 I tempera 20.02 tor for ga 0.98 I tempera 18.98 I tempera 19.52 nent to th	erature eating p ins for l Mar 0.96 ature in 20.46 eating p 20.02 ins for r 0.95 ature in 19.36 ature (fo 19.85 e mean	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86 the rest 19.74 r the wh 20.18 interna	sease n the live ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69 of dwe 19.95 nole dw 20.38 I temper	n) ving m (s / (follc (follc (follc 1, h2 1, h2 1, h2 1, h2 2 velling 2 velling	area f see Ta Jun 0.56 20.99 velling 20.03 ,m (se 0.48 1 T2 (fd 20.02 ig) = fl 20.45 ure fro	from Tab able 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32 ollow ste 20.03	Aug 0.45 7 in Tabl 21 able 9, T 20.03 9a) 0.36 eps 3 to 20.03 + (1 - fL 20.46	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61 7 in Table 20 fl A) × T2 20.43 pre appro	Oct 0.92 20.71 20.03 0.89 e 9c) 19.72 A = Liv 20.16 priate	Nov 0.99 20.29 20.02 0.98 19.13 ving area ÷ (4 19.65	De 1 19.9 20.0 0.99 18.6 4) =	90 95 93 13 12 22	21	(85) (86) (87) (88) (89) (90) (91) (92)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m=	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac 0.99 interna 18.69 interna 19.27 r adjustn 19.27	nal temper during he itor for ga Feb 0.98 I tempera 20.2 during he 20.02 itor for ga 0.98 I tempera 20.02 itor for ga 0.98 I tempera 18.98 I tempera 19.52 nent to th 19.52	erature eating p ins for l Mar 0.96 ature in 20.46 eating p 20.02 ins for r 0.95 ature in 19.36 ature (fo 19.85 e mean 19.85	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86 the rest 19.74 r the wh 20.18 interna 20.18	sease n the live ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69 of dwe 19.95 nole dw 20.38 ttempe 20.38	n) ving m (s / / (follc (follc 2 (follc 2 2 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4	area 1 see Ta Jun 0.56 20.99 velling 20.03 ,m (se 0.48 1 T2 (fr 20.02 ag) = fl 20.45 ure fro 20.45	from Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32 ollow ste 20.03 LA × T1 20.46 m Table 20.46	Aug 0.45 7 in Tabl 21 able 9, T 20.03 9a) 0.36 eps 3 to 20.03 + (1 - fL 20.46 4e, whe 20.46	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61 7 in Table 20 fl A) × T2 20.43 ere appro 20.43	Oct 0.92 20.71 20.03 0.89 20.03 19.72 A = Liv 20.16 priate 20.16	Nov 0.99 20.29 20.02 0.98 19.13 ving area ÷ (4 19.65	De 1 19.9 20.0 0.99 18.6 4) = 19.2	(95) 92) 93) 122) 122)	21	(85) (86) (87) (88) (89) (90) (91) (92) (93)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Apply (93)m= 8. Sp	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac 0.99 interna 18.69 interna 19.27 r adjustn 19.27 ace hea	nal temper during he itor for ga Feb 0.98 I tempera 20.2 during he 20.2 during he 20.2 during he 20.02 itor for ga 0.98 I tempera 18.98 I tempera 19.52 nent to th 19.52 ting requi	erature eating p ins for l Mar 0.96 ature in 20.46 eating p 20.02 ins for r 0.95 ature in 19.36 ature (fo 19.85 e mean 19.85 irement	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86 the rest 19.74 r the wh 20.18 interna 20.18	sease n the live ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69 of dwe 19.95 nole dw 20.38 I tempe 20.38	n) ving m (s / (follo (follo (follo (follo 2 velling velling velling 2 velling 2 velling 2 velling	area 1 <u>see Ta</u> <u>Jun</u> 0.56 <u>ow ste</u> 20.99 velling 20.03 <u>,m (se</u> 0.48 <u>1 T2 (fa</u> 20.02 <u>ing) = fl</u> 20.45 <u>ure fro</u> 20.45	from Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32 ollow ste 20.03 LA × T1 20.46 m Table 20.46	Aug 0.45 7 in Tabl 21 able 9, T 20.03 9a) 0.36 eps 3 to 20.03 + (1 – fL 20.46 4e, whe 20.46	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61 7 in Table 20 ft A) × T2 20.43 ere appro 20.43	Oct 0.92 20.71 20.03 0.89 e 9c) 19.72 .A = Liv 20.16 priate 20.16	Nov 0.99 20.29 20.02 0.98 19.13 ving area ÷ (4 19.65	De 1 19.9 20.0 0.99 18.6 4) = 19.2	()2)2)3)3 (2)2)2)2	21	(85) (86) (87) (88) (89) (90) (91) (92) (93)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Sp Set T	an inter perature ation fac Jan 0.99 interna 19.99 erature 20.02 ation fac 0.99 interna 18.69 interna 19.27 r adjustn 19.27 ace hea i to the r	nal temper during he tor for ga Feb 0.98 I tempera 20.2 during he 20.02 tor for ga 0.98 I tempera 20.02 tor for ga 0.98 I tempera 18.98 I tempera 19.52 nent to th 19.52 ting requi mean intee	erature eating p ins for I Mar 0.96 ature in 20.46 eating p 20.02 ins for r 0.95 ature in 19.36 ature (fo 19.85 e mean 19.85 irement ernal ter	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86 the rest 19.74 r the wh 20.18 ninterna 20.18	sease n the live ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69 of dwe 19.95 nole dw 20.38 I tempe 20.38	n) ving m (s / (follc (follc i, h2 i, r>i, h2 i i, h2 i i, h2 i i, h2 i i, h2 i i, h2 i i, h2	area f see Ta Jun 0.56 20.99 velling 20.03 ,m (se 0.48 1 T2 (fu 20.02 1 T2 (fu 20.45 1 T2	from Tab ble 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32 ollow ste 20.03 LA × T1 20.46 m Table 20.46 ep 11 of	Aug 0.45 'in Tabl 21 able 9, T 20.03 9a) 0.36 ps 3 to 20.03 + (1 - fL 20.46 4e, whe 20.46 Table 9	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61 7 in Table 20 fi A) × T2 20.43 ere appro 20.43 b, so that	Oct 0.92 20.71 20.03 0.89 9C) 19.72 A = Liv 20.16 priate 20.16	Nov 0.99 20.29 20.02 0.98 19.13 ving area ÷ (4 19.65 19.65 (19.65)	De 1 19.9 20.0 0.99 18.6 4) = 19.2 19.2 d re-c	22 22 22 22 22	21 0.45	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Sp Set T the ut	an inter perature ation fac Jan 0.99 interna 19.99 perature 20.02 ation fac 0.99 interna 18.69 interna 19.27 adjustn 19.27 ace hea i to the r cilisation	nal temper during he itor for ga Feb 0.98 I tempera 20.2 during he 20.02 itor for ga 0.98 I tempera 20.02 itor for ga 0.98 I tempera 18.98 I tempera 19.52 nent to th 19.52 ting requi mean integration for factor for	erature eating p ins for I Mar 0.96 ature in 1 20.46 eating p 20.02 ins for r 0.95 ature in 1 19.36 ature (fo 19.85 e mean 19.85 irement ernal ter r gains o	(heating eriods in iving are 0.89 living ar 20.74 eriods in 20.03 rest of d 0.86 the rest 19.74 r the wh 20.18 interna 20.18 mperatu using Ta	sease n the live ea, h1, May 0.75 ea T1 (20.92 n rest c 20.03 welling 0.69 of dwe 19.95 nole dw 20.38 I tempe 20.38 re obta able 9a	n) ving m (s / / (follc (follc 2 of dw 1 2 of dw 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2	area f see Ta Jun 0.56 0.5	from Tab able 9a) Jul 0.41 ps 3 to 7 21 from Ta 20.03 ee Table 0.32 ollow ste 20.03 LA × T1 20.46 m Table 20.46 ep 11 of	Aug 0.45 7 in Tabl 21 able 9, T 20.03 9a) 0.36 eps 3 to 20.03 + (1 - fL 20.46 4e, whe 20.46 Table 9	1 (°C) Sep 0.69 e 9c) 20.96 h2 (°C) 20.03 0.61 7 in Table 20 fl A) × T2 20.43 ere appro 20.43 b, so that	Oct 0.92 20.71 20.03 0.89 9 9c) 19.72 A = Liv 20.16 priate 20.16 Ti,m=	Nov 0.99 20.29 20.02 0.98 19.13 ving area ÷ (4 19.65 (19.65 (19.65) (19.65) (19.65)	De 1 19.9 20.0 0.99 18.6 4) = 19.2 19.2 d re-c	(95) 92) 93) 12 13 12 12 12 12 12 12 12 12	21 0.45	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)



Utilisa	ation fac	ctor for g	ains, hm	1:			-							
(94)m=	0.99	0.98	0.94	0.86	0.71	0.52	0.36	0.4	0.64	0.9	0.98	0.99		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	456.98	544.18	600.38	606.26	528.55	374.56	250.44	262.58	395.11	483.97	453.86	429.05		(95)
Month	nly aver	age exte	ernal terr	perature	e from Ta	able 8			-		-			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	-			
(97)m=	992.68	968.11	882.12	739.74	568.39	380.5	251.14	263.78	412.56	626.02	823.9	989.19		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	398.56	284.88	209.62	96.11	29.64	0	0	0	0	105.69	266.43	416.74		
								Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	1807.66	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year							Ī	29.5	(99)
9a. En	ergy rea	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					_
Spac	e heati	ng:												
Fracti	ion of sp	bace hea	at from s	econdar	y/supple	mentary	system					Γ	0	(201)
Fracti	ion of sp	bace hea	at from m	nain syst	em(s)			(202) = 1 ·	- (201) =			ן	1	(202)
Fracti	ion of to	tal heati	na from	main sve	stem 1			(204) = (2	02) × [1 –	(203)] =		ľ	1	(204)
Efficie	ency of	main sna	ace heat	ina svste	-m 1							Ľ	03.1	
Efficie				amontor		a oveter	0 /					Ĺ		
EIIICIE		seconda	ry/suppi	ementar	y neating	y system	1, 70						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c	alculate	d above) I)	1		1					
	398.56	284.88	209.62	96.11	29.64	0	0	0	0	105.69	266.43	416.74		
(211)m	n = {[(98	3)m x (20	4)] } x 1	00 ÷ (20)6)									(211)
	426.72	305.01	224.43	102.9	31.74	0	0	0	0	113.15	285.25	446.19		_
								Tota	ll (kWh/yea	ar) =Sum(2	211) _{15,1012}	-	1935.4	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							-		_
= {[(98)m x (20	01)]	00 ÷ (20	8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	ll (kWh/yea	ar) =Sum(2	215) _{15,1012}	-	0	(215)
Water	heating	9										-		_
Output	from w	ater hea	ter (calc	ulated a	bove)						. <u> </u>			
	179.99	157.22	163.58	145.09	140.47	123.72	118.53	132.14	133.59	152.12	162.39	175.76		_
Efficier	ncy of w	ater hea	iter										80.3	(216)
(217)m=	87	86.53	85.68	84.04	81.89	80.3	80.3	80.3	80.3	84.15	86.29	87.15		(217)
Fuel fo	or water	heating,	kWh/m	onth										
(219)m	1 = (64)	m x 100	$) \div (217)$	m	474.50	454.07	4 47 64	404.55	400.07	400 77	400.40	004 00		
(219)m=	206.89	101.7	190.93	172.64	171.53	154.07	147.61	104.55 Tota	100.37	100.77	188.19	201.68		٦
								rota	n = 30m(2	19a) ₁₁₂ =		L	2126.92	(219)
Annua	al totals	i u fu ol u or	nd main	ovetore	1					k	Wh/year	Г	kWh/year	7
Space	neaung	i uei use	su, main	System	I							Ļ	1935.4	ļ
Water	heating	fuel use	d										2126.92	

Electricity for pumps, fans and electric keep-hot



central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				277.76	(232)
Total delivered energy for all uses (211)(221) + ((231) + (232)(237b) =			4415.07	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	418.05	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	459.42	(264)
Space and water heating	(261) + (262) + (263) + (264) =			877.46	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	144.16	(268)
Total CO2, kg/year	sum	of (265)(271) =		1060.54	(272)

TER =

(273)

17.31



			User D	etails:						
Assessor Name:	Panagiotis	Dalapas		Strom	a Num	ber:		STRO	030082	
Software Name:	Stronars	AP 2012	roportu	Soltwa		SION:	loor Elat	versio	JII. 1.0.3.41	
Address :	238 KILBUE			ON NWA	S 2BS	п-тортт	1001 1 181			
1. Overall dwelling dimer	sions:		, LONDO	514, 14776	200					
Ground floor				a(m²) 02.92	(1a) x	Av. He	ight(m) .45	(2a) =	Volume(m ³) 252.15	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+((1d)+(1e)+(1r	ר) (ו	02.92	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	252.15	(5)
2. Ventilation rate:									<u> </u>	
Number of chimneys	main heating	secondar heating + 0	у] + [0 0] = [total 0	x 4	40 =	m ³ per hour	(6a)
Number of open flues	0	+ 0	+	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fan	S					4	x ^	10 =	40	(7a)
Number of passive vents					Γ	0	x ^	10 =	0	(7b)
Number of flueless gas fire	es					0	x 4	40 =	0	(7c)
								Air ch	nanges per ho	ur
Infiltration due to chimney. If a pressurisation test has be	s, flues and fa en carried out or	ans = (6a)+(6b)+(7)	7a)+(7b)+(d to (17), d	7c) = otherwise c	continue fro	40 om (9) to ((16)	÷ (5) =	0.16	(8)
Number of storeys in the Additional infiltration	e dwelling (ns	3)					[(9)-	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	25 for steel or esent, use the va gs); if equal user	timber frame or lue corresponding to 0.35	0.35 for	r masonr er wall are	y constr a (after	uction			0	(11)
If suspended wooden flo	bor, enter 0.2	(unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else e	enter U							0	
Window infiltration		aught stripped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(10)
Air permeability value, c	150. expresse	d in cubic metre	es per ho	our per so	auare m	etre of e	nvelope	area	5	
If based on air permeabilit	y value, then	(18) = [(17) ÷ 20]+(8), otherwi	se (18) = (16)				0.41	_(18)
Air permeability value applies	if a pressurisation	on test has been dor	ne or a deg	gree air pei	rmeability	is being us	sed			
Number of sides sheltered	l			(00)	0.075 (4	0.1			2	(19)
Shelter factor				(20) = 1 - [0.075 X (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter fac	tor		(21) = (18)) x (20) =				0.35	(21)
Infiltration rate modified to	r monthly win	d speed			0	0.1	NL	Du	1	
	viar Apr	iviay Jun	Jui	Aug	Sep	Oct	INOV	Dec	J	
Monthly average wind spe	ed from Tabl	e 7	0.0	0.7	4	4.0	4.5	47	1	
(22)11= 0.1 5 2	4.9 4.4	4.3 3.8	3.8	3.1	4	4.3	4.5	4./	J	
Wind Factor $(22a)m = (22)$)m ÷ 4	I	1					1	1	
(22a)m= 1.27 1.25 1	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	J	



Adjusted infilt	ration rat	te (allowi	ing for sł	nelter ar	nd wind s	peed) =	(21a) x	(22a)m	-			_	
0.44	0.43	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41		
If mechanic	<i>ective air</i> al ventila	change	rate for t	ne appli	cable ca	se						0	(23a)
If exhaust air h	neat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	15)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced wit	th heat reco	overy: effic	iency in %	allowing	for in-use fa	actor (from	n Table 4h) =	, , ,			0	(23c)
a) If balanc	ed mech	anical ve	entilation	with he	at recove	erv (MVF	HR) (24a	a)m = (22	2b)m + (2	23b) × [*	1 – (23c)	÷ 1001	()
, (24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanc	ed mech	anical ve	entilation	without	heat rec	overy (N	/IV) (24b)m = (22	2b)m + (2	23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole I	house ex	tract ver	ntilation of	or positiv	ve input v	ventilatio	on from c	outside	E (0.2h		-	-	
(24c)m = 0	11 < 0.5			(23) = (23)			c) = (22)	$\int \int \int \int dx$	0 × (230	0	0	ו	(24c)
d) If natural						ventilatio	n from l	oft	Ŭ	0	0	J	()
if (22b)	m = 1, th	en (24d)	m = (22)	o)m othe	erwise (2	4d)m = (0.5 + [(2	2b)m ² x	0.5]				
(24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24d)
Effective ai	r change	rate - er	nter (24a) or (24l	b) or (24	c) or (24	d) in box	x (25)			-	-	
(25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58]	(25)
3. Heat losse	es and he	eat loss i	paramet	er:									
ELEMENT	Gros	SS	Openin	gs	Net Ar	ea	U-valı	ue	AXU		k-value	Э	AXk
	area	(m²)	'n	1 ²	A,r	n²	W/m2	K	(W/ł	<)	kJ/m².	K	kJ/K
Doors	area	(m²)	'n	0 1 ²	A ,r	n ²	W/m2	:К = [(W/ł 2.15	<) 	kJ/m²-	K	kJ/K (26)
Doors Windows Typ	area e 1	(m²)	r	02 1 ²	A ,r 2.15	n ² x x	W/m2 1 /[1/(1.4)+	2K = [0.04] = [(W/ł 2.15 2.32	<) 	kJ/m²-	K	kJ/K (26) (27)
Doors Windows Typ Windows Typ	area e 1 e 2	. (m²)	r) ²	A ,n 2.15 1.75	n ² x x x ^{1/}	W/m2 1 [1/(1.4)+ /[1/(1.4)+	K = [0.04] = [0.04] = [(W/ł 2.15 2.32 2.32	<) 	kJ/m²•	K	kJ/K (26) (27) (27)
Doors Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3	(m²)	'n	²	A ,r 2.15 1.75 1.75 1.75	n ² x x ^{1/} x ^{1/} x ^{1/}	W/m2 [1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$K = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.0$	(W/k 2.15 2.32 2.32 2.32		kJ/m²•	K	kJ/K (26) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4	(m²)	m	ŭ2	A ,r 2.15 1.75 1.75 1.75 1.75	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 ([1/(1.4)+ ([1/(1.4)+ ([1/(1.4)+ ([1/(1.4)+	$K = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.0$	(W/k 2.15 2.32 2.32 2.32 2.32 2.32		kJ/m²∙	ĸ	kJ/K (26) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5	(m²)	m	2	A ,r 2.15 1.75 1.75 1.75 1.75 1.75	n ² x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} $	(W/ł 2.15 2.32 2.32 2.32 2.32 2.32 2.32	$\langle \rangle$	kJ/m²⊷	K	kJ/K (26) (27) (27) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6	(m²)	m	J2	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75	$ \begin{array}{c c} n^{2} \\ x^{1$	W/m2 1 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+	$ \begin{bmatrix} & & \\ & &$	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\diamond	kJ/m²-I	ĸ	kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7	(m²)	m	J2	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 1.75	n ² x x1/ x	W/m2 1 (1/(1.4)+ (1/(1.4)+	$\begin{array}{c} \mathbf{K} \\ \hline \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix}$	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\diamond	kJ/m²-	κ	kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8	(m²)	m	J2	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 1.75 2.88	n ² x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.4)+ (1/(1.4)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\diamond	kJ/m²-I	K	kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	(m²)	m	22	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88	n ² x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.4)+ (1/(1.4)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ \end{array}$	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\diamond	kJ/m²+	κ	kJ/K (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	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10	(m²)	m	32	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88	$ \begin{array}{c c} n^{2} \\ x^{1$	W/m2 1 $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$	$ \begin{bmatrix} \\ 0.04 \\ \\ \\ 0.04 \\ \\ \\ \\ \\ 0.04 \\ \\ \\ \\ \\ \\ 0.04 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\diamond	kJ/m²-	κ	kJ/K (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 Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11	(m²)	m	32	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 2.88	$ \begin{array}{c c} n^{2} \\ x^{1$	W/m2 1 $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \\ = \\ 0.04 \\$	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\diamond	kJ/m²-	ĸ	kJ/K (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 Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12	(m²)	m	32	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 2.88 1.65	$ \begin{array}{c c} n^{2} \\ x^{1$	W/m2 1 $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$	$ \begin{bmatrix} \\ \\ 0.04 \\ \\ \\ \\ 0.04 \\ \\ \\ \\ \\ \\ 0.04 \\ \\ \\ \\ \\ \\ \\ 0.04 \\ \\ \\ \\ \\ \\ \\ \\ \\ 0.04 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\diamond	kJ/m²+	ĸ	kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12	(m ²)	m	2	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 1.65 1.06	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 $(1/(1.4)+)$	$ \begin{bmatrix} \mathbf{K} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix} $	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\[kJ/m²+	ĸ	kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> 22.8	(m ²)	m 23.6	5	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 2.88 1.65 1.06 104.8 22.83	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 $(1/(1.4)+)$	$ \begin{bmatrix} \mathbf{K} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix} $	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	<pre>></pre>	kJ/m²-	K L	kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>22.8</u> <u>19.2</u>	.(m ²)	23.6 0 2.15	5	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 2.88 2.88 1.65 1.06 1.04.8 22.83	n ² x x 1/ x 1	W/m2 1 $(1/(1.4)+)$ $(1/(1$	$ \begin{bmatrix} \mathbf{K} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix} $	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\[kJ/m²-		kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Walls Type1 Walls Type3 Roof	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>22.8</u> <u>19.2</u>	(m ²) 3.4 33 21 92	m 23.6 0 2.15 0		A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 2.88 1.65 1.06 104.8 22.83 17.06	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 (1/(1.4)+ (1/(1.4	$ \begin{bmatrix} \mathbf{K} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix} $	(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\[kJ/m²-		kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Walls Type1 Walls Type2 Walls Type3 Roof Total area of	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>22.8</u> <u>19.2</u> elements	(m²) 3.4 33 21 92 5, m²	m 23.6 0 2.15 0		A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 2.88 1.65 1.06 104.8 22.83 17.06 102.93 273.3	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 (1/(1.4)+ (1/(1.4	$\begin{array}{c} \mathbf{K} \\ \hline \\ 0.04 \\ = \\ \\ 0.04 \\ = \\ \\ \\ 0.04 \\ = \\ \\ \\ 0.04 \\ = \\ \\ \\ 0.04 \\ = \\ \\ \\ 0.04 \\ = \\ \\ \\ 0.04 \\ = \\ \\ \\ 0.04 \\ = \\ \\ \\ 0.04 \\ = \\ \\ \\ 0.04 \\ = \\ \\ \\ \\ 0.04 \\ = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	(W// 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3		kJ/m²-		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) =

72.86 (33)



Heat capacity $Cm = S(A \times k)$ ((28)(:Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m²KIndicativFor design assessments where the details of the construction are not known precisely the indicative values of a detailed calculationIndicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values of the construction are not known precisely the indicative values o	(30) + (32) + (32			-
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K Indicativ For design assessments where the details of the construction are not known precisely the indicative via can be used instead of a detailed calculation		a)(32e) =	17158.83	(34)
For design assessments where the details of the construction are not known precisely the indicative vi can be used instead of a detailed calculation	ve Value: Mediu	m	250	(35)
	values of TMP in	Table 1f		_
Thermal bridges : S (L x Y) calculated using Appendix K			38.03	(36)
if details of thermal bridging are not known (36) = $0.05 \times (31)$				_
Total fabric heat loss (33) + (3	36) =		110.89	(37)
Ventilation heat loss calculated monthly (38)m =	= 0.33 × (25)m x	(5)	-	
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct No	v Dec	_	
(38)m= 49.77 49.45 49.14 47.68 47.41 46.14 46.14 45.9 46.62	47.41 47.96	6 48.54		(38)
Heat transfer coefficient, W/K (39)m =	= (37) + (38)m		_	
(39)m= 160.66 160.34 160.03 158.57 158.3 157.03 157.03 156.79 157.52	158.3 158.8	159.43		_
Av Heat loss parameter (HLP), W/m²K	verage = Sum(3 = (39)m ÷ (4)	9) ₁₁₂ /12=	158.57	(39)
(40)m= 1.56 1.56 1.55 1.54 1.54 1.53 1.53 1.52 1.53	1.54 1.54	1.55		_
Av Number of days in month (Table 1a)	verage = Sum(4	0)112 /12=	1.54	(40)
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct No	v Dec]	
(41)m= 31 28 31 30 31 30 31 31 30	31 30	31	1	(41)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TF if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use not more that 125 litres per percent per day (all water use, but and cold)	FA -13.9)	99.87]	
not more that 120 litres per person per day (all water use, not and cold)				(43)
		– – – – – – – – – – – – – – – – – – –	1	(43)
Jan Feb Mar Apr May Jun Jul Aug Sep Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43)	Oct No	v Dec]	(43)
Jan Feb Mar Apr May Jun Jul Aug Sep Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 100.85 105.86 101.87 97.87 93.88 89.88 89.88 93.88 97.87	Oct No	v Dec]	(43)
Jan Feb Mar Apr May Jun Jul Aug Sep Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 109.85 105.86 101.87 97.87 93.88 89.88 89.88 93.88 97.87 10	Oct No 101.87 105.8	v Dec 6 109.85]	(43)
JanFebMarAprMayJunJulAugSepHot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m=109.85105.86101.8797.8793.8889.8889.8893.8897.87ToToEnergy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/monthly	Oct No 101.87 105.8 otal = Sum(44) h (see Tables 1b)	v Dec 36 109.85 .12 = .0, 1c, 1d)] 1198.41	(43)
Jan Feb Mar Apr May Jun Jul Aug Sep Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) 109.85 105.86 101.87 97.87 93.88 89.88 89.88 93.88 97.87 (44)m= 109.85 105.86 101.87 97.87 93.88 89.88 89.88 93.88 97.87 To To Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (45)m= 162.91 142.48 147.03 128.18 123 106.14 98.35 112.86 114.21	Oct No 101.87 105.8 otal = Sum(44) h (see Tables 1b) 133.1 145.2	v Dec 109.85 112 = 10, 1c, 1d) 19 157.77]	(43)](44)
Jan Feb Mar Apr May Jun Jul Aug Sep Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) 109.85 105.86 101.87 97.87 93.88 89.88 93.88 93.88 97.87 (44)m= 109.85 105.86 101.87 97.87 93.88 89.88 93.88 93.88 97.87 content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month To (45)m= 162.91 142.48 147.03 128.18 123 106.14 98.35 112.86 114.21 To If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	Oct No 101.87 105.8 otal = Sum(44)1 h (see Tables 1b) 133.1 145.2 otal = Sum(45)1 h (see Tables 1b)	v Dec 6 109.85 .12 = 0, 1c, 1d) 29 157.77 .12 =] 	(43)](44)](45)
Jan Feb Mar Apr May Jun Jul Aug Sep Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 109.85 105.86 101.87 97.87 93.88 89.88 89.88 93.88 97.87 (44)m= 109.85 105.86 101.87 97.87 93.88 89.88 93.88 93.88 97.87 ro Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month 70 (45)m= 162.91 142.48 147.03 128.18 123 106.14 98.35 112.86 114.21 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) To (46)m= 24.44 21.37 22.05 19.23 18.45 15.92 14.75 16.93 17.13	Oct No 101.87 105.8 otal = Sum(44) h h (see Tables 1b) 133.1 145.2 otal = Sum(45) 19.96 21.75	v Dec 36 109.85 37 10 39 157.77 39 23.67] 	(43)](44)](45) (46)
Jan Feb Mar Apr May Jun Jul Aug Sep Hot water usage in litres per day for each month $Vd,m = factor from Table 1c x (43)$ 109.85 105.86 101.87 97.87 93.88 89.88 89.88 93.88 97.87 (44)m= 109.85 105.86 101.87 97.87 93.88 89.88 89.88 93.88 97.87 Energy content of hot water used - calculated monthly = $4.190 \times Vd,m \times nm \times DTm / 3600 kWh/month$ (45)m= 162.91 142.48 147.03 128.18 123 106.14 98.35 112.86 114.21 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) To (46)m= 24.44 21.37 22.05 19.23 18.45 15.92 14.75 16.93 17.13 Water storage loss: Storage volume (litres) including any solar or W/W/HPS storage within same vessolar or W/W/HPS Storage within same vessolar or W/W/HPS Storage within same vessolar or W/W/HPS	Oct No 101.87 105.8 otal = Sum(44) h (see Tables 1b) 133.1 145.2 otal = Sum(45) 19.96 21.75 21.75	v Dec 36 109.85 372 = 36, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10] 	(43)](44)](45) (46) (47)
JanFebMarAprMayJunJulAugSepHot water usage in litres per day for each month $Vd,m = factor from Table 1c x (43)$ (44)m=109.85105.86101.8797.8793.8889.8889.8893.8897.87ToToEnergy content of hot water used - calculated monthly = $4.190 \times Vd,m \times nm \times DTm / 3600 kWh/monthl(45)m=162.91142.48147.03128.18123106.1498.35112.86114.21ToIf instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)(46)m=24.4421.3722.0519.2318.4515.9214.7516.9317.13Water storage loss:Storage volume (litres) including any solar or WWHRS storage within same vesself community beating and no tank in dwelling, enter 110 litres in (47)$	Oct No 101.87 105.8 otal = Sum(44)1 h (see Tables 1b) 133.1 145.2 otal = Sum(45)1 19.96 21.75 el	v Dec 6 109.85 .12 = 0, 1c, 1d) 19 157.77 .12 = 9 23.67 0] 	(43)](44)](45) (46) (47)
JanFebMarAprMayJunJulAugSepHot water usage in litres per day for each month $Vd,m = factor from Table 1c x (43)$ (44)m=109.85105.86101.8797.8793.8889.8889.8893.8897.87(44)m=109.85105.86101.8797.8793.8889.8889.8893.8897.87ToEnergy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month(45)m=162.91142.48147.03128.18123106.1498.35112.86114.21ToIf instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)(46)m=24.4421.3722.0519.2318.4515.9214.7516.9317.13Water storage loss:Storage volume (litres) including any solar or WWHRS storage within same vesseIf community heating and no tank in dwelling, enter 110 litres in (47)Otherwise if no stored hot water (this includes instantaneous combi boilers) enter	Oct No 101.87 105.8 otal = Sum(44)1 h (see Tables 1b) 133.1 145.2 otal = Sum(45)1 19.96 21.75 el r '0' in (47)	v Dec 6 109.85 .12 = 0, 1c, 1d) 19 157.77 .12 = 9 23.67 0] 	(43) (44) (45) (46) (47)
JanFebMarAprMayJunJulAugSepHot water usage in litres per day for each month $Vd,m = factor from Table 1c \times (43)$ (44)m=109.85105.86101.8797.8793.8889.8893.8893.8897.87(44)m=109.85105.86101.8797.8793.8889.8893.8893.8897.87ToEnergy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month(45)m=162.91142.48147.03128.18123106.1498.35112.86114.21ToIf instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)(46)m=24.4421.3722.0519.2318.4515.9214.7516.9317.13Water storage loss:Storage volume (litres) including any solar or WWHRS storage within same vesselIf community heating and no tank in dwelling, enter 110 litres in (47)Otherwise if no stored hot water (this includes instantaneous combi boilers) enterWater storage loss:a) If manufacturer's declared loss factor is known (kWh/day):	Oct No 101.87 105.8 otal = Sum(44) h (see Tables 1b) 133.1 145.2 otal = Sum(45) 139.96 21.75 el r '0' in (47)	v Dec 109.85 12 =]]]]	(43)](44)](45) (46) (47) (48)
JanFebMarAprMayJunJulAugSepHot water usage in litres per day for each month $Vd,m = factor from Table 1c x (43)$ (44)m=109.85105.86101.8797.8793.8889.8889.8893.8897.87ToToToInterse of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month(45)m=162.91142.48147.03128.18123106.1498.35112.86114.21ToIf instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)(46)m=24.4421.3722.0519.2318.4515.9214.7516.9317.13Water storage loss:Storage volume (litres) including any solar or WWHRS storage within same vessedIf community heating and no tank in dwelling, enter 110 litres in (47)Otherwise if no stored hot water (this includes instantaneous combi boilers) enterWater storage loss:a) If manufacturer's declared loss factor is known (kWh/day):Temperature factor from Table 2b	Oct No 101.87 105.8 otal = Sum(44)1 h (see Tables 1b) 133.1 145.2 otal = Sum(45)1 19.96 21.75 el r '0' in (47)	v Dec 109.85 12 = 0, 1c, 1d 19 157.77 12 = 0 23.67 0 0 0]]] 	(43)](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 Ta factor fro	factor fi ee secti ble 2a m Table	rom Tabl on 4.3 • 2b	le 2 (kWl	h/litre/da	y)					0 0 0		(51) (52) (53)
Energy Enter	/ lost fro (50) or	om water (54) in (5	storage 55)	e, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54) (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	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (50	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 Primar (moo	y circuit y circuit dified by	t loss (ar t loss cal v factor fi	nual) fro culated rom Tab	om Table for each le H5 if t	e 3 month (here is s	59)m = (solar wat	58) ÷ 36 er heatir	5 × (41) ng and a	m cylinde	r thermo	stat)	0		(58)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41)	m						
(61)m=	50.96	46.03	50.96	48.26	47.84	44.32	45.8	47.84	48.26	50.96	49.32	50.96		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	213.87	188.51	197.99	176.45	170.83	150.46	144.15	160.7	162.47	184.06	194.6	208.73		(62)
Solar DH	-IW input	calculated	using App	endix G or	r Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contributi	on to wate	er heating)		
(add a	dditiona	I lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix C	G)	r				
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	213.87	188.51	197.99	176.45	170.83	150.46	144.15	160.7	162.47	184.06	194.6	208.73		1
								Outp	out from wa	ater heatei	r (annual) _{1.}	12	2152.82	(64)
Heat g	ains fro	m water	heating,	, kWh/me	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 >	((46)m	+ (57)m	+ (59)m]	(05)
(65)m=	66.91	58.88	61.63	54.69	52.86	46.37	44.15	49.49	50.04	56.99	60.64	65.2		(65)
inclu	ıde (57)	m in calo	culation	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	ns (Table	5), Wat	ts								_		
(00)	Jan	Feb	Mar	Apr	May	Jun	Juli	Aug		()-1				
(66)m=	138.25	138.25	1 1 2 0 1 2	400.05	400.05	400.05	400.05	7 (dg	Sep		100.05	Dec		(66)
Lightin		· · ·	130.25	138.25	138.25	138.25	138.25	138.25	Sep 138.25	138.25	138.25	Dec 138.25		(66)
(h/)m=	g gains	(calcula	ted in Ap	138.25	138.25 L, equati	138.25 on L9 oi	138.25 L9a), a	138.25	Sep 138.25 Table 5	138.25	138.25	Dec 138.25		(66)
(01)	g gains 23.27	(calcula 20.66	138.23 ted in Ap 16.8	138.25 opendix 12.72	138.25 L, equati 9.51	138.25 on L9 oi 8.03	138.25 L9a), a 8.68	138.25 Iso see 11.28	Sep 138.25 Table 5 15.14	138.25 19.22	138.25 22.43	Dec 138.25 23.91		(66) (67)
Applia	g gains 23.27 nces ga	(calcula 20.66 ins (calc	ted in Ap 16.8 ulated ir	138.25 opendix 12.72 Append	138.25 L, equati 9.51 dix L, equ	138.25 on L9 or 8.03 uation L	138.25 L9a), a 8.68 13 or L13	138.25 Iso see 11.28 3a), also	Sep 138.25 Table 5 15.14 see Ta	138.25 19.22 ble 5	138.25 22.43	Dec 138.25 23.91		(66) (67)
Appliar (68)m=	g gains 23.27 nces ga 260.96	(calcula 20.66 ins (calc 263.67	ted in Ap 16.8 ulated ir 256.85	138.25 opendix 12.72 Append 242.32	138.25 L, equati 9.51 dix L, eq 223.98	138.25 on L9 of 8.03 uation L 206.75	138.25 L9a), a 8.68 13 or L1: 195.23	138.25 Iso see 11.28 3a), also 192.52	Sep 138.25 Table 5 15.14 9 see Ta 199.35	138.25 19.22 ble 5 213.88	138.25 22.43 232.21	Dec 138.25 23.91 249.45		(66) (67) (68)
Applian (68)m= Cookir	g gains 23.27 nces ga 260.96 ng gains	(calcula 20.66 ins (calc 263.67 (calcula	ted in Ap 16.8 ulated ir 256.85 tted in A	138.25 opendix 12.72 Append 242.32 ppendix	138.25 L, equati 9.51 dix L, equati 223.98 L, equati	138.25 on L9 of 8.03 uation L 206.75 ion L15	138.25 r L9a), a 8.68 13 or L13 195.23 or L15a)	138.25 138.25 11.28 3a), also 192.52 , also se	Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table	138.25 19.22 ble 5 213.88 5	138.25 22.43 232.21	Dec 138.25 23.91 249.45		(66)(67)(68)
Applian (68)m= Cookir (69)m=	g gains 23.27 nces ga 260.96 ng gains 36.82	(calcula 20.66 ins (calc 263.67 (calcula 36.82	136.23 ted in Ap 16.8 ulated ir 256.85 ted in A 36.82	138.25 opendix 12.72 Append 242.32 ppendix 36.82	138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82	138.25 on L9 of 8.03 uation L 206.75 ion L15 36.82	138.25 L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	138.25 138.25 11.28 3a), also 192.52 , also se 36.82	Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82	138.25 19.22 ble 5 213.88 5 36.82	138.25 22.43 232.21 36.82	Dec 138.25 23.91 249.45 36.82		(66) (67) (68) (69)
Applian (68)m= Cookin (69)m= Pumps	g gains 23.27 nces ga 260.96 ng gains 36.82 s and fa	(calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains	ted in Ap 16.8 ulated ir 256.85 ted in A 36.82 (Table s	138.25 opendix 12.72 Append 242.32 ppendix 36.82 5a)	138.25 L, equati 9.51 dix L, equ 223.98 L, equat 36.82	138.25 on L9 of 8.03 uation L 206.75 ion L15 36.82	138.25 r L9a), a 8.68 13 or L1: 195.23 or L15a) 36.82	138.25 Iso see 11.28 3a), also 192.52 , also se 36.82	Sep 138.25 Table 5 15.14 see Ta 199.35 ee Table 36.82	138.25 19.22 ble 5 213.88 5 36.82	138.25 22.43 232.21 36.82	Dec 138.25 23.91 249.45 36.82		(66)(67)(68)(69)
Applian (68)m= Cookir (69)m= Pumps (70)m=	g gains 23.27 nces ga 260.96 ng gains 36.82 s and fa 3	(calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3	ted in Ap 16.8 ulated ir 256.85 tted in A 36.82 (Table 9 3	138.25 opendix 12.72 Appendi 242.32 ppendix 36.82 5a) 3	138.25 L, equati 9.51 dix L, equ 223.98 L, equat 36.82	138.25 on L9 of 8.03 uation L 206.75 ion L15 36.82	138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	138.25 138.25 11.28 3a), also 192.52 , also se 36.82	Sep 138.25 Table 5 15.14 9 see Ta 199.35 9 Table 36.82 3	138.25 19.22 ble 5 213.88 5 36.82	138.25 22.43 232.21 36.82 3	Dec 138.25 23.91 249.45 36.82 3		 (66) (67) (68) (69) (70)
Applian (68)m= Cookir (69)m= Pumps (70)m= Losses	g gains 23.27 nces ga 260.96 ng gains 36.82 s and fat 3 s e.g. ev	(calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 yaporatic	ted in A ₁ 16.8 ulated ir 256.85 ted in A 36.82 (Table 9 3 on (nega	138.25 opendix 12.72 Appendix 242.32 ppendix 36.82 5a) 3 tive valu	138.25 L, equati 9.51 dix L, equ 223.98 L, equat 36.82 3 aes) (Tab	138.25 on L9 or 8.03 uation L 206.75 ion L15 36.82 3 le 5)	138.25 r L9a), a 8.68 13 or L1: 195.23 or L15a) 36.82 3	138.25 138.25 11.28 3a), also 192.52 , also se 36.82	Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82 3	138.25 19.22 ble 5 213.88 5 36.82 3	NOV 138.25 22.43 232.21 36.82 3	Dec 138.25 23.91 249.45 36.82 3		 (66) (67) (68) (69) (70)
Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	g gains 23.27 nces ga 260.96 ng gains 36.82 s and fat 3 s e.g. ev -110.6	(calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 vaporatic -110.6	ted in Ar 16.8 ulated ir 256.85 ted in A 36.82 (Table 9 3 on (nega -110.6	138.25 opendix 12.72 Appendix 242.32 ppendix 36.82 5a) 3 tive valu -110.6	138.25 L, equati 9.51 dix L, equ 223.98 L, equat 36.82 3 es) (Tab -110.6	138.25 on L9 of 8.03 uation L 206.75 ion L15 36.82 3 le 5) -110.6	138.25 L9a), a 8.68 13 or L13 195.23 or L15a) 36.82 3 -110.6	138.25 138.25 11.28 3a), also 192.52 , also se 36.82 3 -110.6	Sep 138.25 Table 5 15.14 9 see Ta 199.35 9 Table 36.82 3 -110.6	138.25 19.22 ble 5 213.88 5 36.82 3 -110.6	NOV 138.25 22.43 232.21 36.82 3 -110.6	Dec 138.25 23.91 249.45 36.82 3 3		 (66) (67) (68) (69) (70) (71)
Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water	g gains 23.27 nces ga 260.96 ng gains 36.82 s and fa 3 s e.g. ev -110.6 heating	(calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 /aporatic -110.6 gains (T	ted in Ar 16.8 ulated ir 256.85 tted in A 36.82 (Table \$ 3 on (nega -110.6 Table \$)	138.25 opendix 12.72 n Appendix 242.32 ppendix 36.82 5a) 3 tive valu -110.6	138.25 L, equati 9.51 dix L, equ 223.98 L, equat 36.82 3 es) (Tab -110.6	138.25 on L9 of 8.03 uation L 206.75 ion L15 36.82 3 le 5) -110.6	138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82 3 -110.6	138.25 138.25 11.28 3a), also 192.52 , also se 36.82 3 -110.6	Sep 138.25 Table 5 15.14 9 see Ta 199.35 9 Table 36.82 3 -110.6	0ct 138.25 19.22 ble 5 213.88 5 36.82 3 -110.6	NOV 138.25 22.43 232.21 36.82 3 -110.6	Dec 138.25 23.91 249.45 36.82 3 3 -110.6		 (66) (67) (68) (69) (70) (71)



Total	interna	l gains =						(66)n	n <mark>+ (67)m</mark>	n <mark>+ (6</mark> 8	3)m + (6	69) <mark>m +</mark> (70)m +	(71)m + ((72)m			
(73)m=	441.63	439.43	423.9	6	398.47	372.01	3	46.65	330.73	337.	.79 3	351.46	377.1	7 406.3	34 4	28.47]	(73)
6. Sc	lar gain	s:																
Solar	gains are	calculated	using so	olar	flux from	Table 6a	a and	associa	ited equa	tions t	to conv	ert to the	e applio	able orie	ntation			
Orient	ation:	Access F Table 6d	actor		Area m²			Flux Tab	le 6a		g Tab	l_ ble 6b		FF Table 6	Sc		Gains (W)	
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	11	.28	x	C).63	x	0.	7	=	5.69) (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	11	.28	x	C).63	x	0.	7	=	3.66	₅ (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	22	9 7	x	C).63	x	0.	7	=	11.5	8 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	22	9 7	x	C).63	x	0.	7	=	7.44	t (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	41	.38	x	C).63	x	0.	7	=	20.8	7 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	41	.38	x	C).63	x	0.	7	=	13.4	t (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	67	.96	x	C).63	x	0.	7	=	34.2	7 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	67	.96	x	C).63	x	0.	7	=	22.0	1 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	91	.35	x	C).63	x	0.	7	=	46.0	6 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	91	.35	x	C).63	x	0.	7	=	29.5	9 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	97	.38	x	C).63	x	0.	7	=	49.1	1 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	97	.38	x	C).63	x	0.	7	=	31.5	5 <mark>(75)</mark>
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	9	1.1	x	C).63	x	0.	7	=	45.9	4 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	9	1.1	x	C).63	x	0.	7	=	29.5	1 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	72	.63	x	C).63	x	0.	7	=	36.6	2 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	72	:.63	x	C).63	x	0.	7	=	23.5	3 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	50	1.42	x	C).63	x	0.	7	=	25.4	3 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	50	1.42	x	C).63	x	0.	7	=	16.3	3 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	28	6.07	x	C).63	x	0.	7	=	14.1	5 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	28	6.07	x	C).63	x	0.	7	=	9.09) (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	1.	4.2	x	C).63	x	0.	7	=	7.16	<u>з</u> (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	1.	4.2	x	C).63	x	0.	7	=	4.6	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.6	5	x	9	.21	x	C).63	x	0.	7	=	4.65	5 (75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.0	6	x	9.	.21	x	C).63	x	0.	7	=	2.98	3 (75)
Southe	east <mark>0.9x</mark>	0.77		x	1.7	5	x	36	i.79	x	C).63	x	0.	7	=	19.6	8 (77)
Southe	east <mark>0.9x</mark>	0.77		x	1.7	5	x	36	i.79	x	C).63	x	0.	7	=	19.6	8 (77)
Southe	east <mark>0.9x</mark>	0.77		x	1.7	5	x	36	i.79	x	C).63	x	0.	7	=	19.6	8 (77)
Southe	east <mark>0.9x</mark>	0.77		x	1.7	5	x	36	i.79	x	C).63	x	0.	7	=	19.6	8 (77)
Southe	east <mark>0.9x</mark>	0.77		x	2.8	8	x	36	i.79	x	C).63	x	0.	7	=	32.3	8 (77)
Southe	east <mark>0.9x</mark>	0.77		x	2.8	8	x	36	5.79	x	C).63	x	0.	7	=	32.3	8 (77)
Southe	east <mark>0.9x</mark>	0.77		x	2.8	8	x	36	5.79	x	C).63	×	0.	7	=	32.3	8 (77)
Southe	east <mark>0.9x</mark>	0.77		x	1.7	5	x	62	:.67	x	C).63	x	0.	7	_ =	33.5	2 (77)
Southe	east <mark>0.9x</mark>	0.77		x	1.7	5	x	62	:.67	x	C).63	x	0.	7	_ =	33.5	2 (77)
Southe	east <mark>0.9x</mark>	0.77		x	1.7	5	x	62	2.67	x	C).63	×	0.	7	7 =	33.5	2 (77)



Southeast 0.9x	0.77	x	1.75	x	62.67	x	0.63	x	0.7] =	33.52	(77)
Southeast 0.9x	0.77	x	2.88	x	62.67	×	0.63	x	0.7	i =	55.16	(77)
Southeast 0.9x	0.77	x	2.88	×	62.67	×	0.63	x	0.7	i =	55.16	(77)
Southeast 0.9x	0.77	x	2.88	×	62.67	×	0.63	x	0.7] =	55.16	(77)
Southeast 0.9x	0.77	x	1.75	×	85.75	×	0.63	x	0.7] =	45.86	(77)
Southeast 0.9x	0.77	x	1.75	x	85.75	×	0.63	x	0.7] =	45.86	(77)
Southeast 0.9x	0.77	x	1.75	x	85.75	x	0.63	x	0.7	=	45.86	(77)
Southeast 0.9x	0.77	x	1.75	x	85.75	x	0.63	x	0.7	=	45.86	(77)
Southeast 0.9x	0.77	x	2.88	×	85.75	x	0.63	x	0.7] =	75.48	(77)
Southeast 0.9x	0.77	x	2.88	×	85.75	×	0.63	x	0.7	=	75.48	(77)
Southeast 0.9x	0.77	x	2.88	×	85.75	x	0.63	x	0.7	=	75.48	(77)
Southeast 0.9x	0.77	x	1.75	×	106.25	×	0.63	x	0.7	=	56.83	(77)
Southeast 0.9x	0.77	x	1.75	×	106.25	×	0.63	x	0.7	=	56.83	(77)
Southeast 0.9x	0.77	x	1.75	x	106.25	x	0.63	x	0.7	=	56.83	(77)
Southeast 0.9x	0.77	x	1.75	×	106.25	×	0.63	x	0.7	=	56.83	(77)
Southeast 0.9x	0.77	x	2.88	×	106.25	×	0.63	x	0.7	=	93.52	(77)
Southeast 0.9x	0.77	x	2.88	x	106.25	x	0.63	x	0.7	=	93.52	(77)
Southeast 0.9x	0.77	x	2.88	x	106.25	x	0.63	x	0.7	=	93.52	(77)
Southeast 0.9x	0.77	x	1.75	x	119.01	x	0.63	x	0.7	=	63.65	(77)
Southeast 0.9x	0.77	x	1.75	x	119.01	x	0.63	x	0.7	=	63.65	(77)
Southeast 0.9x	0.77	x	1.75	x	119.01	x	0.63	x	0.7	=	63.65	(77)
Southeast 0.9x	0.77	x	1.75	x	119.01	×	0.63	x	0.7] =	63.65	(77)
Southeast 0.9x	0.77	x	2.88	x	119.01	x	0.63	x	0.7	=	104.75	(77)
Southeast 0.9x	0.77	x	2.88	x	119.01	x	0.63	x	0.7	=	104.75	(77)
Southeast 0.9x	0.77	x	2.88	x	119.01	x	0.63	x	0.7	=	104.75	(77)
Southeast 0.9x	0.77	x	1.75	x	118.15	x	0.63	x	0.7	=	63.19	(77)
Southeast 0.9x	0.77	x	1.75	x	118.15	x	0.63	x	0.7	=	63.19	(77)
Southeast 0.9x	0.77	x	1.75	x	118.15	x	0.63	x	0.7	=	63.19	(77)
Southeast 0.9x	0.77	x	1.75	x	118.15	x	0.63	x	0.7	=	63.19	(77)
Southeast 0.9x	0.77	x	2.88	x	118.15	x	0.63	x	0.7	=	103.99	(77)
Southeast 0.9x	0.77	x	2.88	x	118.15	x	0.63	x	0.7	=	103.99	(77)
Southeast 0.9x	0.77	x	2.88	x	118.15	x	0.63	x	0.7	=	103.99	(77)
Southeast 0.9x	0.77	x	1.75	×	113.91	x	0.63	x	0.7] =	60.92	(77)
Southeast 0.9x	0.77	x	1.75	×	113.91	x	0.63	x	0.7] =	60.92	(77)
Southeast 0.9x	0.77	x	1.75	×	113.91	x	0.63	x	0.7] =	60.92	(77)
Southeast 0.9x	0.77	x	1.75	x	113.91	x	0.63	x	0.7] =	60.92	(77)
Southeast 0.9x	0.77	x	2.88	×	113.91	x	0.63	x	0.7	=	100.26	(77)
Southeast 0.9x	0.77	x	2.88	x	113.91	x	0.63	x	0.7	=	100.26	(77)
Southeast 0.9x	0.77	x	2.88	×	113.91	×	0.63	x	0.7] =	100.26	(77)
Southeast 0.9x	0.77	x	1.75	×	104.39	×	0.63	x	0.7	=	55.83	(77)
Southeast 0.9x	0.77	x	1.75	x	104.39	×	0.63	x	0.7	=	55.83	(77)



Southeast 0.9x	0.77	x	1.75	x	104.39	x	0.63	x	0.7] =	55.83	(77)
Southeast 0.9x	0.77	x	1.75	×	104.39	×	0.63	x	0.7] =	55.83	– (77)
Southeast 0.9x	0.77	x	2.88	×	104.39	×	0.63	x	0.7] =	91.88	(77)
Southeast 0.9x	0.77	x	2.88	×	104.39	x	0.63	x	0.7] =	91.88	(77)
Southeast 0.9x	0.77	x	2.88	×	104.39	×	0.63	x	0.7] =	91.88	– (77)
Southeast 0.9x	0.77	x	1.75	×	92.85	x	0.63	x	0.7	=	49.66	(77)
Southeast 0.9x	0.77	x	1.75	×	92.85	x	0.63	x	0.7] =	49.66	(77)
Southeast 0.9x	0.77	x	1.75	x	92.85	x	0.63	x	0.7] =	49.66	(77)
Southeast 0.9x	0.77	x	1.75	x	92.85	×	0.63	x	0.7] =	49.66	(77)
Southeast 0.9x	0.77	x	2.88	x	92.85	x	0.63	x	0.7	=	81.73	(77)
Southeast 0.9x	0.77	x	2.88	x	92.85	x	0.63	x	0.7] =	81.73	(77)
Southeast 0.9x	0.77	x	2.88	x	92.85	x	0.63	x	0.7	=	81.73	(77)
Southeast 0.9x	0.77	x	1.75	x	69.27	x	0.63	x	0.7	=	37.05	(77)
Southeast 0.9x	0.77	x	1.75	x	69.27	x	0.63	x	0.7	=	37.05	(77)
Southeast 0.9x	0.77	x	1.75	x	69.27	x	0.63	x	0.7	=	37.05	(77)
Southeast 0.9x	0.77	x	1.75	×	69.27	x	0.63	x	0.7] =	37.05	(77)
Southeast 0.9x	0.77	x	2.88	x	69.27	x	0.63	x	0.7	=	60.97	(77)
Southeast 0.9x	0.77	x	2.88	x	69.27	x	0.63	x	0.7	=	60.97	(77)
Southeast 0.9x	0.77	x	2.88	x	69.27	x	0.63	x	0.7	=	60.97	(77)
Southeast 0.9x	0.77	x	1.75	x	44.07	x	0.63	x	0.7	=	23.57	(77)
Southeast 0.9x	0.77	x	1.75	x	44.07	x	0.63	x	0.7	=	23.57	(77)
Southeast 0.9x	0.77	x	1.75	x	44.07	x	0.63	x	0.7] =	23.57	(77)
Southeast 0.9x	0.77	x	1.75	x	44.07	x	0.63	x	0.7	=	23.57	(77)
Southeast 0.9x	0.77	x	2.88	×	44.07	x	0.63	x	0.7	=	38.79	(77)
Southeast 0.9x	0.77	x	2.88	x	44.07	x	0.63	x	0.7] =	38.79	(77)
Southeast 0.9x	0.77	x	2.88	x	44.07	x	0.63	x	0.7	=	38.79	(77)
Southeast 0.9x	0.77	x	1.75	×	31.49	x	0.63	x	0.7	=	16.84	(77)
Southeast 0.9x	0.77	x	1.75	x	31.49	x	0.63	x	0.7	=	16.84	(77)
Southeast 0.9x	0.77	x	1.75	x	31.49	x	0.63	x	0.7	=	16.84	(77)
Southeast 0.9x	0.77	x	1.75	x	31.49	x	0.63	x	0.7	=	16.84	(77)
Southeast 0.9x	0.77	x	2.88	x	31.49	x	0.63	x	0.7	=	27.71	(77)
Southeast 0.9x	0.77	x	2.88	x	31.49	x	0.63	x	0.7	=	27.71	(77)
Southeast 0.9x	0.77	x	2.88	x	31.49	x	0.63	x	0.7	=	27.71	(77)
Southwest0.9x	0.77	x	1.75	×	36.79]	0.63	x	0.7	=	19.68	(79)
Southwest0.9x	0.77	x	1.75	x	36.79]	0.63	x	0.7	=	19.68	(79)
Southwest0.9x	0.77	x	1.75	x	36.79]	0.63	x	0.7] =	19.68	(79)
Southwest0.9x	0.77	x	1.75	×	62.67]	0.63	x	0.7] =	33.52	(79)
Southwest0.9x	0.77	x	1.75	×	62.67]	0.63	x	0.7] =	33.52	(79)
Southwest0.9x	0.77	x	1.75	×	62.67]	0.63	x	0.7] =	33.52	(79)
Southwest0.9x	0.77	x	1.75	×	85.75]	0.63	×	0.7] =	45.86	(79)
Southwest0.9x	0.77	x	1.75	×	85.75]	0.63	×	0.7] =	45.86	(79)



Southw	est <mark>0.9x</mark>	0.77	x	1.7	7 5	x	8	85.75		0.63	x	0.7	=	45.86	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	06.25		0.63	x	0.7	=	56.83	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	06.25		0.63	x	0.7	=	56.83	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	06.25		0.63	x	0.7	=	56.83	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	19.01		0.63	x	0.7	=	63.65	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	19.01		0.63	x	0.7	=	63.65	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	19.01		0.63	x	0.7	=	63.65	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	18.15		0.63	x	0.7	=	63.19	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	18.15		0.63	x	0.7	=	63.19	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	7 5	x	1	18.15]	0.63	x	0.7	=	63.19	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	13.91		0.63	x	0.7	=	60.92	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	13.91		0.63	x	0.7	=	60.92	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	13.91		0.63	x	0.7	=	60.92	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	′ 5	x	1	04.39		0.63	x	0.7	=	55.83	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	′ 5	x	1	04.39		0.63	x	0.7	=	55.83	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	1	04.39		0.63	×	0.7	=	55.83	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	g	92.85		0.63	x	0.7	=	49.66	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	g	92.85		0.63	x	0.7	=	49.66	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	g	92.85		0.63	×	0.7	=	49.66	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	6	69.27		0.63	x	0.7	=	37.05	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	6	9.27		0.63	x	0.7	=	37.05	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	6	9.27]	0.63	x	0.7	=	37.05	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	4	4.07		0.63	x	0.7	=	23.57	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	7 5	x	4	4.07]	0.63	x	0.7	=	23.57	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	4	4.07		0.63	x	0.7	=	23.57	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	' 5	x	3	31.49		0.63	x	0.7	=	16.84	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	7 5	x	3	31.49]	0.63	x	0.7	=	16.84	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.7	7 5	x	3	81.49]	0.63	x	0.7	=	16.84	(79)
Solar g	ains in	watts, cal	culated	for eac	h mont	h			(83)m	= Sum(74)m .	(82)m			1	()
(83)m=	244.25	419.14	581.74	734.62	835.45	5 8	34.95	802.68	726	.61 634.55	465.4	7 293.12	208.66		(83)
l otal g	ains – i	nternal an	d solar	· (84)m =	= (73)m	$\frac{1}{2} + (1)$	83)m	, watts	400		0.40.0	4 000 45	007.40	1	(0.4)
(84)m=	685.88	858.58	1005.7	1133.09	1207.4	6 1'	81.61	1133.4	1064	.39 986.01	842.6	4 699.45	637.13		(84)
7. Me	an intei	rnal tempe	erature	(heating	seaso	n)									
Temp	erature	during he	eating p	eriods i	n the liv	/ing	area	from Tab	ole 9,	Th1 (°C)				21	(85)
Utilisa	ation fac	ctor for gai	ins for	living ar	ea, h1,i	m (s	ee Ta	ible 9a)	<u> </u>					1	
(0.0)	Jan	Feb	Mar	Apr	May	/	Jun	Jul	A	ug Sep	Oct	Nov	Dec		(96)
(86)m=	1	0.99	0.98	0.95	0.87		0.73	0.57	0.6	0.84	0.97	0.99	1		(00)
Mean	interna	l temperat	ture in	living ar	ea T1 (follo	w ste	ps 3 to 7	7 in T	able 9c)			1	1	
(87)m=	19.3	19.53	19.86	20.28	20.64	2	20.88	20.97	20.	95 20.78	20.29	19.71	19.26	J	(87)
Temp	erature	during he	eating p	eriods i	n rest o	of dw	elling	from Ta	able 9	9, Th2 (°C)		_		1	
(88)m=	19.64	19.64	19.65	19.66	19.66	1	9.67	19.67	19.	67 19.66	19.66	19.66	19.65		(88)



Utilisa	ation fac	tor for g	ains for	rest of dy	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.97	0.93	0.82	0.62	0.42	0.47	0.75	0.95	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	17.43	17.76	18.24	18.84	19.32	19.59	19.66	19.65	19.5	, 18.87	18.03	17.37		(90)
				<u> </u>					f	LA = Livin	g area ÷ (4	l) =	0.33	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) – fl	Δ 🗸 Τ1	⊥ (1 _ fl	Δ) v T2			I		
(92)m=	18.05	18.35	18.78	19.32	19.76	20.02	20.09	20.08	19.92	19.34	18.59	18		(92)
Apply	adjustn	nent to t	L he mear	ا internal	temper	Lature fro	n Table	4e, whe	ere appro	opriate				
(93)m=	18.05	18.35	18.78	19.32	19.76	20.02	20.09	20.08	19.92	19.34	18.59	18		(93)
8. Sp	ace hea	ting requ	uirement	i i										
Set T	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=(1	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		
Utilisa	ation fac	tor for g	ains, hm	1: T		·	·							
(94)m=	0.99	0.98	0.96	0.92	0.82	0.65	0.47	0.52	0.77	0.94	0.99	0.99		(94)
Usefu	ıl gains,	hmGm ,	, W = (94	4)m x (84	4)m			i	i					
(95)m=	681.29	845.11	970.26	1040.37	992.2	772.7	532.82	554.18	760.11	793.42	690.06	633.89		(95)
Month	nly avera	age exte	ernal tem	perature	e from Ta	able 8								(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , VV =	=[(39)m:	x [(93)m	– (96)m	4000.07	4005.45	2222 22		(07)
(97)m=	2209.01	2150.22	1900.01	1001.00	1275.53	001.09	040.00	377.04	910.95	1303.37	1025.15	2200.23		(97)
Space (98)m-	1136.62	881 07	740 54		210 8		n = 0.02	4 X [(97])m – (95)111] X (4 438.93	817.26	1165 35		
(50)11-	1100.02	001.07	740.04	440.14	210.0	0	0	Tota		(k)//b///oor	= Sum(0)		5830 72	
-								Tota	i per year	(KWII/year) = Sum(9	5) 15,912 =	3030.72	
Space	e heatin	g require	ement in	kWh/m ²	/year								56.65	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												_
Fracti	ion of sp	bace hea	at from s	econdary	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	– (201) =				1	(202)
Fracti	ion of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.4	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Αυα	Sep	Oct	Nov	Dec	kWh/ve	_ ar
Space	e heatin	a require	ement (c	alculate	d above)		, tug	000	000		200		
-1	1136.62	881.07	740.54	440.14	210.8	0	0	0	0	438.93	817.26	1165.35		
(211)m	n – {[(98)m x (20	1 4)] } x 1	$1 \\ 100 \div (20)$)6)									(211)
(211)11	1216.94	943.33	792.87	471.24	225.7	0	0	0	0	469.94	875.02	1247.7		(2)
						-	-	Tota	l (kWh/yea	ar) =Sum(2	211), 540, 43	=	6242 74	7(211)
Snac	a haatin	a fual (a	econdar	ν) k\Λ/h/	month					. (+ 10,1012		52 12.1 7	
= {[(98)m x (20	y iuci (5)1)] } x 1	$00 \div (20)$	y), rvvii/)8)	monun									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
	L	I	I	L	L	I	I	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)



Water heating

Output from water heater (calculated above)		_		-	_			
213.87 188.51 197.99 176.45 170.83 1	50.46 144.15	160.7	162.47	184.06	194.6	208.73		
Efficiency of water heater	-						80.3	(216)
(217)m= 88.63 88.44 88.06 87.26 85.58	80.3 80.3	80.3	80.3	87.16	88.26	88.71		(217)
Fuel for water heating, kWh/month	-							
$(219)m = (64)m \times 100 \div (217)m$	07.07 470.50			044.47	000.47	005.04		
(219)m= 241.29 213.15 224.83 202.21 199.62 1	87.37 179.52	200.12	202.33	211.17	220.47	235.31		1
		TOLA	ii = 5um(2	$(9a)_{112} =$			2517.39	(219)
Annual totals Space heating fuel used, main system 1				K	Wh/year	•	6242.74]
Water heating fuel used							2517.39	j
Electricity for pumps, fans and electric keep-hot								-
central heating pump:						30		(230c)
boiler with a fan-assisted flue		(230e)						
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							410.87	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232))(237b)	=				9246	(338)
12a. CO2 emissions – Individual heating system	s including m	nicro-CHF						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x			0.2	16	=	1348.43	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	543.76	(264)
Space and water heating	(261) + (262)) + (263) + ((264) =				1892.19	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	213.24	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		2144.35	(272)

TER =

(273)

20.84



APPENDIX C. TFEE WORKSHEETS



			User D	etails:						
Assessor Name:	Panagiotis	Dalapas		Strom	a Num	ber:		STRO	030082	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.41	
		F	Property A	Address:	: Be Lea	n-First F	loor Flat	t		
Address :	238 KILBUF	RN HIGH ROAD	, LONDO	ON, NWØ	6 2BS					
1. Overall dwelling dimens	ions:		_							
Ground floor			Area 5	a(m²) 60.18	(1a) x	Av. He i	ight(m) 2.5	(2a) =	Volume(m ³) 125.45	(3a)
Total floor area TFA = (1a)-	-(1b)+(1c)+((1d)+(1e)+(1	n) 5	0.18	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	125.45	(5)
2. Ventilation rate:				- 4						_
	main heating	seconda heating	ry	other		total			m ³ per hour	•
Number of chimneys	0	+ 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	_ + _	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fans					- F	2	x ′	10 =	20	(7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fires	5					0	x 4	40 =	0](7c)
5									Ŭ	
								Air ch	anges per ho	ur
Infiltration due to chimneys,	flues and fa	ans = (6a)+(6b)+(7a)+(7b)+(7c) =		20	<u> </u>	÷ (5) =	0.16	(8)
If a pressurisation test has beer	n carried out or	is intended, procee	ed to (17), o	otherwise o	continue fr	om (9) to ((16)			_
Number of storeys in the	dwelling (ns	5)							0	(9)
Additional infiltration	for staal or	timbor from a	r 0 25 fo			uction	[(9)-	-1]x0.1 =	0	(10)
if both types of wall are presideducting areas of openings	ent, use the val ; if equal user	umber frame o lue corresponding t 0.35	o the great	er wall are	a (after	uction			0	_(11)
If suspended wooden floo	or, enter 0.2	(unsealed) or ().1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, enter	0.05, else e	enter 0							0	(13)
Percentage of windows a	nd doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	[00] =			0	(15)
Infiltration rate	0	al in a china an ata		(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, qo	u, expresse	a in cubic metro (18) = [(17) ÷ 20]+	(8) otherwi	our per so ise (18) = (quare m	etre of e	nvelope	area	5	(17)
Air permeability value applies if	a pressurisatio	$(10) = [(11) \cdot 20]$	ne or a dec	gree air pei	rmeability	is being us	sed		0.41	(18)
Number of sides sheltered	,			, ,	,	Ū			4	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporating	shelter fac	tor		(21) = (18)) x (20) =				0.29	(21)
Infiltration rate modified for	monthly win	d speed								
Jan Feb M	ar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spee	d from Tabl	e 7							1	
(22)m= 5.1 5 4.9	4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)r	n ÷ 4									
(22a)m= 1.27 1.25 1.2	3 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	J	



Adjusted infilt	ration rate	e (allowi	ng for sł	nelter an	nd wind s	speed) =	: (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 effe	ective air (cal ventila	change i ition:	rate for t	he appli	cable ca	se						0	(235)
If exhaust air	heat pump i	usina Appe	endix N. (2	3b) = (23a	a) x Fmv (e	equation (N5)) . othe	rwise (23b) = (23a)			0	(23b)
If balanced wi	th heat reco	overy: effic	iency in %	allowing	for in-use f	actor (fror	n Table 4h) =	, (,			0	(23c)
a) If halanc	ed mech:	, anical ve	ntilation	with he	at recove	` ≏rv (M\/	HR) (24a	, a)m – (2;	2h)m + (23h) 🗙 [ʻ	l – (23c)	 ∸ 1001	(200)
(24a)m = 0			0	0					0	0	0]	(24a)
b) If balance	ed mecha	L anical ve	entilation	without	L heat rec	L coverv (l	1 MV) (24h	I_{0})m = (22	L2b)m + (;	L 23b)		I	
(24b)m= 0	0	0	0	0	0		0	0	0	0	0		(24b)
c) If whole	house ex	tract ver	tilation o	or positiv	/e input v	ı ventilatio	n from o	utside				I	
if (22b)	m < 0.5 ×	(23b), t	hen (24	c) = (23k	o); otherv	wise (24	-c) = (22	o) m + 0.	5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natura if (22b)	l ventilation m = 1, the	on or wh en (24d)	ole hous m = (22l	e positi o)m othe	ve input erwise (2	ventilati 24d)m =	on from l 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	0.54	0.54	0.55	0.55	0.56		(24d)
Effective ai	r change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	ld) in box	x (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 loss	es and he	eat loss r	paramet	ər:									
ELEMENT	Gros	ss (m²)	Openin m	gs ²	Net Ar A ,r	rea m²	U-val W/m2	ue 2K	A X U (W/I	<)	k-value kJ/m²·l	e K	A X k kJ/K
Doors		、 ,			2.15	x	1	=	2.15				(26)
Windows Typ	e 1				2.77		/[1/(1.4)+	0.04] =	3.67				(27)
Windows Typ	e 2				2.77		/[1/(1.4)+	0.04] =	3.67				(27)
Windows Typ	e 3				1.7		/[1/(1.4)+	0.04] =	2.25				(27)
Windows Typ	e 4				1.45		/[1/(1.4)+	0.04] =	1.92				(27)
Windows Typ	e 5				1.7		/[1/(1.4)+	0.04] =	2.25				(27)
Floor					50.18	3 X	0.13		6.5234	= r			(28)
Walls Type1	53.6	8	10.3	Э	43.29) x	0.18		7.79	= F		\exists	(29)
Walls Type2	14.7	'3	0		14.73	3 X	0.18	= =	2.65	5		\dashv	(29)
Walls Type3	3.34	4	2.15		1.19	x	0.18		0.21			\dashv	(29)
Total area of	elements	, m²			121.9	3		I					(31)
Party wall					22.09) x	0	= [0				(32)
* for windows an ** include the are	d roof winde eas on both	ows, use e sides of in	ffective wi iternal wal	ndow U-va Is and par	alue calcul titions	ated using	g formula 1	 //[(1/U-valu	ie)+0.04] a	ns given in	paragraph	 1 3.2	
Fabric heat lo	ss, W/K =	= S (A x	U)				(26)(30)) + (32) =				33.11	(33)
Heat capacity	/ Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	10852.	79 (34)
Thermal mas	s parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35)
For design asses can be used inst	ssments wh ead of a de	ere the de tailed calci	tails of the ulation.	construct	ion are not	t known p	recisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridg	ges : S (L	x Y) cal	culated	using Ap	pendix ł	<						14.45	; (36)
if details of thern	nal bridging	are not kn	own (36) =	= 0.05 x (3	81)								



Total fa	abric he	at loss							(33) +	(36) =			47.55	(37)
Ventila	tion hea	at loss ca	alculated	I monthly	y				(38)m	= 0.33 × ((25)m x (5)			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	23.46	23.36	23.25	22.76	22.66	22.23	22.23	22.15	22.4	22.66	22.85	23.05		(38)
Heat tr	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	71.02	70.91	70.8	70.31	70.22	69.79	69.79	69.71	69.95	70.22	70.4	70.6		
Heat lo	oss para	meter (H	HLP), W/	′m²K					ر (40)m	Average = = (39)m ÷	Sum(39)₁. · (4)	12 /12=	70.31	(39)
(40)m=	1.42	1.41	1.41	1.4	1.4	1.39	1.39	1.39	1.39	1.4	1.4	1.41		
Numbe	er of day	rs in mor	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	₁₂ /12=	1.4	(40)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing enei	gy requi	rement:								kWh/ye	ear:	
Assum	ed occu	ipancy, I	N								1	7		(42)
if TF	A > 13.9	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	-13.9)2)] + 0.0)013 x (⁻	TFA -13	.9)	.1		()
if TF	A £ 13.9	9, N = 1						(05 ··· NI)					I	
Annua Reduce	the annua	e not wa al average	ater usag hot water	je in litre usage by :	s per aa 5% if the a	ly va,av Iwelling is	erage = designed t	(25 X N) to achieve	+ 30 a water us	se target o	74 f	.47		(43)
not more	e that 125	litres per p	person per	[.] day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)			_	-		
(44)m=	81.91	78.93	75.96	72.98	70	67.02	67.02	70	72.98	75.96	78.93	81.91		_
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x D)))))))))))))))))))	kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	893.59	(44)
(45)m=	121.47	106.24	109.63	95.58	91.71	79.14	73.33	84.15	85.16	99.24	108.33	117.64		
lf instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)	to (61)	Total = Su	m(45) ₁₁₂ =	=	1171.64	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:									·			
Storag	e volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ime ves	sel		0		(47)
If comr Otherw	nunity h /ise if no	eating a stored	nd no ta hot wate	nk in dw er (this in	velling, e Icludes i	nter 110 nstantar) litres in neous co	(47) ombi boile	ers) ente	er '0' in (47)			
a) If m	storage	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/dav).					0		(48)
Tempe	erature f	actor fro	m Table	2h			"day).					0		(40)
Energy	lost fro	m water	storage	 kWh/ve	ar			(48) x (49)	=			0		(50)
b) If m	anufact	urer's de	eclared of	ylinder l	oss fact	or is not	known:	() / ()				0		(00)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If comr	nunity h	eating s	ee sectio	on 4.3									I	(==)
Tempe	e factor	Irom Tal	ue ∠a m Tahle	2h								0		(52)
Energy	lost fro	mwator	etoroao	-0 k\//h/w	or			(A7) v (51)	v (52) v (53) -		0		(53)
Enter	(50) or (54) in (5	50 age	,yt	Jai			(10) × (01)	~ (02) ^ (0		(54)
	、 , - 、		,								L	-	l	



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 cylind	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)
Prima	ry circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Prima	ry 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	solar 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	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat 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=	103.25	90.31	93.19	81.24	77.95	67.27	62.33	71.53	72.38	84.36	92.08	99.99		(62)
Solar D	HW input o	calculated	using App	endix G o	Appendix	t 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 \	WWHRS	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=	103.25	90.31	93.19	81.24	77.95	67.27	62.33	71.53	72.38	84.36	92.08	99.99		_
								Outp	out from w	ater heate	r (annual)₁	12	995.89	(64)
Heat g	ains froi	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=	25.81	22.58	23.3	20.31	19.49	16.82	15.58	17.88	18.1	21.09	23.02	25		(65)
inclu	ude (57)ı	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 gain	is (Table	e 5), Wat	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77		(66)
Lightir	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	13.22	11.74	9.55	7.23	5.4	4.56	4.93	6.41	8.6	10.92	12.74	13.59		(67)
Applia	nces gai	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m=	147.7	149.23	145.37	137.15	126.77	117.02	110.5	108.97	112.83	121.05	131.43	141.18		(68)
Cookir	ng gains	(calcula	Ited in A	ppendix	L, equat	tion L15	or L15a)	, also se	ee Table	5	•	•		
(69)m=	31.48	31.48	31.48	31.48	31.48	31.48	31.48	31.48	31.48	31.48	31.48	31.48		(69)
Pumps	s and far	ns gains	(Table \$	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatic	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-67.82	-67.82	-67.82	-67.82	-67.82	-67.82	-67.82	-67.82	-67.82	-67.82	-67.82	-67.82		(71)
Water	heating	gains (T	able 5)	•		•	•							
(72)m=	34.7	33.6	31.31	28.21	26.19	23.36	20.95	24.04	25.13	28.35	31.97	33.6		(72)
Total	internal	gains =	:		•	(66)	- m + (67)m	n + (68)m +	+ (69)m +	(70)m + (7	1)m + (72)	m		
(73)m=			004.00	004.00	200.0	102.26	101 0	107.04	104.00	200 75	224 50	226.0		(73)
· · ·	244.05	243	234.66	221.02	200.0	193.30	104.0	107.04	194.99	206.75	224.56	230.0		(10)

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	1.45	×	11.28	×	0.63	x	0.7	=	5	(75)
Northeast 0.9x	0.77	x	1.45	x	22.97	×	0.63	x	0.7	İ =	10.18	(75)
Northeast 0.9x	0.77	x	1.45	×	41.38	×	0.63	x	0.7	=	18.34	(75)
Northeast 0.9x	0.77	x	1.45	×	67.96	×	0.63	x	0.7	=	30.11	(75)
Northeast 0.9x	0.77	x	1.45	×	91.35	×	0.63	x	0.7	=	40.48	(75)
Northeast 0.9x	0.77	x	1.45	×	97.38	×	0.63	x	0.7	=	43.15	(75)
Northeast 0.9x	0.77	x	1.45	×	91.1	×	0.63	x	0.7	=	40.37	(75)
Northeast 0.9x	0.77	x	1.45	×	72.63	x	0.63	x	0.7	=	32.18	(75)
Northeast 0.9x	0.77	x	1.45	×	50.42	×	0.63	x	0.7	=	22.34	(75)
Northeast 0.9x	0.77	x	1.45	×	28.07	×	0.63	x	0.7	=	12.44	(75)
Northeast 0.9x	0.77	x	1.45	×	14.2	x	0.63	x	0.7	=	6.29	(75)
Northeast 0.9x	0.77	x	1.45	×	9.21	×	0.63	x	0.7	=	4.08	(75)
Southeast 0.9x	0.77	x	2.77	x	36.79	×	0.63	x	0.7	=	31.15	– (77)
Southeast 0.9x	0.77	x	2.77	x	36.79	×	0.63	x	0.7	=	31.15	(77)
Southeast 0.9x	0.77	x	1.7	×	36.79	x	0.63	x	0.7	i =	19.12	– (77)
Southeast 0.9x	0.77	x	1.7	×	36.79	×	0.63	x	0.7	=	19.12	(77)
Southeast 0.9x	0.77	x	2.77	×	62.67	×	0.63	x	0.7	=	53.06	(77)
Southeast 0.9x	0.77	x	2.77	×	62.67	x	0.63	x	0.7	=	53.06	– (77)
Southeast 0.9x	0.77	x	1.7	×	62.67	x	0.63	x	0.7	=	32.56	– (77)
Southeast 0.9x	0.77	x	1.7	x	62.67	x	0.63	x	0.7	=	32.56	– (77)
Southeast 0.9x	0.77	x	2.77	×	85.75	x	0.63	x	0.7	=	72.59	– (77)
Southeast 0.9x	0.77	x	2.77	×	85.75	×	0.63	x	0.7	=	72.59	(77)
Southeast 0.9x	0.77	x	1.7	×	85.75	×	0.63	x	0.7	=	44.55	(77)
Southeast 0.9x	0.77	x	1.7	×	85.75	×	0.63	x	0.7	=	44.55	(77)
Southeast 0.9x	0.77	x	2.77	×	106.25	x	0.63	x	0.7	İ =	89.95	(77)
Southeast 0.9x	0.77	x	2.77	×	106.25	x	0.63	x	0.7	=	89.95	(77)
Southeast 0.9x	0.77	x	1.7	×	106.25	×	0.63	x	0.7	=	55.2	(77)
Southeast 0.9x	0.77	x	1.7	×	106.25	x	0.63	x	0.7	=	55.2	(77)
Southeast 0.9x	0.77	x	2.77	×	119.01	×	0.63	x	0.7	=	100.75	(77)
Southeast 0.9x	0.77	x	2.77	×	119.01	×	0.63	x	0.7	=	100.75	(77)
Southeast 0.9x	0.77	x	1.7	×	119.01	×	0.63	x	0.7	=	61.83	(77)
Southeast 0.9x	0.77	x	1.7	×	119.01	×	0.63	x	0.7	=	61.83	(77)
Southeast 0.9x	0.77	x	2.77	×	118.15	×	0.63	x	0.7	=	100.02	(77)
Southeast 0.9x	0.77	x	2.77	×	118.15	x	0.63	x	0.7	=	100.02	(77)
Southeast 0.9x	0.77	x	1.7	×	118.15	×	0.63	x	0.7	=	61.38	(77)
Southeast 0.9x	0.77	x	1.7	×	118.15	×	0.63	x	0.7	=	61.38	(77)
Southeast 0.9x	0.77	x	2.77	×	113.91	×	0.63	×	0.7	=	96.43	(77)
Southeast 0.9x	0.77	x	2.77	×	113.91	×	0.63	x	0.7	=	96.43	(77)
Southeast 0.9x	0.77	x	1.7	×	113.91	×	0.63	×	0.7	=	59.18	(77)



										_								
Southea	ast <mark>0.9x</mark>	0.77		x	1.7	7	x	1	13.91	x		0.63	x	0.7		=	59.18	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	1	04.39	×		0.63	x	0.7		=	88.37	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	1	04.39	x		0.63	×	0.7		=	88.37	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	1.7	7	x	1	04.39	x		0.63	×	0.7		=	54.24	(77)
Southea	ist <mark>0.9x</mark>	0.77		x	1.7	7	x	1	04.39	x		0.63	x	0.7		=	54.24	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	9	2.85	x		0.63	x	0.7		=	78.6	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	9	2.85	x		0.63	×	0.7		=	78.6	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	1.7	7	x	9	2.85	x		0.63	x	0.7		=	48.24	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	1.7	7	x	9	92.85	x		0.63	x	0.7		=	48.24	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	6	9.27	x		0.63	×	0.7		=	58.64	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	6	9.27	x		0.63	×	0.7		=	58.64	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	1.7	7	x	6	9.27	x		0.63	×	0.7		=	35.99	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	1.7	7	x	6	9.27	x		0.63	×	0.7		=	35.99	(77)
Southea	st <mark>0.9x</mark>	0.77		x	2.7	7	x	4	4.07	x		0.63	×	0.7		=	37.31	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	4	4.07	x		0.63	×	0.7		=	37.31	(77)
Southea	st <mark>0.9x</mark>	0.77		x	1.7	7	x	4	4.07	x		0.63	×	0.7		=	22.9	(77)
Southea	st <mark>0.9x</mark>	0.77		x	1.7	7	x	4	4.07	x		0.63	x	0.7		=	22.9	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2.7	7	x	3	31.49	x		0.63	×	0.7		=	26.66	(77)
Southea	ist <mark>0.9x</mark>	0.77		x	2.7	7	x	3	31.49	x		0.63	×	0.7		=	26.66	(77)
Southea	ist <mark>0.9x</mark>	0.77		x	1.7	7	x	3	31.49	x		0.63	×	0.7		=	16.36	(77)
Southea	ist <mark>0.9x</mark>	0.77		x	1.7	7	x	3	31.49	x		0.63	×	0.7		=	16.36	(77)
	-									-								
Solar g	ains in	watts, ca	alcula	ated	for eacl	n mont	h			(83)m	ı = Su	m(74)m	.(82)m					
(83)m=	105.53	181.41	252	.63	320.41	365.64	1 3	65.96	351.59	317	7.4	276.03	201.69	9 126.7	90.	.11		(83)
Total ga	ains – i	nternal a	and s	olar	(84)m =	: (73)m) + (83)m	, watts								1	
(84)m=	349.57	424.41	487.	.29	541.43	572.44	5	59.33	536.39	505	.24	471.02	410.43	3 351.28	326	5.91		(84)
7. Mea	an inter	nal temp	perati	ure (heating	seaso	n)											
Tempe	erature	during h	neatir	ng pe	eriods ir	the liv	/ing	area	from Tal	ole 9	, Th1	(°C)					21	(85)
Utilisa	tion fac	tor for g	ains	for li	ving are	a, h1,	m (s	ee Ta	ble 9a)								1	
ļ	Jan	Feb	M	ar	Apr	Мау	/	Jun	Jul	A	ug	Sep	Oct	Nov	D)ec		
(86)m=	1	0.99	0.9	8	0.94	0.86		0.71	0.55	0.	6	0.82	0.96	0.99	1	1		(86)
Mean	interna	l temper	ature	e in li	iving are	ea T1 (follo	ow ste	ps 3 to 7	7 in T	able	9c)						
(87)m=	19.5	19.71	20.	02	20.39	20.71	2	20.91	20.98	20.	97	20.83	20.4	19.87	19.	.46		(87)
Temp	erature	during h	neatir	ng pe	eriods ir	rest c	of dv	velling	from Ta	able 9	9, Th	2 (°C)					-	
(88)m=	19.75	19.75	19.	75	19.76	19.76	·	19.77	19.77	19.	77	19.77	19.76	19.76	19.	.76		(88)
L Itilisa	tion fac	tor for a	ains	for r	est of d	vellina	h2	m (se	e Table	9a)	I	I		-			1	
(89)m=	0.99	0.99	0.9	07	0.92	0.81	, <u>112</u>	0.61	0.41	0.4	16	0.74	0.94	0.99	1	1		(89)
Moon	intorna	L tompor			ho root	of dwo		T2 /f			to 7	in Toble		_!	L		I	
$\frac{1}{(90)m=}$	18.41	18.62	18	92	19.29	19.58		1∠ (I 19.73	19 77	19 19	76	19.68	19.3	18 79	18	38		(90)
	10.71				10.20					L ^{10.}	. •	fl	A = Liv	/ing area ÷ (4	4) =		0.48	(91)
														U	1		0.40	()

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$



(92)m=	18.94	19.15	19.45	19.82	20.12	20.3	20.35	20.34	20.23	19.83	19.31	18.9		(92)
Apply	adjustr	nent to t	he mear	n internal	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.94	19.15	19.45	19.82	20.12	20.3	20.35	20.34	20.23	19.83	19.31	18.9		(93)
8. Sp	ace hea	ting requ	uirement	1										
Set T the ut	i to the i ilisation	mean int factor fo	ernal tei or gains	mperatui using Ta	re obtair able 9a	ned at ste	ep 11 of	Table 9	o, so tha	t 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	i ains, hm	1 <u>'</u> 1:	,			<u> </u>						
(94)m=	0.99	0.99	0.97	0.92	0.82	0.66	0.48	0.53	0.77	0.94	0.99	1		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	347.36	418.32	471.48	499.33	472.09	366.45	255.53	265.56	363.77	387.38	346.81	325.33		(95)
Mont	nly aver	age exte	ernal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	- =[(39)m :	x [(93)m	– (96)m]				
(97)m=	1039.6	1010.2	916.89	767.73	591.54	397.85	261.66	274.89	429	648.23	859.65	1037.77		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4 ⁻	1)m			
(98)m=	515.03	397.74	331.39	193.25	88.87	0	0	0	0	194.07	369.25	530.05		
						•		Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2619.65	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								52.21	(99)
8c. S	oace co	olina rec	uiremer	nt										
Calcu	lated fo	rJune .	lulv and	August	See Ta	ble 10b								
Calot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rate	e Lm (ca	lculated	using 2	5°C inter	nal tem	berature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	655.99	516.42	529.77	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.85	0.91	0.89	0	0	0	0		(101)
Usefu	L loss, h	ı mLm (V	vatts) = ((100)m x	(101)m	I								
(102)m=	0	0	0	0	0	555.67	469.29	470.02	0	0	0	0		(102)
Gains	s (solar	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	717.93	689.92	654.45	0	0	0	0		(103)
Space	e coolin	g require	ement fo	r month,	whole o	dwelling,	continue	ous (kW	h) = 0.0	24 x [(10)3)m – (102)m]>	x (41)m	
Set (1			(104)/// <			116.92	164 15	127 21	0	0	0			
(104)11-	0	0	0	0	0	110.05	104.13	157.21			104)		440.40	
Cooler	1 fractio	n							f C –	= Sum(1004) area - (4	= 1) _	418.19	(104)
Intermi	ittency f	' actor (Ta	able 10b)					10 -	coolea	arca - (-	•) —	1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
						•			Tota	= Sum(104)	=	0	(106)
Space	cooling	requirer	ment for	month =	(104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	29.21	41.04	34.3	0	0	0	0		
		-			-				Total	= Sum(107)	=	104.55	(107)
Space	cooling	requirer	ment in k	kWh/m²/y	/ear				(107)) ÷ (4) =		Ì	2.08	(108)
8f. Fab	oric Ene	rgy Effic	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabri	c Energ	y Efficie	псу						(99) -	+ (108) =	=		54.29	(109)
Targe	et Fabri	c Energ	y Efficie	ency (TF	EE)								62.43	(109)




			User D	etails:						
Assessor Name:	Panagiotis	Dalapas		Strom	a Num	ber:		STRO	030082	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.41	
		P	roperty	Address:	Be Lea	n-Secon	d Floor	Flat		
Address :	238 KILBUF	RN HIGH ROAD	, LONDO	ON, NWE	6 2BS					
1. Overall dwelling dimen	sions:									
Ground floor			Area 6	a(m²) 1.28	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 153.2	(3a)
Total floor area TFA = (1a)	+(1b)+(1c)+	(1d)+(1e)+(1r	ר) 🛛 6	1.28	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	153.2	(5)
2. Ventilation rate:				- 4		4 - 4 - 1				_
	main heating	secondai heating	·у	other		total			m ³ per hour	•
Number of chimneys	0	+ 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fans	3				- <u> </u>	2	x ′	10 =	20	(7a)
Number of passive vents						0	x ′	10 =	0	(7b)
Number of flueless gas fire	S					0	x 4	40 =	0	(7c)
					L					
								Air ch	anges per ho	ur
Infiltration due to chimneys	, flues and fa	ans = (6a)+(6b)+(7	7a)+(7b)+(7c) =		20	·	÷ (5) =	0.13	(8)
If a pressurisation test has bee	n carried out o	r is intended, procee	d to (17), o	otherwise o	continue fro	om (9) to ((16)			_
Number of storeys in the	dwelling (ne	6)					[(0)	11-0.4	0	(9)
Structural infiltration: 0.2	5 for steel o	r timber frame or	· 0 35 foi	r masonr	v constr	uction	[(9)-	-1jx0.1 =	0	(10)
if both types of wall are pre- deducting areas of opening	sent, use the va s); if equal user	lue corresponding to 0.35	the great	er wall are	a (after	Gottori			0	_()
If suspended wooden flo	or, enter 0.2	(unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	r 0.05, else e	enter 0							0	(13)
Percentage of windows	and doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	[00] =			0	(15)
Infiltration rate		din outin matra	o nor ha	(8) + (10)	+ (11) + (1	2) + (13) + (1	F (15) =	oroo	0	(16)
If based on air permeability	ou, expresse v value then	$(18) = [(17) \div 20] + (18)$	8), otherwi	our per so ise (18) = (4uare m 16)	elle ole	nvelope	area	5	(17)
Air permeability value applies	f a pressurisatio	on test has been dor	ne or a deg	gree air pei	rmeability	is being us	sed		0.36	
Number of sides sheltered			-		-	-			4	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporation	g shelter fac	tor		(21) = (18)) x (20) =				0.27	(21)
Infiltration rate modified for	monthly wir	nd speed					· · · · · ·		1	
Jan Feb M	lar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spec	ed from Tabl	e 7		i	i		i	i	1	
(22)m= 5.1 5 4	9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	J	
Wind Factor (22a)m = (22)	m÷4		r					1	1	
(22a)m= 1.27 1.25 1.	23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	



Adjuste	ed infiltr	ation rat	e (allowi	ing for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.34	0.33	0.33	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31		
Calcula	ate effe	ctive air	change	rate for t	he appli	cable ca	se	-					2	(22.0)
lf exh	aust air h	ai verillia eat numn i	using App	endix N (2	'3h) <i>– (</i> 23a) x Emv (e	auation (N	(5)) othe	wise (23h) – (23a)			0	(238)
lf bala	anced with			viency in %	(200) = (200)	or in-use f	actor (from	Table 4h	wise (200) – (200)			0	(230)
a) If		d moob			with ho				$(-)^{-}$	2h)m i (f	00h) v [/	1 (220)	0	(23C)
a) II (24a)m-								1K) (24a	0	$\frac{2}{0}$	230) X [0	÷ 100]	(24a)
b) If					without	boot roc		 /\/) (24h	m = (2)	 2b)m + ('	23P)	Ŭ		(_ · · ·)
(24b)m=								0	0		0	0		(24b)
(2 10)11-			tract ver				ventilatio	n from c		Ů	•	Ŭ		(- · · ·
i c)	if (22b)n	n < 0.5 ×	(23b), 1	then (24	c) = (23b); otherv	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	ventilatio	on or wh	lole hous	se positiv	e input	ventilatio	on from l	oft					
Í	if (22b)n	n = 1, th	en (24d)	m = (22	o)m othe	rwise (2	4d)m =	0.5 + [(2	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	0.54	0.55		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55		(25)
3. He	at losse	s and he	eat loss	paramet	er:									
ELEN	IENT	Gros area	ss (m²)	Openin m	lgs 1 ²	Net Ar A ,r	ea n²	U-valı W/m2	le K	A X U (W/ł	<)	k-value kJ/m²∙ł	e <	A X k kJ/K
Doors						2.15	x	1	=	2.15				(26)
Windo	ws Type	e 1				1.43	x1.	/[1/(1.4)+	0.04] =	1.9				(27)
Window	ws Type	92				1.43	x1.	/[1/(1.4)+	0.04] =	1.9				(27)
Window	ws Type	e 3				1.43	x1.	/[1/(1.4)+	0.04] =	1.9				(27)
Window	ws Type	e 4				1.43	x1.	/[1/(1.4)+	0.04] =	1.9				(27)
Windo	ws Type	e 5				2.36	x1,	/[1/(1.4)+	0.04] =	3.13	_			(27)
Window														(27)
Windo.	ws Type	e 6				1.43	x1,	/[1/(1.4)+	0.04] =	1.9				(27)
vvindo	ws Type ws Type	e 6 e 7				1.43 2.36	x1,	/[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] =	1.9 3.13				(27)
Windo	ws Type ws Type ws Type	e 6 e 7 e 8				1.43 2.36	x1, x1, x1,	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04	1.9 3.13 1.68				(27)
Windo Windo Walls	ws Type ws Type ws Type Type1	e 6 e 7 e 8 59.8	8	13.1	4	1.43 2.36 1.27 46.74	x1, x1, x1, x1, x1, x1,	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 	0.04] = 0.04] = 0.04] =	1.9 3.13 1.68 8.41				(27)
Window Window Walls ⁻ Walls ⁻	ws Type ws Type ws Type Type1 Type2	≥ 6 ≥ 7 ≥ 8 <u>59.8</u>	38	13.1	4	1.43 2.36 1.27 46.74	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18	0.04] = 0.04	1.9 3.13 1.68 8.41 0.99				(27) (27) (29)
Windov Walls ⁻ Walls ⁻ Walls ⁻	ws Type ws Type ws Type Type1 Type2 Type3	 6 7 8 59.8 5.4 16.3 	18 B	13.1	4	1.43 2.36 1.27 46.74 5.48	x1. x1. x1. x1. x1. x	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18	0.04] = [0	1.9 3.13 1.68 8.41 0.99 2.56				(27) (27) (29) (29) (29)
Windov Walls ⁻ Walls ⁻ Walls ⁻ Total a	ws Type ws Type ws Type Type1 Type2 Type3 area of e	e 6 $e 7$ $e 8$ 59.8 5.4 5.4 16.3 $e ements$	88 8 87 . m ²	13.1 0 2.15	4	1.43 2.36 1.27 46.74 5.48 14.22	x1. x1. x1. x1. x1. x	<pre>/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+</pre>	0.04] = [0.04] = [0.04] = [= [= [= [= [1.9 3.13 1.68 8.41 0.99 2.56				(27) (27) (29) (29) (29) (29) (31)
Windov Walls ⁻ Walls ⁻ Walls ⁻ Total a	ws Type ws Type Type1 Type2 Type3 area of e wall	 6 7 8 59.8 5.4 16.3 elements 	88 3 37 , m ²	13.1 0 2.15	4	1.43 2.36 1.27 46.74 5.48 14.22 81.73	x1. x1. x1. x1. x x x x	<pre>(1/(1.4)+ (1/(1.4)+ (1/(1.4)+</pre>	0.04] = [0.04] = [0.04] = [] = [] = [] = [1.9 3.13 1.68 8.41 0.99 2.56				(27) (27) (29) (29) (29) (29) (31) (32)
Window Walls ⁻ Walls ⁻ Walls ⁻ Total a Party w	ws Type ws Type Type1 Type2 Type3 area of e wall	 6 7 8 59.8 5.44 16.3 elements 	88 3 37 , m ²	13.1 0 2.15	4 5 5	1.43 2.36 1.27 46.74 5.48 14.22 81.73 24.18	x1. x1. x1. x1. x x x x x x x x x x x x	<pre>/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+</pre>	0.04] = [0.04] = [0.04] = [= [= [= [//(1/U-vali)	1.9 3.13 1.68 8.41 0.99 2.56 0 (e)+0.041	[[[[[paraoranh		(27) (27) (29) (29) (29) (31) (32)
Window Walls ⁻ Walls ⁻ Walls ⁻ Total a Party w * for win ** includ	ws Type ws Type ws Type Type1 Type2 Type3 area of e wall dows and le the area	 6 7 8 59.8 59.8 16.3 elements roof windles on both 	88 3 37 , m ² ows, use e sides of ir	13.1 0 2.15	4 5 Indow U-va Is and part	1.43 2.36 1.27 46.74 5.48 14.22 81.73 24.18 alue calculations	x1. x1. x1. x1. x x x x x x x x x x x x	<pre>/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+</pre>	0.04] = [0.04] = [0.04] = [= [= [= [= [/[(1/U-valu)]	1.9 3.13 1.68 8.41 0.99 2.56 0 ue)+0.04] a	[[[[[[paragraph		(27) (27) (29) (29) (29) (31) (32)

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

Thermal mass	parameter (TMP =	Cm÷ ⁻	TFA)	in k	⟨J/m²K
		1				

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

Indicative Value: Medium

 31.53
 (33)

 7799.88
 (34)

 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 u	ised instea	ad of a det	tailed calc	ulation.										
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix I	<						6.59	(36)
if details	of therma	l bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			38.12	(37)
Ventila	tion hea	t 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=	28.19	28.08	27.97	27.45	27.35	26.9	26.9	26.81	27.07	27.35	27.55	27.75		(38)
Heat tr	ansfer o	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	66.31	66.2	66.09	65.56	65.47	65.01	65.01	64.93	65.19	65.47	65.66	65.87		
										Average =	Sum(39)1.	₁₂ /12=	65.56	(39)
Heat lo	oss para	meter (H	ILP), W/	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.08	1.08	1.08	1.07	1.07	1.06	1.06	1.06	1.06	1.07	1.07	1.07		
Numbe	er of dav	rs in mor	nth (Tab	le 1a)					/	Average =	Sum(40)1.	₁₂ /12=	1.07	(40)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4) 0 / -	1	•												
4. VVa	iter neat	ing ener	gy requ	irement:								KVVN/Ye	ear:	
Assum	ed occu	ipancy, I	N								2.	02		(42)
if TF if TF	A > 13.9	9, N = 1 9 N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9))2)] + 0.0	0013 x (1	ΓFA -13.	.9)			
Annual	averag	e hot wa	ater usag	ge in litre	es per da	iy Vd,av	erage =	(25 x N)	+ 36		82	.12		(43)
Reduce	the annua	al average	hot water	usage by a	5% if the a	welling is	designed t	o achieve	a water us	se target o	f			
not more	e that 125	litres per p	person per	r day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	90.33	87.04	83.76	80.48	77.19	73.91	73.91	77.19	80.48	83.76	87.04	90.33		
							_			Total = Su	m(44) ₁₁₂ =	-	985.41	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600	kWh/mon	oth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	133.96	117.16	120.9	105.4	101.13	87.27	80.87	92.8	93.91	109.44	119.46	129.73		
lf in stand					. h . t t		antan O in	h) to (Cd)	Total = Su	m(45) ₁₁₂ =	=	1292.03	(45)
ii instant	aneous w	ater neatir	ng at point	or use (no	not water	storage),	enter 0 in	boxes (46,) to (61)				I	
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Storage	siorage e volum	o (litros)	includir		alar or M		storado	within ea	mayas	col		•	l	(47)
If com				ng any so		ntor 110		(47)		501		0		(47)
Otherw	riunity n vise if no	eating a	hot wate	r (this in	venny, e Indes i	nstantar		(47) mhi hoili	ers) ente	er 'O' in (47)			
Water	storage	loss:	not wate			notantai	10000 00			, o (.,			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b			• /					0		(49)
Enerav	lost fro	m water	storage	. kWh/ve	ear			(48) x (49)	=			0		(50)
b) If m	anufact	urer's de	eclared of	cylinder l	loss fact	or is not	known:					0		(00)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If comr	nunity h	eating s	ee secti	on 4.3										
Volume	e factor	trom Tal	ble 2a	01-								0	,	(52)
rempe	rature fa	actor tro	III I ADIE	ZD								0		(53)



Energy Enter	/ lost fro	m water (54) in (5	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Water	storage	loss cal	culated :	for each	month			((56)m = (55) x (41)ı	m		0		(00)
(56)m-						0	0		0	0	0	0		(56)
lf 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	(00)
(57)m-	0	0	0		0				0	0	,	0		(57)
(07)11-	0	0	0	0	0	0	0	0	0	0		0		(0))
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3 manth (E0)m	(50) . 20	SE (44)	~			0		(58)
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	(50) - 50 ter heati	ng and a	n cylinder	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi		ı Iculated	for each	n month ((61)m –	ı (60) ∸ 3(1 65 x (41))m	1		I	1		
(61)m=	0	0	0	0	0			0	0	0	0	0		(61)
Total h	L	L uired for	l water h	L eating ca	I alculated	l for eac	I h month	I (62)m =	0.85 x ((45)m +	L (46)m +	L (57)m +	l (59)m + (61)m	
(62)m=	113.86	99.58	102.76	89.59	85.96	74.18	68.74	78.88	79.82	93.02	101.54	110.27	((62)
Solar DI	L -IW input (L calculated	L using App	l endix G or	I Appendix	L H (negati	L ve quantity	/ (enter '0	if no sola	r contribut	l ion to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)			0,		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	113.86	99.58	102.76	89.59	85.96	74.18	68.74	78.88	79.82	93.02	101.54	110.27		
								Outp	out from wa	ater heate	r (annual)₁	12	1098.23	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	28.47	24.9	25.69	22.4	21.49	18.55	17.18	19.72	19.96	23.26	25.39	27.57		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	is (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see [·]	Table 5					
(67)m=	15.73	13.97	11.36	8.6	6.43	5.43	5.86	7.62	10.23	12.99	15.16	16.16		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	176.16	177.99	173.38	163.58	151.2	139.56	131.79	129.96	134.57	144.38	156.76	168.39		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5				
(69)m=	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09		(69)
Pumps	and fai	ns gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatic	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7		(71)
Water	heating	gains (1	able 5)	-			-	-						
(72)m=	38.26	37.05	34.53	31.11	28.89	25.76	23.1	26.51	27.72	31.26	35.26	37.05		(72)
Total i	internal	gains =				(66))m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	283.41	282.27	272.54	256.55	239.78	224.01	214.02	217.36	225.78	241.89	260.44	274.87		(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.



Orientation:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.27	x	11.28	×	0.63	x	0.7	=	4.38	(75)
Northeast 0.9x	0.77	x	1.27	x	22.97	x	0.63	×	0.7	=	8.91	(75)
Northeast 0.9x	0.77	x	1.27	x	41.38	×	0.63	×	0.7	=	16.06	(75)
Northeast 0.9x	0.77	x	1.27	x	67.96	×	0.63	×	0.7	=	26.38	(75)
Northeast 0.9x	0.77	x	1.27	x	91.35	×	0.63	×	0.7	=	35.45	(75)
Northeast 0.9x	0.77	x	1.27	x	97.38	×	0.63	x	0.7	=	37.8	(75)
Northeast 0.9x	0.77	x	1.27	x	91.1	×	0.63	x	0.7	=	35.36	(75)
Northeast 0.9x	0.77	x	1.27	x	72.63	x	0.63	x	0.7	=	28.19	(75)
Northeast 0.9x	0.77	x	1.27	x	50.42	x	0.63	x	0.7	=	19.57	(75)
Northeast 0.9x	0.77	x	1.27	x	28.07	x	0.63	x	0.7	=	10.89	(75)
Northeast 0.9x	0.77	x	1.27	x	14.2	x	0.63	x	0.7	=	5.51	(75)
Northeast 0.9x	0.77	x	1.27	x	9.21	x	0.63	x	0.7	=	3.58	(75)
Southeast 0.9x	0.77	x	1.43	x	36.79	x	0.63	×	0.7	=	16.08	(77)
Southeast 0.9x	0.77	x	2.36	x	36.79	x	0.63	x	0.7	=	26.54	(77)
Southeast 0.9x	0.77	x	1.43	x	36.79	×	0.63	×	0.7	=	16.08	(77)
Southeast 0.9x	0.77	x	2.36	x	36.79	×	0.63	×	0.7	=	26.54	(77)
Southeast 0.9x	0.77	x	1.43	x	62.67	x	0.63	x	0.7	=	27.39	(77)
Southeast 0.9x	0.77	x	2.36	x	62.67	×	0.63	×	0.7	=	45.2	(77)
Southeast 0.9x	0.77	x	1.43	x	62.67	x	0.63	×	0.7	=	27.39	(77)
Southeast 0.9x	0.77	x	2.36	x	62.67	x	0.63	x	0.7	=	45.2	(77)
Southeast 0.9x	0.77	x	1.43	x	85.75	×	0.63	×	0.7	=	37.48	(77)
Southeast 0.9x	0.77	x	2.36	x	85.75	x	0.63	x	0.7	=	61.85	(77)
Southeast 0.9x	0.77	x	1.43	x	85.75	x	0.63	x	0.7	=	37.48	(77)
Southeast 0.9x	0.77	x	2.36	x	85.75	x	0.63	x	0.7	=	61.85	(77)
Southeast 0.9x	0.77	x	1.43	x	106.25	x	0.63	x	0.7	=	46.43	(77)
Southeast 0.9x	0.77	x	2.36	x	106.25	×	0.63	x	0.7	=	76.63	(77)
Southeast 0.9x	0.77	x	1.43	x	106.25	×	0.63	x	0.7	=	46.43	(77)
Southeast 0.9x	0.77	x	2.36	x	106.25	x	0.63	x	0.7	=	76.63	(77)
Southeast 0.9x	0.77	x	1.43	x	119.01	×	0.63	x	0.7	=	52.01	(77)
Southeast 0.9x	0.77	x	2.36	x	119.01	×	0.63	x	0.7	=	85.84	(77)
Southeast 0.9x	0.77	x	1.43	x	119.01	x	0.63	x	0.7	=	52.01	(77)
Southeast 0.9x	0.77	x	2.36	x	119.01	×	0.63	x	0.7	=	85.84	(77)
Southeast 0.9x	0.77	x	1.43	x	118.15	x	0.63	x	0.7	=	51.63	(77)
Southeast 0.9x	0.77	x	2.36	x	118.15	x	0.63	x	0.7	=	85.22	(77)
Southeast 0.9x	0.77	x	1.43	x	118.15	x	0.63	x	0.7	=	51.63	(77)
Southeast 0.9x	0.77	x	2.36	x	118.15	×	0.63	x	0.7] =	85.22	(77)
Southeast 0.9x	0.77	x	1.43	x	113.91	x	0.63	x	0.7	=	49.78	(77)
Southeast 0.9x	0.77	x	2.36	x	113.91	×	0.63	×	0.7	=	82.16	(77)
Southeast 0.9x	0.77	x	1.43	x	113.91	×	0.63	×	0.7	=	49.78	(77)



Southeast 0.9x	0.77	x	2.36	x	113.91	x	0.63	x	0.7] =	82.16	(77)
Southeast 0.9x	0.77	x	1.43	×	104.39	×	0.63	x	0.7	j =	45.62	(77)
Southeast 0.9x	0.77	x	2.36	×	104.39	×	0.63	x	0.7] =	75.29	(77)
Southeast 0.9x	0.77	x	1.43	×	104.39	x	0.63	x	0.7	=	45.62	(77)
Southeast 0.9x	0.77	x	2.36	×	104.39	x	0.63	x	0.7] =	75.29	(77)
Southeast 0.9x	0.77	x	1.43	×	92.85	x	0.63	x	0.7] =	40.58	(77)
Southeast 0.9x	0.77	x	2.36	×	92.85	×	0.63	x	0.7] =	66.97	(77)
Southeast 0.9x	0.77	x	1.43	x	92.85	x	0.63	x	0.7] =	40.58	(77)
Southeast 0.9x	0.77	x	2.36	x	92.85	×	0.63	x	0.7] =	66.97	(77)
Southeast 0.9x	0.77	x	1.43	x	69.27	x	0.63	x	0.7	=	30.27	(77)
Southeast 0.9x	0.77	x	2.36	x	69.27	x	0.63	x	0.7] =	49.96	(77)
Southeast 0.9x	0.77	x	1.43	x	69.27	x	0.63	x	0.7	=	30.27	(77)
Southeast 0.9x	0.77	x	2.36	x	69.27	x	0.63	x	0.7] =	49.96	(77)
Southeast 0.9x	0.77	x	1.43	x	44.07	x	0.63	x	0.7	=	19.26	(77)
Southeast 0.9x	0.77	x	2.36	x	44.07	x	0.63	x	0.7] =	31.79	(77)
Southeast 0.9x	0.77	x	1.43	×	44.07	x	0.63	x	0.7] =	19.26	(77)
Southeast 0.9x	0.77	x	2.36	x	44.07	x	0.63	x	0.7] =	31.79	(77)
Southeast 0.9x	0.77	x	1.43	x	31.49	x	0.63	x	0.7	=	13.76	(77)
Southeast 0.9x	0.77	x	2.36	x	31.49	x	0.63	x	0.7] =	22.71	(77)
Southeast 0.9x	0.77	x	1.43	x	31.49	x	0.63	x	0.7] =	13.76	(77)
Southeast 0.9x	0.77	x	2.36	x	31.49	x	0.63	x	0.7	=	22.71	(77)
Southwest _{0.9x}	0.77	x	1.43	×	36.79]	0.63	x	0.7] =	16.08	(79)
Southwest _{0.9x}	0.77	x	1.43	x	36.79]	0.63	x	0.7	=	16.08	(79)
Southwest0.9x	0.77	x	1.43	x	36.79]	0.63	x	0.7	=	16.08	(79)
Southwest0.9x	0.77	x	1.43	x	62.67]	0.63	x	0.7	=	27.39	(79)
Southwest0.9x	0.77	x	1.43	x	62.67]	0.63	x	0.7	=	27.39	(79)
Southwest0.9x	0.77	x	1.43	x	62.67]	0.63	x	0.7	=	27.39	(79)
Southwest0.9x	0.77	x	1.43	x	85.75]	0.63	x	0.7] =	37.48	(79)
Southwest0.9x	0.77	x	1.43	x	85.75]	0.63	x	0.7	=	37.48	(79)
Southwest0.9x	0.77	x	1.43	×	85.75]	0.63	x	0.7	=	37.48	(79)
Southwest0.9x	0.77	x	1.43	x	106.25]	0.63	x	0.7	=	46.43	(79)
Southwest0.9x	0.77	x	1.43	x	106.25]	0.63	x	0.7] =	46.43	(79)
Southwest0.9x	0.77	x	1.43	×	106.25]	0.63	x	0.7] =	46.43	(79)
Southwest0.9x	0.77	x	1.43	x	119.01]	0.63	x	0.7	=	52.01	(79)
Southwest0.9x	0.77	x	1.43	x	119.01]	0.63	x	0.7	=	52.01	(79)
Southwest0.9x	0.77	x	1.43	x	119.01]	0.63	x	0.7] =	52.01	(79)
Southwest _{0.9x}	0.77	x	1.43	×	118.15]	0.63	x	0.7	=	51.63	(79)
Southwest _{0.9x}	0.77	x	1.43	×	118.15]	0.63	x	0.7] =	51.63	(79)
Southwest <mark>0.9x</mark>	0.77	x	1.43	×	118.15]	0.63	x	0.7] =	51.63	(79)
Southwest _{0.9x}	0.77	x	1.43	×	113.91]	0.63	x	0.7] =	49.78	(79)
Southwest _{0.9x}	0.77	x	1.43	×	113.91]	0.63	x	0.7	=	49.78	(79)



Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	1	13.91		0.63	x	0.7	=	49.78	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	1	04.39		0.63	×	0.7	=	45.62	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	1	04.39		0.63	×	0.7	=	45.62	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	1	04.39		0.63	x	0.7	=	45.62	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	g	92.85]	0.63	×	0.7	=	40.58	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	g	92.85] [0.63	x	0.7	=	40.58	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	g	92.85		0.63	x	0.7	=	40.58	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	6	69.27		0.63	x	0.7	=	30.27	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	6	69.27		0.63	x	0.7	=	30.27	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	6	69.27		0.63	x	0.7	=	30.27	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	4	14.07		0.63	x	0.7	=	19.26	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	4	14.07		0.63	x	0.7	=	19.26	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	4	14.07		0.63	x	0.7	=	19.26	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	3	31.49		0.63	x	0.7	=	13.76	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	3	31.49		0.63	x	0.7	=	13.76	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.4	43	x	3	31.49		0.63	x	0.7	=	13.76	(79)
Total g (84)m=	ains – ir 421.27	nternal ar 518.54	nd solar 599.68	(84)m = 668.37	= (73)m 706.96	1 + (6 6	83)m 90.41	, watts 662.6	624.23	582.18	504.06	6 425.82	392.67]	(84)
7. Me	ean inter	nal temp	erature	(heating	seaso	n)									
7. Me Temp	ean inter perature	nal tempo during he	erature eating p	(heating eriods ir	i seaso n the liv	n) /ing	area	from Tal	ole 9, Th	n1 (°C)				21	(85)
7. Me Temp Utilisa	ean inter perature ation fac	nal tempo during he tor for ga	erature eating p ains for l	(heating eriods in iving are	i seaso n the liv ea, h1,i	n) /ing m (s	area t see Ta	from Tal able 9a)	ole 9, Th	n1 (°C)		- I		21	(85)
7. Me Temp Utilisa	ean inter perature ation fac Jan	nal tempo during he ctor for ga Feb	erature eating p ains for l Mar	(heating eriods in iving are Apr	seaso n the liv ea, h1,i May	n) /ing m (s /	area t see Ta Jun	from Tal able 9a) Jul	ole 9, Th Aug	1 (°C) Sep	Oct	Nov	Dec	21	(85)
7. Me Temp Utilisa (86)m=	ean inter perature ation fac Jan 1	nal tempo during he ctor for ga Feb 0.99	erature eating p ains for l Mar 0.97	(heating eriods ir iving are Apr 0.9	seaso n the liv ea, h1,i May 0.77	n) /ing m (s /	area f see Ta Jun 0.59	from Tal able 9a) Jul 0.43	ole 9, Th Aug 0.47	1 (°C) Sep 0.72	Oct 0.94	Nov 0.99	Dec 1	21	(85)
7. Me Temp Utilisa (86)m= Mean	ean inter perature ation fac Jan 1 interna	nal temperature during he stor for ga Feb 0.99	erature eating p ains for I Mar 0.97 ature in I	(heating eriods in iving are Apr 0.9 living are	seaso n the live a, h1,i May 0.77 ea T1 (n) /ing m (s /	area f see Ta Jun 0.59 ow ste	from Tal able 9a) Jul 0.43 eps 3 to 7	ole 9, Th Aug 0.47 7 in Tabl	1 (°C) Sep 0.72 e 9c)	Oct 0.94	Nov 0.99	Dec 1	21	(85)
7. Me Temp Utilisa (86)m= Mean (87)m=	ean inter perature ation fac Jan 1 n interna	nal tempe during he stor for ga Feb 0.99 I tempera 20.14	erature eating p ains for l Mar 0.97 ature in 20.41	(heating eriods ir iving are Apr 0.9 living are 20.71	seaso n the liv ea, h1,i May 0.77 ea T1 (20.9	n) /ing m (s / follc	area t see Ta Jun 0.59 ow ste 20.98	from Tab able 9a) Jul 0.43 ps 3 to 7 21	ole 9, Th Aug 0.47 7 in Tabl 21	1 (°C) Sep 0.72 e 9c) 20.95	Oct 0.94 20.68	Nov 0.99 20.24	Dec 1 19.89	21	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp	ean inter perature ation fac Jan 1 interna 19.93 perature	nal tempe during he stor for ga Feb 0.99 I tempera 20.14 during he	erature eating p ains for I Mar 0.97 ature in 20.41 eating p	(heating eriods ir iving are 0.9 living are 20.71 eriods ir	seaso n the liv ea, h1,i May 0.77 ea T1 (20.9 n rest c	n) /ing m (s / / follc	area f see Ta Jun 0.59 ow ste 20.98 velling	from Tal able 9a) Jul 0.43 eps 3 to 7 21 from Ta	ole 9, Th Aug 0.47 7 in Tabl 21 able 9, T	n1 (°C) Sep 0.72 e 9c) 20.95 rh2 (°C)	Oct 0.94 20.68	Nov 0.99 20.24	Dec 1 19.89	21	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	ean inter perature ation fac Jan 1 interna 19.93 perature 20.02	nal temper during he stor for ga Feb 0.99 I tempera 20.14 during he 20.02	erature eating p ains for l Mar 0.97 ature in l 20.41 eating p 20.02	(heating eriods ir iving are 0.9 living are 20.71 eriods ir 20.03	seaso n the liv ea, h1,i May 0.77 ea T1 (20.9 n rest c 20.03	n) ving m (s v follc follc follc 2	area 1 see Ta Jun 0.59 ow ste 20.98 velling 20.03	from Tal able 9a) Jul 0.43 eps 3 to 7 21 from Ta 20.03	ole 9, Th Aug 0.47 7 in Tabl 21 able 9, T 20.03	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03	Oct 0.94 20.68 20.03	Nov 0.99 20.24 20.02	Dec 1 19.89 20.02]]	(85) (86) (87) (88)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	ean inter perature ation fac Jan 1 interna 19.93 perature 20.02 ation fac	nal temper during he stor for ga Feb 0.99 I tempera 20.14 during he 20.02	erature eating p ains for l Mar 0.97 ature in l 20.41 eating p 20.02 ains for r	(heating eriods ir iving are 0.9 living are 20.71 eriods ir 20.03	seaso n the liv ea, h1,i May 0.77 ea T1 (20.9 n rest c 20.03 welling	n) ving m (s v ifollc if dw if dw v v v v v v v v v v v v v	area f see Ta Jun 0.59 ow ste 20.98 velling 20.03 ,m (se	from Tal able 9a) Jul 0.43 ps 3 to 7 21 from Ta 20.03 ee Table	ole 9, Th Aug 0.47 7 in Tabl 21 able 9, T 20.03	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03	Oct 0.94 20.68 20.03	Nov 0.99 20.24 20.02	Dec 1 19.89 20.02]]	(85) (86) (87) (88)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	an inter perature ation fac Jan 1 interna 19.93 perature 20.02 ation fac	nal temper during he stor for ga Feb 0.99 I tempera 20.14 during he 20.02 stor for ga 0.98	erature eating p ains for I Mar 0.97 ature in 20.41 eating p 20.02 ains for r 0.96	(heating eriods ir iving are 0.9 living are 20.71 eriods ir 20.03 rest of d 0.88	seaso n the liv ea, h1,i May 0.77 ea T1 (20.9 n rest c 20.03 welling 0.72	n) //ing m (s / ifollc ifollc if dw if dw if dw if dw if dw	area 1 see Ta Jun 0.59 ow ste 20.98 velling 20.03 ,m (se 0.5	from Table 9a) Jul 0.43 ps 3 to 7 21 from Ta 20.03 ee Table 0.34	ole 9, Th Aug 0.47 7 in Tabl 21 able 9, T 20.03 9a) 0.38	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03	Oct 0.94 20.68 20.03	Nov 0.99 20.24 20.02 0.99	Dec 1 19.89 20.02	21]]	(85) (86) (87) (88) (89)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	an inter perature ation fac Jan 1 interna 19.93 perature 20.02 ation fac 0.99	nal temper during he stor for ga Feb 0.99 I tempera 20.14 during he 20.02 stor for ga 0.98	erature eating p ains for I Mar 0.97 ature in I 20.41 eating p 20.02 ains for r 0.96 ature in 1	(heating eriods ir iving are 0.9 living are 20.71 eriods ir 20.03 rest of d 0.88 the rest	seaso n the liv ea, h1,i May 0.77 ea T1 (20.9 n rest c 20.03 welling 0.72 of dwe	n) <i>v</i> ing m (s <u>follc</u> <u>follc</u> <u>f</u> ollc <u>f</u>	area 1 see Ta Jun 0.59 ow ste 20.98 velling 20.03 ,m (se 0.5	from Tal able 9a) Jul 0.43 eps 3 to 7 21 from Ta 20.03 ee Table 0.34 ollow ste	Aug 0.47 7 in Table 21 able 9, T 20.03 9a) 0.38 eps 3 to	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03 0.64 7 in Tabl	Oct 0.94 20.68 20.03 0.91 e 9c)	Nov 0.99 20.24 20.02 0.99	Dec 1 19.89 20.02	21]]	(85) (86) (87) (88) (89)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an inter perature ation fac Jan 1 interna 19.93 perature 20.02 ation fac 0.99 interna 19.05	nal temper during he stor for ga Feb 0.99 I tempera 20.14 during he 20.02 stor for ga 0.98 I tempera 19.26	erature eating p ains for I Mar 0.97 ature in 20.41 eating p 20.02 ains for r 0.96 ature in 1 19.52	(heating eriods ir iving are 0.9 living are 20.71 eriods ir 20.03 rest of d 0.88 the rest 19.8	seaso n the live ea, h1,1 May 0.77 ea T1 (20.9 n rest of 20.03 welling 0.72 of dwe 19.97	n) ving m (s v follo if f dw if f dw if f dw if f dw if if if if if if if if if if	area 1 see Ta Jun 0.59 ow ste 20.98 velling 20.03 ,m (se 0.5 1 T2 (fi 20.03	from Tal able 9a) Jul 0.43 eps 3 to 7 21 from Ta 20.03 ee Table 0.34 ollow ste 20.03	Aug 0.47 7 in Table 21 able 9, T 20.03 9a) 0.38 eps 3 to 20.03	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03 0.64 7 in Tabl 20.01	Oct 0.94 20.68 20.03 0.91 e 9c) 19.78	Nov 0.99 20.24 20.02 0.99 19.36	Dec 1 19.89 20.02 1 19.01	21]]]	(85) (86) (87) (88) (89) (90)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an inter perature ation fac Jan 1 interna 19.93 perature 20.02 ation fac 0.99 interna 19.05	nal temper during he stor for ga 0.99 I tempera 20.14 during he 20.02 stor for ga 0.98 I tempera 19.26	erature eating p ains for I Mar 0.97 ature in 20.41 eating p 20.02 ains for r 0.96 ature in 1 19.52	(heating eriods in iving are 0.9 living are 20.71 eriods in 20.03 rest of d 0.88 the rest 19.8	seaso n the liv ea, h1,i May 0.77 ea T1 (20.9 n rest o 20.03 welling 0.72 of dwe 19.97	n) ving m (s v follc if dw if dw if dw if dw if a i	area 1 see Ta Jun 0.59 0w ste 20.98 velling 20.03 ,m (se 0.5 1 T2 (fd 20.03	from Table 9a) Jul 0.43 ps 3 to 7 21 from Ta 20.03 ee Table 0.34 ollow ste 20.03	Aug 0.47 7 in Table 21 able 9, T 20.03 9a) 0.38 eps 3 to 20.03	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03 0.64 7 in Tabl 20.01	Oct 0.94 20.68 20.03 0.91 e 9c) 19.78 LA = Liv	Nov 0.99 20.24 20.02 0.99 19.36 ring area ÷ (4)	Dec 1 19.89 20.02 1 19.01 4) =	21]]] 0.45	(85) (86) (87) (88) (89) (90) (91)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an inter perature ation fac Jan 1 interna 19.93 perature 20.02 ation fac 0.99 interna	nal tempor during he stor for ga Feb 0.99 I tempera 20.14 during he 20.02 stor for ga 0.98 I tempera 19.26	erature eating p ains for I Mar 0.97 ature in I 20.41 eating p 20.02 ains for r 0.96 ature in 1 19.52	(heating eriods in iving are 0.9 living are 20.71 eriods in 20.03 rest of d 0.88 the rest 19.8	seaso n the live ea, h1,i May 0.77 ea T1 (20.9 n rest c 20.03 welling 0.72 of dwe 19.97 wole dw	n) ving m (s v follc follc i follc i i i i elling ellin	area f see Ta Jun 0.59 ow ste 20.98 velling 20.03 ,m (se 0.5 1 T2 (fr 20.03	from Tal able 9a) Jul 0.43 ps 3 to 7 21 from Ta 20.03 ee Table 0.34 ollow ste 20.03	Aug 0.47 7 in Table 21 able 9, T 20.03 9a) 0.38 eps 3 to 20.03 + (1 - fl)	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03 0.64 7 in Tabl 20.01	Oct 0.94 20.68 20.03 0.91 e 9c) 19.78 LA = Liv	Nov 0.99 20.24 20.02 0.99 19.36 ring area ÷ (4	Dec 1 19.89 20.02 1 19.01 4) =	21]]] 0.45	(85) (86) (87) (88) (89) (90) (91)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m=	an interna berature ation fac Jan 1 interna 19.93 berature 20.02 ation fac 0.99 interna 19.05	nal tempo during he etor for ga Feb 0.99 I tempera 20.14 during he 20.02 etor for ga 0.98 I tempera 19.26	erature eating p ains for I Mar 0.97 ature in 1 20.41 eating p 20.02 ains for r 0.96 ature in 1 19.52 ature (fo 19.92	(heating eriods ir iving are 0.9 living are 20.71 eriods ir 20.03 rest of d 0.88 the rest 19.8 r the wh 20.21	seaso n the live ea, h1,i May 0.77 ea T1 (20.9 n rest c 20.03 welling 0.72 of dwe 19.97 nole dw 20.38	n) <i>i</i> ing m (s <u>/</u> <u>f</u> ollc <u>f</u> ollc <u>f</u> ollc <u>i</u> <u>f</u> ollc <u>i</u> <u>i</u> <u>i</u> <u>i</u> <u>i</u> <u>i</u> <u>i</u> <u>i</u>	area f see Ta Jun 0.59 ow ste 20.98 velling 20.03 ,m (se 0.5 1 T2 (fr 20.03	from Tal able 9a) Jul 0.43 ps 3 to 7 21 from Ta 20.03 ee Table 0.34 ollow ste 20.03	ole 9, Th Aug 0.47 7 in Tabl 21 able 9, T 20.03 9a) 0.38 eps 3 to 20.03 + (1 - fl 20.46	11 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03 0.64 7 in Tabl 20.01 (C) 20.03 0.64 7 in Tabl 20.01 (C) 10 10 10 10 10 10 10 10 10 10	Oct 0.94 20.68 20.03 0.91 e 9c) 19.78 LA = Liv 20.18	Nov 0.99 20.24 20.02 0.99 19.36 ring area ÷ (4 19.75	Dec 1 19.89 20.02 1 19.01 4) =	21]]] 0.45	(85) (86) (87) (88) (89) (90) (91) (92)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply	an internation factor Jan 1 1 19.93 Derature 20.02 ation factor 0.99 19.05 19.05	nal tempor during he stor for ga 0.99 I tempera 20.14 during he 20.02 stor for ga 0.98 I tempera 19.26 I tempera 19.65 nent to th	erature eating p ains for I Mar 0.97 ature in 20.41 eating p 20.02 ains for r 0.96 ature in 1 19.52 ature (fo 19.92 ae mean	(heating eriods in iving are 0.9 living are 20.71 eriods in 20.03 rest of d 0.88 the rest 19.8 r the wh 20.21 interna	seaso n the live ea, h1,i May 0.77 ea T1 (20.9 n rest c 20.03 welling 0.72 of dwe 19.97 nole dw 20.38 I tempe	n) ving m (s v follc if dw if dw if dw if dw if dw if a elling elling eratu	area 1 see Ta Jun 0.59 0w ste 20.98 velling 20.03 ,m (se 0.5 1 T2 (fo 20.03 i T2 (fo 20.03	from Table 9a) Jul 0.43 ps 3 to 7 21 from Ta 20.03 ee Table 0.34 ollow ste 20.03	Aug 0.47 7 in Tabl 21 able 9, T 20.03 9a) 0.38 eps 3 to 20.03 + (1 - fl 20.46 e 4e, who	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03 0.64 7 in Tabl 20.01 f -A) × T2 20.43 ere appro	Oct 0.94 20.68 20.03 0.91 e 9c) 19.78 LA = Liv 20.18 opriate	Nov 0.99 20.24 20.02 0.99 19.36 ring area ÷ (4 19.75	Dec 1 19.89 20.02 1 19.01 4) = 19.4	21]]] 0.45	(85) (86) (87) (88) (89) (90) (91) (92)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Apply (93)m=	an inter perature ation fac Jan 1 interna 19.93 perature 20.02 ation fac 0.99 interna 19.05 interna 19.44 y adjustn 19.44	nal tempor during he stor for ga Feb 0.99 I tempera 20.14 during he 20.02 stor for ga 0.98 I tempera 19.26 I tempera 19.65 nent to th 19.65	erature eating p ains for I Mar 0.97 ature in 1 20.41 eating p 20.02 ains for r 0.96 ature in 1 19.52 ature (fo 19.92 ne mean 19.92	(heating eriods in iving are 0.9 living are 20.71 eriods in 20.03 rest of d 0.88 the rest 19.8 r the wh 20.21 interna 20.21	seaso n the live ea, h1,i May 0.77 ea T1 (20.9 n rest c 20.03 welling 0.72 of dwe 19.97 nole dw 20.38 tempe 20.38	n) <i>v</i> ing m (s <u>/</u> <u>f</u> ollc <u>f</u> ollc <u>i</u> <u>f</u> ollc <u>i</u> <u>i</u> <u>i</u> <u>i</u> <u>i</u> <u>i</u> <u>i</u> <u>i</u>	area 1 ee Ta Jun 0.59 ow ste 20.98 velling 20.03 ,m (se 0.5 1 T2 (fe 20.03 ing) = fl 20.45 ure fro 20.45	from Tal able 9a) Jul 0.43 ps 3 to 7 21 from Ta 20.03 ee Table 0.34 ollow ste 20.03 LA × T1 20.46 m Table 20.46	Aug 0.47 7 in Table 21 able 9, T 20.03 9a) 0.38 eps 3 to 20.03 + (1 - fl 20.46 20.46	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03 0.64 7 in Tabl 20.01 1 A) × T2 20.43 ere appro 20.43	Oct 0.94 20.68 20.03 0.91 e 9c) 19.78 LA = Liv 20.18 opriate 20.18	Nov 0.99 20.24 20.02 0.99 19.36 ring area ÷ (4 19.75	Dec 1 19.89 20.02 1 19.01 4) = 19.4	21]]]]]]]]]]]]]	(85) (86) (87) (88) (89) (90) (91) (92) (93)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Apply (93)m= 8. Sp	an inter perature ation fac Jan 1 interna 19.93 perature 20.02 ation fac 0.99 interna 19.05 interna 19.44 y adjustn 19.44 ace hea	nal tempor during he stor for ga Feb 0.99 I tempera 20.14 during he 20.02 stor for ga 0.98 I tempera 19.26 I tempera 19.65 nent to th 19.65 ting requ	erature eating p ains for I Mar 0.97 ature in 1 20.41 eating p 20.02 ains for r 0.96 ature in 1 19.52 ature (fo 19.92 ature mean 19.92 irement	(heating eriods in iving are 0.9 living are 20.71 eriods in 20.03 rest of d 0.88 the rest 19.8 r the wh 20.21 interna 20.21	seaso n the live ea, h1,i May 0.77 ea T1 (20.9 n rest c 20.03 welling 0.72 of dwe 19.97 nole dw 20.38 I tempe 20.38	n) ving m (s v follc if ollc if dw if dw if dw if dw if dw if dw if dw if ollc	area 1 see Ta Jun 0.59 0w ste 20.98 velling 20.03 ,m (se 0.5 1 T2 (fr 20.03 ure fro 20.45	from Tal able 9a) Jul 0.43 ps 3 to 7 21 from Ta 20.03 ee Table 0.34 ollow ste 20.03 LA × T1 20.46 pm Table 20.46	Aug 0.47 7 in Table 21 able 9, T 20.03 9a) 0.38 eps 3 to 20.03 + (1 - fl 20.46 20.46	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03 0.64 7 in Tabl 20.01 (C) 20.03 0.64 7 in Tabl 20.01 (C) 20.03 (C) 20.03 (C) 20.03 (C) 20.03 (C) 20.03 (C) 20.03 (C) 20.03 (C) 20.03 (C) 20.04 (C) (C) (C) (C) (C) (C) (C) (C)	Oct 0.94 20.68 20.03 0.91 e 9c) 19.78 LA = Liv 20.18 ppriate 20.18	Nov 0.99 20.24 20.02 0.99 19.36 ring area ÷ (4 19.75	Dec 1 19.89 20.02 1 19.01 4) = 19.4	21]]] 0.45	(85) (86) (87) (88) (89) (90) (91) (92) (93)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Sp	an inter perature ation fac Jan 1 interna 19.93 perature 20.02 ation fac 0.99 interna 19.05 interna 19.44 r adjustn 19.44 ace hea i to the r	nal temper during he stor for ga Feb 0.99 I tempera 20.14 during he 20.02 stor for ga 0.98 I tempera 19.26 I tempera 19.65 nent to th 19.65 ting requ mean inte	erature eating p ains for I Mar 0.97 ature in 20.41 eating p 20.02 ains for r 0.96 ature in 1 20.02 ains for r 0.96 ature (fo 19.52 ature (fo 19.92 irement ernal ter	(heating eriods in iving are Apr 0.9 living are 20.71 eriods in 20.03 rest of d 0.88 the rest 19.8 r the wh 20.21 interna 20.21	seaso n the live ea, h1,i May 0.77 ea T1 (20.9 n rest C 20.03 welling 0.72 of dwe 19.97 nole dw 20.38 I tempe 20.38 re obta	n) ving m (s v follc if dw if dw v ing elling elling v v inec	area 1 ee Ta Jun 0.59 ow ste 20.98 velling 20.03 ,m (se 0.5 1 T2 (fa 20.03 i T2 (fa 20.03 i T2 (fa 20.45 ure fro 20.45 d at sta	from Table 9a) Jul 0.43 ps 3 to 7 21 from Ta 20.03 ee Table 0.34 ollow ste 20.03 LA × T1 20.46 m Table 20.46 ep 11 of	Aug 0.47 7 in Table 21 able 9, T 20.03 9a) 0.38 eps 3 to 20.03 + (1 - fl 20.46 20.46 Table 9	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03 0.64 7 in Tabl 20.01 f -A) × T2 20.43 ere appro 20.43 b, so tha	Oct 0.94 20.68 20.03 0.91 e 9c) 19.78 LA = Liv 20.18 ppriate 20.18 t Ti,m=	Nov 0.99 20.24 20.02 0.99 19.36 ing area ÷ (4 19.75 19.75 (76)m an	Dec 1 19.89 20.02 1 19.01 4) = 19.4 19.4 d re-cale	21	(85) (86) (87) (88) (89) (90) (91) (92) (93)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Sp Set T the ut	an inter perature ation fac Jan 1 interna 19.93 perature 20.02 ation fac 0.99 interna 19.05 interna 19.44 r adjustn 19.44 ace hea i to the r tilisation	nal tempor during he stor for ga 0.99 I tempera 20.14 during he 20.02 stor for ga 0.98 I tempera 19.26 I tempera 19.65 nent to th 19.65 ting requi mean inter factor fo	erature eating p ains for I Mar 0.97 ature in I 20.41 eating p 20.02 ains for r 0.96 ature in 1 20.02 ains for r 0.96 ature in 1 19.52 ature (fo 19.92 irement r gains (Mor	(heating eriods in iving are Apr 0.9 living are 20.71 eriods in 20.03 rest of d 0.88 the rest 19.8 r the wh 20.21 interna 20.21 nperatul using Ta	seaso n the live ea, h1,i May 0.77 ea T1 (20.9 n rest c 20.03 welling 0.72 of dwe 19.97 nole dw 20.38 tempe 20.38 tempe 20.38 ne obta able 9a	n) ving m (s v follc follc i follc i follc i c i c i c i i c c c c c c c c c c c c c	area f ee Ta Jun 0.59 pw ste 20.98 velling 20.03 ,m (se) 0.5 1 T2 (fe) 20.03 ng) = ff 20.45 ure fro 20.45 ure fro 20.45 ure fro 20.45	from Tal able 9a) Jul 0.43 ps 3 to 7 21 from Ta 20.03 ee Table 0.34 ollow ste 20.03 LA × T1 20.46 m Table 20.46 ep 11 of	Aug 0.47 7 in Table 21 able 9, T 20.03 9a) 0.38 eps 3 to 20.03 + (1 - fl 20.46 4e, who 20.46	1 (°C) Sep 0.72 e 9c) 20.95 h2 (°C) 20.03 0.64 7 in Tabl 20.01 f A) × T2 20.43 ere appro 20.43 b, so tha	Oct 0.94 20.68 20.03 0.91 e 9c) 19.78 LA = Liv 20.18 opriate 20.18 t Ti,m=	Nov 0.99 20.24 20.02 0.99 19.36 ring area ÷ (4 19.75 19.75 19.75	Dec 1 19.89 20.02 1 19.01 4) = 19.4 19.4 d re-calc	21	(85) (86) (87) (88) (89) (90) (91) (92) (93)



Utilisa	ation fac	tor for g	ains, hm	n:										
(94)m=	0.99	0.98	0.96	0.88	0.74	0.54	0.38	0.42	0.67	0.92	0.99	1		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	418.76	509.81	572.92	589.56	522.02	373.33	250.27	262.26	391.06	462.93	419.8	391.01		(95)
Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	r		I	
(97)m=	1004.15	976.48	886.83	741.24	568.55	380.48	251.13	263.76	412.47	627.3	830.67	1001.38		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mont	th = 0.02	24 x [(97])m – (95)m] x (4	1)m		1	
(98)m=	435.53	313.61	233.55	109.21	34.62	0	0	0	0	122.29	295.82	454.12		_
								Tota	l per year	(kWh/year	[.]) = Sum(9	8)15,912 =	1998.74	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								32.62	(99)
8c. Sr	bace co	oling rec	uiremer	nt										
Calcu	lated fo	r June, J	July and	August.	See Tal	ble 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	e Lm (ca	lculated	using 2	5°C inter	nal temp	berature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	611.12	481.1	493.46	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	oss hm		-		-		-	-	-			
(101)m=	0	0	0	0	0	0.95	0.98	0.97	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = ((100)m x	(101)m									
(102)m=	0	0	0	0	0	582.12	470.88	479	0	0	0	0		(102)
Gains	(solar (gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)	i	i		1	
(103)m=	0	0	0	0	0	882.25	848.25	804.58	0	0	0	0	I	(103)
Space	e coolin	g require	ement fo	r month,	whole c	dwelling,	continue	ous (kW	(h) = 0.0	24 x [(10	03)m – (102)m]x	« (41)m	
set (1	04)m to		104)m <	3 × (98)m	216.1	200 77	242.24	0	0	0	0		
(104)11=	0	0	0	0	0	210.1	200.77	242.24			104)		700.4	
Cooled	l fraction	n							f C =	cooled :	nu ∩) area ∸ (4	= 4) =	1	(104)
Intermi	ttency f	actor (Ta	able 10b)						coolea	4.04 . (.,		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
I									Tota	l = Sum((104)	=	0	(106)
Space	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n	_		-			
(107)m=	0	0	0	0	0	54.02	70.19	60.56	0	0	0	0		
									Tota	= Sum(107)	=	184.78	(107)
Space	cooling	requirer	ment in k	(Wh/m²/y	/ear				(107)) ÷ (4) =			3.02	(108)
8f. <u>Fab</u>	ric En <u>e</u> i	rgy <u>Effici</u>	ienc <u>y (ca</u>	alcul <u>ated</u>	l onl <u>y un</u>	der <u>spec</u>	cial <u>cond</u>	lition <u>s, s</u>	ee s <u>ectio</u>	on 1 <u>1)</u>				
Fabrio	Energy	y Efficier	псу						(99)	+ (108) =	=		35.63	(109)
Targe	et Fabri	c Enera	v Efficie	ency (TF	EE)				. /	· /			40.98	- (109)
·unge			,		,								40.00	(,



			User D	etails:						
Assessor Name:	Panagiotis	Dalapas		Stroma	a Num	ber:		STRO	030082	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.41	
		P	roperty a	Address:	Be Lea	n-Top Fl	loor Flat			
Address :	238 KILBUF	RN HIGH ROAD	, LONDO	ON, NW6	3 2BS					
1. Overall dwelling dimer	isions:									
Ground floor				a(m²) 02.92	(1a) x	Av. He i	i ght(m) .45	(2a) =	Volume(m ³) 252.15	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+((1d)+(1e)+(1ı	ר) 10	02.92	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	252.15	(5)
2. Ventilation rate:	-								<u> </u>	
Number of chimneys	heating	heating	ry] + [0 Other] = [total	x 4	40 =	m ^s per nour	(6a)
Number of open flues	0	+ 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fan	s				- <u> </u>	4	x ′	10 =	40	(7a)
Number of passive vents					Γ	0	x ^	10 =	0	(7b)
Number of flueless gas fire	es				Г	0	x 4	40 =	0	(7c)
_					L					
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fa	ans = (6a)+(6b)+(7	7a)+(7b)+(7c) =	Γ	40	·	÷ (5) =	0.16	(8)
If a pressurisation test has be	en carried out or	r is intended, procee	d to (17), o	otherwise o	continue fro	om (9) to ((16)			-
Number of storeys in the	e dwelling (ne	5)					[(0)	11-0 1 -	0	(9)
Structural infiltration: 0.2	25 for steel or	timber frame o	· 0 35 foi	r masonr	v constr	uction	[(9)-	-1jx0.1 =	0	(10)
if both types of wall are pre deducting areas of opening	sent, use the va s); if equal user	lue corresponding to 0.35	the great	er wall area	a (after				0	
If suspended wooden flo	oor, enter 0.2	(unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else e	enter 0							0	(13)
Percentage of windows	and doors dr	aught stripped		0.05 [0.0	× (1 4) + 1	001			0	(14)
VVINDOW INTIITRATION				$(8) \pm (10)$	X (14) ÷ 1 + (11) + (1	(00] =	L (15) -		0	
	50 evoresse	d in cubic metre	s nor ha			2) + (13) +	nvelone	area	0	(16)
If based on air permeabilit	v value, then	$(18) = [(17) \div 20] + (18)$	8), otherwi	ise (18) = (16)		intelope	alea	5 0.41	(17)
Air permeability value applies	if a pressurisatio	on test has been doi	ne or a deg	gree air pei	meability	is being us	sed		0.41	
Number of sides sheltered	I								2	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter fac	tor		(21) = (18)	x (20) =				0.35	(21)
Infiltration rate modified fo	r monthly win	nd speed							I	
Jan Feb I	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Tabl	e 7	i	1 1					I	
(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	I	1							
(22a)m= 1.27 1.25 1	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		



Adjusted infilt	ration rat	e (allowi	ng for sł	nelter ar	d wind s	peed) =	(21a) x	(22a)m				_	
0.44	0.43	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41		
If mechanic	al ventila	cnange i ation:	rate for t	ne appil	capie ca	se						0	(23a)
lf exhaust air h	neat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	√5)) , othei	wise (23b) = (23a)			0	(23b)
If balanced wit	h heat reco	overy: effic	iency in %	allowing	or in-use fa	actor (from	Table 4h) =				0	(23c)
a) If balance	ed mech	anical ve	entilation	with he	at recove	ery (MVF	HR) (24a	ı)m = (22	2b)m + (2	23b) × ['	1 – (23c)	÷ 100]	、 、
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance	ed mech	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 h	nouse ex	tract ver	tilation o	or positiv	/e input \	ventilatio	on from c (22t)	utside	5 v (23h)			
(24c)m = 0				$\frac{5}{0} = (20)$		0	0) = (220)	0		/ 0	0	ו	(24c)
d) If natural	ventilati	on or wh	ole hous	e positiv	ve input v	ventilatio	on from l	oft				J	× ,
if (22b)	m = 1, th	en (24d)	m = (221	o)m othe	erwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]				
(24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58]	(24d)
Effective air	r change	rate - er	nter (24a) or (24	o) or (24	c) or (24	d) in box	(25)			-	_	
(25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58]	(25)
3. Heat losse	es and he	eat loss p	paramet	er:									
ELEMENT	Gros	SS	Openin	gs	Net Ar	ea	U-valu	Je	ΑXU		k-value	e	AXk
	area	(m²)	m	²	A ,n	n²	W/m2	K	(W/ŀ	()	kJ/m²·l	K	kJ/K
Doors	area	(m²)	rr	1 ²	A ,n 2.15	n² X	W/m2 1	K =	(W/k 2.15	<)	kJ/m²₊I	K	kJ/K (26)
Doors Windows Type	area e 1	(m²)	ſſ	J ²	A ,r 2.15	n² x x1/	W/m2 1 /[1/(1.4)+	K = [0.04] = [(W/k 2.15 2.32	<) 	kJ/m²∙l	K	KJ/K (26) (27)
Doors Windows Type Windows Type	area e 1 e 2	(m²)	rr	J ²	A ,r 2.15 1.75	n ² x x x1/	W/m2 1 /[1/(1.4)+ /[1/(1.4)+	K = [0.04] = [0.04] = [(W/k 2.15 2.32 2.32		kJ/m²•l	K	kJ/K (26) (27) (27)
Doors Windows Type Windows Type Windows Type	area e 1 e 2 e 3	(m²)	m	12	A ,r 2.15 1.75 1.75 1.75	n ² x x x x 1/ x x 1/ x x 1/ x x 1/ x 1/	W/m2 1 [1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K 0.04] = [0.04] = [0.04] = [(W/k 2.15 2.32 2.32 2.32		kJ/m²-I	ĸ	KJ/K (26) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type	area e 1 e 2 e 3 e 4	(m²)	rr	12	A ,r 2.15 1.75 1.75 1.75 1.75	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+	K 0.04] = [0.04] = [0.04] = [0.04] = [(W/k 2.15 2.32 2.32 2.32 2.32 2.32		kJ/m²-I	ĸ	KJ/K (26) (27) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type	area e 1 e 2 e 3 e 4 e 5	(m²)	rr	12	A ,r 2.15 1.75 1.75 1.75 1.75 1.75	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+	K 0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [(W/k 2.15 2.32 2.32 2.32 2.32 2.32 2.32		kJ/m²-I	ĸ	KJ/K (26) (27) (27) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type	area e 1 e 2 e 3 e 4 e 5 e 6	(m²)	rr	12	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+	K 0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [(W/F 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32		kJ/m²-I	ĸ	KJ/K (26) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	area e 1 e 2 e 3 e 4 e 5 e 6 e 7	(m²)	ſſ	β ²	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 1.75	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+	K 0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\diamond	kJ/m²-I	K	KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8	(m²)	ſſ	2	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 1.75 2.88	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.4)+ (1/(1.4)+	K 0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	\diamond	kJ/m²-I	K	 kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	(m²)	ſſ	β ²	A , n 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88	n ² x x x x x x x x x x x x x x x x x x x	W/m2 1 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+	K 0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	$\langle $	kJ/m²-I	K	 kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10	(m²)	ſſ	β ²	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$	K 0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3		kJ/m²-I	K	 kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11	(m²)	ſſ	2	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 1.65	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$	K 0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	<>	kJ/m²-I	Κ	 kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Type Windows Type	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12	(m²)	ſſ	ρ2	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 1.65 1.06	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$	K 0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	<>	kJ/m²-I	K	 kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u>	.(m ²)	m	3	A ,r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 1.65 1.06	n ² x x x x x x x x x x x x x x x x x x x	W/m2 1 $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$ $(1/(1.4)+)$	K 0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3		kJ/m²-I	к Т	 kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29)
Doors Windows Type Windows Type	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> 22.8	.(m²) .4 33	m 23.6	5	A , r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 1.65 1.06 104.8 22.83	n ² x x x x x x x x x x x x x x x x x x x	W/m2 1 $(1/(1.4)+)$	K 0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3		kJ/m²-I		 kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29) (29)
Doors Windows Type Windows pe2	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>22.8</u> <u>19.2</u>	.4 33 21	m 23.6 0 2.15	3 3 3 3	A , r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 2.88 1.65 1.06 1.04.8 22.83 17.06	n ² x x x x x x x x x x x x x x x x x x x	W/m2 1 $(1/(1.4)+)$ $(1/(1$	K 0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3	<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	kJ/m²-I		 kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)
Doors Windows Type Windows pe2 Walls Type3 Roof	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>22.8</u> <u>19.2</u>	.4 33 21 92	m 23.6 0 2.15 0	5 5 5	A , r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 2.88 1.65 1.06 104.8 22.83 17.06 102.92	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 $(1/(1.4)+)$ $(1/(1$	K 0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3		kJ/m²-I		 kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29) (30)
Doors Windows Type Windows pe1 Walls Type3 Roof Total area of e	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>22.8</u> <u>19.2</u> elements	.4 33 21 92 5, m ²	m 23.6 0 2.15 0	5 5	A , r 2.15 1.75 1.75 1.75 1.75 1.75 1.75 2.88 2.88 2.88 2.88 1.65 1.06 104.8 22.83 17.06 102.92 273.3	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ (1.4)+	K 0.04] = [0.04] = [(W/H 2.15 2.32 2.32 2.32 2.32 2.32 2.32 2.32 2.3		kJ/m²-I		 kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (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) =

72.86 (33)



Heat c	apacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	17158.83	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For desi can be u	gn assess ised inste	sments wh ad of a dei	ere the de tailed calc	tails of the ulation.	construct	ion are noi	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<					[38.03	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								_
Total f	abric he	at loss							(33) +	(36) =			110.89	(37)
Ventila	ition 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=	49.77	49.45	49.14	47.68	47.41	46.14	46.14	45.9	46.62	47.41	47.96	48.54		(38)
Heat ti	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	160.66	160.34	160.03	158.57	158.3	157.03	157.03	156.79	157.52	158.3	158.85	159.43		_
Heat lo	oss para	meter (H	HLP), W	′m²K					ر (40)m	Average = = (39)m ÷	Sum(39) _{1.} (4)	12 /12=	158.57	(39)
(40)m=	1.56	1.56	1.55	1.54	1.54	1.53	1.53	1.52	1.53	1.54	1.54	1.55		_
Numbe	er of day	vs in mor	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12 /12=	1.54	(40)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
Assum if TF if TF	ied occu A > 13.9 A £ 13.9	ipancy, I 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0)013 x (⁻	ΓFA -13.	<u>2</u> . 9)	76		(42)
Annua Reduce not more	l averag the annua e that 125	e hot wa al average litres per p	ater usa hot water person pe	ge in litre usage by ^r day (all w	es per da 5% if the d vater use, l	ay Vd,av Iwelling is hot and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target o	99 f	.87		(43)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	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=	109.85	105.86	101.87	97.87	93.88	89.88	89.88	93.88	97.87	101.87	105.86	109.85		
Energy	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	m x nm x D)Tm / 3600	kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	1198.41	(44)
(45)m=	162.91	142.48	147.03	128.18	123	106.14	98.35	112.86	114.21	133.1	145.29	157.77		
lf instan	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)) to (61)	Fotal = Su	m(45) ₁₁₂ =		1571.31	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water Storag	storage e volum	loss: e (litres)	includir	ng any so	blar or W	/WHRS	storage	within sa	me ves	sel		0		(47)
lf com Otherv Water	munity h vise if no storage	eating a stored loss:	nd no ta hot wate	ınk in dw er (this ir	velling, e ncludes i	nter 110 nstantar) litres in neous co	(47) mbi boile	ers) ente	er '0' in (47)			
a) If m	anufact	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)
Energy b) If m	/ lost fro anufact	m water urer's de	storage	, kWh/ye cylinder l	ear loss fact	or is not	known:	(48) x (49)	=			0		(50)



Hot wa	ater stor	age loss	factor fr	om Tabl	e 2 (kWl	h/litre/da	y)					0		(51)
If com	munity h	leating s	ee secti	on 4.3										
Volum	e factor	from Tal	ble 2a m Tabla	Oh								0		(52)
rempe	erature i	actor fro	m rable	20								0		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter	(50) or ((54) in (5	5) 					((50)				0		(55)
vvater	storage	loss cal	culated 1	for each	month	i		((56)m = (55) × (41)I	m i				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)r	n = (56)m	x [(50) – (H11)] ÷ (50	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	y circuit	loss (an	nual) fro	om Table	93							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = (58) ÷ 36	65 × (41)	m					
(moo	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month (61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	l for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	138.47	121.11	124.98	108.96	104.55	90.22	83.6	95.93	97.08	113.13	123.49	134.11		(62)
Solar DH	HW input o	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	v) (enter '0	if no sola	r contribut	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	VWHRS	applies,	, see Ap	pendix C	3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	138.47	121.11	124.98	108.96	104.55	90.22	83.6	95.93	97.08	113.13	123.49	134.11		_
								Outp	out from wa	ater heate	r (annual)	12	1335.61	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	ı] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	34.62	30.28	31.24	27.24	26.14	22.55	20.9	23.98	24.27	28.28	30.87	33.53		(65)
inclu	ıde (57)	m in calo	culation	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gain	s (Table	5), Wat	ts		-				-				
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	138.25	138.25	138.25	138.25	138.25	138.25	138.25	138.25	138.25	138.25	138.25	138.25		(66)
Lightin	g gains	(calcula	ted in Ap	pendix l	L, equati	ion L9 oi	⁻ L9a), a	lso see	Table 5					
(67)m=	23.27	20.66	16.8	12.72	9.51	8.03	8.68	11.28	15.14	19.22	22.43	23.91		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L ⁻	13 or L1	3a), alsc	see Ta	ble 5				
(68)m=	260.96	263.67	256.85	242.32	223.98	206.75	195.23	192.52	199.35	213.88	232.21	249.45		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	36.82	36.82	36.82	36.82	36.82	36.82	36.82	36.82	36.82	36.82	36.82	36.82		(69)
Pumps	s and fai	ns gains	(Table §	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-110.6	-110.6	-110.6	-110.6	-110.6	-110.6	-110.6	-110.6	-110.6	-110.6	-110.6	-110.6		(71)
Water	heating	gains (T	able 5)											
(72)m=	46.53	45.06	41.99	37.83	35.13	31.32	28.09	32.23	33.71	38.01	42.88	45.06		(72)



Total internal	gains =						(66)n	n + (67)m	ı + (68	8)m + (6	69)m + (7	70)m -	+ (7 [.]	1)m + (72)r	n			
(73)m= 395.23	393.87	380.12		357.35	333.1	3	10.57	296.47	300.	.51 3	312.66	335.	58	362	382	.9		(73)
6. Solar gain	s:																	
Solar gains are	calculated	using so	ar	flux from T	able 6a	and	associa	ited equa	tions t	to conv	vert to the	e appli	cab	ole orientatio	on.			
Orientation:	Access F Table 6d	actor		Area m²			Flux Tab	le 6a		g Tab)_ ole 6b		Та	FF able 6c			Gains (W)	
Northeast 0.9x	0.77	:	x	1.65		x	11	.28	x	(0.63	×	Γ	0.7		=	5.69	(75)
Northeast 0.9x	0.77		×	1.06		x	11	.28	x	(0.63	- X	Γ	0.7		=	3.66	(75)
Northeast 0.9x	0.77	:	×	1.65		x	22	2.97	x	(0.63	×	Γ	0.7		=	11.58	(75)
Northeast 0.9x	0.77	:	x	1.06		x	22	2.97	x	(0.63	x		0.7		=	7.44	(75)
Northeast 0.9x	0.77	:	×	1.65		x	41	.38	x	(0.63	x		0.7		=	20.87	(75)
Northeast 0.9x	0.77	:	x	1.06		x	41	.38	x	(0.63	×		0.7		=	13.4	(75)
Northeast 0.9x	0.77	:	×	1.65		x	67	'.96	x	(0.63	x		0.7		=	34.27	(75)
Northeast 0.9x	0.77	:	×	1.06		x	67	'.96	x	(0.63	x		0.7		=	22.01	(75)
Northeast 0.9x	0.77	:	×	1.65		x	91	.35	x	(0.63	x		0.7		=	46.06	(75)
Northeast 0.9x	0.77	:	×	1.06		x	91	.35	x	(0.63	×		0.7		=	29.59	(75)
Northeast 0.9x	0.77	:	×	1.65		x	97	'.38	x	(0.63	x		0.7		=	49.11	(75)
Northeast 0.9x	0.77	:	×	1.06		x	97	'.38	x	(0.63	x		0.7		=	31.55	(75)
Northeast 0.9x	0.77	:	×	1.65		x	9	1.1	x	(0.63	x		0.7		=	45.94	(75)
Northeast 0.9x	0.77	:	x	1.06		x	9	1.1	x	(0.63	x		0.7		=	29.51	(75)
Northeast 0.9x	0.77	:	x	1.65		x	72	2.63	x	(0.63	x		0.7		=	36.62	(75)
Northeast 0.9x	0.77	:	x	1.06		x	72	2.63	x	(0.63	x		0.7		=	23.53	(75)
Northeast 0.9x	0.77		x	1.65		x	50).42	x	(0.63	x		0.7		=	25.43	(75)
Northeast 0.9x	0.77	:	x	1.06		x	50).42	x	(0.63	x		0.7		=	16.33	(75)
Northeast 0.9x	0.77	:	x	1.65		x	28	3.07	x	(0.63	x		0.7		=	14.15	(75)
Northeast 0.9x	0.77	:	×	1.06		x	28	3.07	x	(0.63	x		0.7		=	9.09	(75)
Northeast 0.9x	0.77	:	x	1.65		x	1.	4.2	x	(0.63	x		0.7		=	7.16	(75)
Northeast 0.9x	0.77	:	x	1.06		x	1.	4.2	x	(0.63	x		0.7		=	4.6	(75)
Northeast 0.9x	0.77	:	x	1.65		x	9	.21	x	(0.63	x		0.7		=	4.65	(75)
Northeast 0.9x	0.77	:	x	1.06		x	9.	.21	x	(0.63	x		0.7		=	2.98	(75)
Southeast 0.9x	0.77	:	x	1.75		x	36	j.79	x	(0.63	x		0.7		=	19.68	(77)
Southeast 0.9x	0.77		x	1.75		x	36	j.79	x	(0.63	x		0.7		=	19.68	(77)
Southeast 0.9x	0.77	:	x	1.75		x	36	i.79	x	(0.63	x		0.7		=	19.68	(77)
Southeast 0.9x	0.77	:	x	1.75		x	36	j.79	x	(0.63	x		0.7		=	19.68	(77)
Southeast 0.9x	0.77		x	2.88		x	36	i.79	x	(0.63	x		0.7		=	32.38	(77)
Southeast 0.9x	0.77		×	2.88		x	36	i.79	x	(0.63	×		0.7		=	32.38	(77)
Southeast 0.9x	0.77		×	2.88		x	36	5.79	x	(0.63	×		0.7		=	32.38	(77)
Southeast 0.9x	0.77		×	1.75		x	62	2.67	x	(0.63	×		0.7		=	33.52	(77)
Southeast 0.9x	0.77		×	1.75		x	62	2.67	x	(0.63	×		0.7		=	33.52	(77)
Southeast 0.9x	0.77		x	1.75		x	62	2.67	x	(0.63	٦ x	Ē	0.7		=	33.52	(77)



Southeast 0.9x	0.77	x	1.75	x	62.67	x	0.63	x	0.7	=	33.52	(77)
Southeast 0.9x	0.77	x	2.88	×	62.67	×	0.63	×	0.7	1 =	55.16	(77)
Southeast 0.9x	0.77	x	2.88	×	62.67	×	0.63	×	0.7] =	55.16	(77)
Southeast 0.9x	0.77	x	2.88	x	62.67	x	0.63	x	0.7] =	55.16	(77)
Southeast 0.9x	0.77	×	1.75	×	85.75	x	0.63	×	0.7] =	45.86	(77)
Southeast 0.9x	0.77	x	1.75	x	85.75	×	0.63	x	0.7] =	45.86	(77)
Southeast 0.9x	0.77	x	1.75	x	85.75	x	0.63	x	0.7	=	45.86	(77)
Southeast 0.9x	0.77	x	1.75	x	85.75	×	0.63	x	0.7] =	45.86	(77)
Southeast 0.9x	0.77	x	2.88	x	85.75	x	0.63	x	0.7	=	75.48	(77)
Southeast 0.9x	0.77	x	2.88	x	85.75	x	0.63	x	0.7	=	75.48	(77)
Southeast 0.9x	0.77	x	2.88	x	85.75	x	0.63	x	0.7] =	75.48	(77)
Southeast 0.9x	0.77	x	1.75	x	106.25	x	0.63	x	0.7	=	56.83	(77)
Southeast 0.9x	0.77	x	1.75	×	106.25	x	0.63	×	0.7] =	56.83	(77)
Southeast 0.9x	0.77	x	1.75	x	106.25	x	0.63	x	0.7	=	56.83	(77)
Southeast 0.9x	0.77	x	1.75	x	106.25	x	0.63	x	0.7	=	56.83	(77)
Southeast 0.9x	0.77	x	2.88	x	106.25	×	0.63	x	0.7] =	93.52	(77)
Southeast 0.9x	0.77	x	2.88	x	106.25	x	0.63	x	0.7	=	93.52	(77)
Southeast 0.9x	0.77	x	2.88	x	106.25	x	0.63	x	0.7	=	93.52	(77)
Southeast 0.9x	0.77	x	1.75	×	119.01	x	0.63	×	0.7] =	63.65	(77)
Southeast 0.9x	0.77	x	1.75	x	119.01	x	0.63	x	0.7	=	63.65	(77)
Southeast 0.9x	0.77	x	1.75	x	119.01	x	0.63	x	0.7	=	63.65	(77)
Southeast 0.9x	0.77	x	1.75	x	119.01	×	0.63	x	0.7] =	63.65	(77)
Southeast 0.9x	0.77	x	2.88	x	119.01	x	0.63	x	0.7	=	104.75	(77)
Southeast 0.9x	0.77	x	2.88	x	119.01	x	0.63	x	0.7	=	104.75	(77)
Southeast 0.9x	0.77	x	2.88	x	119.01	x	0.63	x	0.7	=	104.75	(77)
Southeast 0.9x	0.77	x	1.75	x	118.15	x	0.63	x	0.7	=	63.19	(77)
Southeast 0.9x	0.77	x	1.75	x	118.15	x	0.63	x	0.7	=	63.19	(77)
Southeast 0.9x	0.77	x	1.75	x	118.15	x	0.63	x	0.7	=	63.19	(77)
Southeast 0.9x	0.77	x	1.75	×	118.15	x	0.63	x	0.7	=	63.19	(77)
Southeast 0.9x	0.77	x	2.88	×	118.15	x	0.63	×	0.7	=	103.99	(77)
Southeast 0.9x	0.77	x	2.88	x	118.15	x	0.63	x	0.7	=	103.99	(77)
Southeast 0.9x	0.77	x	2.88	x	118.15	x	0.63	x	0.7	=	103.99	(77)
Southeast 0.9x	0.77	x	1.75	x	113.91	x	0.63	x	0.7] =	60.92	(77)
Southeast 0.9x	0.77	x	1.75	x	113.91	x	0.63	x	0.7] =	60.92	(77)
Southeast 0.9x	0.77	x	1.75	x	113.91	x	0.63	x	0.7	=	60.92	(77)
Southeast 0.9x	0.77	x	1.75	x	113.91	x	0.63	x	0.7	=	60.92	(77)
Southeast 0.9x	0.77	x	2.88	×	113.91	x	0.63	x	0.7	=	100.26	(77)
Southeast 0.9x	0.77	x	2.88	×	113.91	×	0.63	x	0.7	=	100.26	(77)
Southeast 0.9x	0.77	x	2.88	×	113.91	×	0.63	×	0.7] =	100.26	(77)
Southeast 0.9x	0.77	x	1.75	×	104.39	×	0.63	×	0.7] =	55.83	(77)
Southeast 0.9x	0.77	x	1.75	×	104.39	×	0.63	×	0.7	=	55.83	(77)
-												



Southeast 0.9x	0.77	x	1.75	x	104.39	x	0.63	x	0.7	=	55.83	(77)
Southeast 0.9x	0.77	x	1.75	x	104.39	×	0.63	x	0.7	i =	55.83	– (77)
Southeast 0.9x	0.77	x	2.88	×	104.39	×	0.63	x	0.7	i =	91.88	(77)
Southeast 0.9x	0.77	x	2.88	x	104.39	x	0.63	x	0.7	=	91.88	(77)
Southeast 0.9x	0.77	x	2.88	×	104.39	×	0.63	x	0.7	j =	91.88	– (77)
Southeast 0.9x	0.77	x	1.75	x	92.85	x	0.63	x	0.7	=	49.66	(77)
Southeast 0.9x	0.77	x	1.75	×	92.85	×	0.63	x	0.7] =	49.66	(77)
Southeast 0.9x	0.77	x	1.75	×	92.85	×	0.63	x	0.7] =	49.66	(77)
Southeast 0.9x	0.77	x	1.75	x	92.85	×	0.63	x	0.7] =	49.66	(77)
Southeast 0.9x	0.77	x	2.88	x	92.85	x	0.63	x	0.7	=	81.73	(77)
Southeast 0.9x	0.77	x	2.88	x	92.85	x	0.63	x	0.7	=	81.73	(77)
Southeast 0.9x	0.77	x	2.88	x	92.85	x	0.63	x	0.7	=	81.73	(77)
Southeast 0.9x	0.77	x	1.75	x	69.27	x	0.63	x	0.7	=	37.05	(77)
Southeast 0.9x	0.77	x	1.75	x	69.27	x	0.63	x	0.7	=	37.05	(77)
Southeast 0.9x	0.77	x	1.75	x	69.27	x	0.63	x	0.7	=	37.05	(77)
Southeast 0.9x	0.77	x	1.75	x	69.27	x	0.63	x	0.7	=	37.05	(77)
Southeast 0.9x	0.77	x	2.88	x	69.27	x	0.63	x	0.7	=	60.97	(77)
Southeast 0.9x	0.77	x	2.88	x	69.27	x	0.63	x	0.7	=	60.97	(77)
Southeast 0.9x	0.77	x	2.88	x	69.27	x	0.63	x	0.7	=	60.97	(77)
Southeast 0.9x	0.77	x	1.75	x	44.07	x	0.63	x	0.7	=	23.57	(77)
Southeast 0.9x	0.77	x	1.75	x	44.07	x	0.63	x	0.7	=	23.57	(77)
Southeast 0.9x	0.77	x	1.75	×	44.07	x	0.63	x	0.7] =	23.57	(77)
Southeast 0.9x	0.77	x	1.75	x	44.07	x	0.63	x	0.7	=	23.57	(77)
Southeast 0.9x	0.77	x	2.88	x	44.07	x	0.63	x	0.7	=	38.79	(77)
Southeast 0.9x	0.77	x	2.88	x	44.07	x	0.63	x	0.7] =	38.79	(77)
Southeast 0.9x	0.77	x	2.88	x	44.07	x	0.63	x	0.7] =	38.79	(77)
Southeast 0.9x	0.77	x	1.75	x	31.49	x	0.63	x	0.7] =	16.84	(77)
Southeast 0.9x	0.77	x	1.75	x	31.49	x	0.63	x	0.7] =	16.84	(77)
Southeast 0.9x	0.77	x	1.75	x	31.49	×	0.63	x	0.7	=	16.84	(77)
Southeast 0.9x	0.77	x	1.75	x	31.49	x	0.63	x	0.7] =	16.84	(77)
Southeast 0.9x	0.77	x	2.88	x	31.49	x	0.63	x	0.7	=	27.71	(77)
Southeast 0.9x	0.77	x	2.88	x	31.49	x	0.63	x	0.7] =	27.71	(77)
Southeast 0.9x	0.77	x	2.88	x	31.49	x	0.63	x	0.7] =	27.71	(77)
Southwest0.9x	0.77	x	1.75	x	36.79]	0.63	x	0.7	=	19.68	(79)
Southwest0.9x	0.77	x	1.75	x	36.79]	0.63	x	0.7	=	19.68	(79)
Southwest0.9x	0.77	x	1.75	x	36.79]	0.63	x	0.7	=	19.68	(79)
Southwest _{0.9x}	0.77	x	1.75	×	62.67]	0.63	x	0.7	=	33.52	(79)
Southwest <mark>0.9x</mark>	0.77	x	1.75	×	62.67]	0.63	x	0.7	=	33.52	(79)
Southwest _{0.9x}	0.77	x	1.75	x	62.67]	0.63	x	0.7] =	33.52	(79)
Southwest _{0.9x}	0.77	x	1.75	x	85.75]	0.63	x	0.7] =	45.86	(79)
Southwest _{0.9x}	0.77	x	1.75	×	85.75]	0.63	x	0.7	=	45.86	(79)
-		_		-		-		-		_		



Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	8	35.75			0.63	x	0.7	=		45.86	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	10	06.25]		0.63	×	0.7	=		56.83	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	10	06.25]		0.63	×	0.7	=		56.83	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	10	06.25]		0.63	x	0.7	=		56.83	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	19.01]		0.63	×	0.7	=		63.65	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	19.01]		0.63	x	0.7	=		63.65	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	19.01]		0.63	x	0.7	=		63.65	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	18.15]		0.63	x	0.7	=		63.19	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	18.15]		0.63	x	0.7	=		63.19	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	18.15]		0.63	×	0.7	=		63.19	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	13.91]		0.63	x	0.7	=		60.92	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	13.91]		0.63	x	0.7	=		60.92	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	13.91]		0.63	×	0.7	=		60.92	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	04.39]		0.63	×	0.7	=		55.83	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	04.39]		0.63	×	0.7	=		55.83	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	1	04.39]		0.63	x	0.7	=		55.83	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	9	92.85]		0.63	×	0.7	=		49.66	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	9	92.85]		0.63	x	0.7	=		49.66	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	9	92.85]		0.63	×	0.7	=		49.66	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	6	9.27]		0.63	×	0.7	=		37.05	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	6	9.27]		0.63	×	0.7	=		37.05	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	6	9.27]		0.63	x	0.7	=		37.05	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	4	4.07]		0.63	x	0.7	=		23.57	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	4	4.07]		0.63	×	0.7	=		23.57	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	4	4.07]		0.63	x	0.7	=		23.57	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	3	31.49]		0.63	×	0.7	=		16.84	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	3	31.49]		0.63	×	0.7	=		16.84	(79)
Southw	est <mark>0.9x</mark>	0.77		x	1.7	'5	x	3	31.49]		0.63	x	0.7	=		16.84	(79)
Solar g	ains in	watts, ca	alcula	ted	for eac	n mont	:h		i	(83)m	า = Su	m(74)m	.(82)m		1	-		
(83)m=	244.25	419.14	581.7	74	734.62	835.45	5 8	334.95	802.68	726	6.61	634.55	465.47	293.12	208.66			(83)
Total g	ains – i	nternal a	nd so	blar	(84)m =	= (73)m	ו + (דר	(83)m	, watts			<u></u>				7		(0.1)
(84)m=	639.48	813.01	961.8	36	1091.97	1168.5	4 1	145.53	1099.15	1027	7.12	947.21	801.0	655.11	591.56			(84)
7. Me	an inte	rnal temp	eratu	ire (heating	seaso	on)											_
Temp	erature	during h	eatin	g pe	eriods ir	n the liv	ving	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	ation fac	ctor for ga	ains f	or li	ving are	ea, h1,	m (s	see Ta	ble 9a)			r				-		
	Jan	Feb	Ma	ar	Apr	May	/	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	4		(2.2)
(86)m=	1	0.99	0.98	3	0.95	0.88		0.75	0.59	0.6	64	0.85	0.97	0.99	1			(86)
Mean	interna	al tempera	ature	in li	iving are	ea T1 (foll	ow ste	ps 3 to 7	7 in T	able	9c)			1	-		
(87)m=	19.26	19.49	19.8	3	20.25	20.62		20.87	20.96	20.	95	20.76	20.26	19.67	19.22			(87)
Temp	erature	during h	eatin	g pe	eriods ir	n rest c	of dv	velling	from Ta	able 9	9, Th	2 (°C)				_		
(88)m=	19.64	19.64	19.6	5	19.66	19.66		19.67	19.67	19.	67	19.66	19.66	19.66	19.65			(88)



Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.98	0.93	0.83	0.64	0.43	0.48	0.77	0.95	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)	•			
(90)m=	18.09	18.32	18.66	19.07	19.41	19.61	19.66	19.66	19.54	, 19.09	18.51	18.06		(90)
I									f	LA = Livin	g area ÷ (4) =	0.33	(91)
Moon	interna	l tompor	aturo (fo	r tho wh	olo dwol	lling) – fl	Λ 🗸 Τ1	⊥ (1 _ fl	۸) v T2					_]
(92)m=	18.48	18.71	19.05	19.46	19.81	20.03	20.09	20.09	19.94	19.48	18.9	18.44		(92)
Apply	adiustr	nent to t	he mear	internal	temper	ature fro	m Table	4e whe	re appro	opriate				. ,
(93)m=	18.48	18.71	19.05	19.46	19.81	20.03	20.09	20.09	19.94	19.48	18.9	18.44		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	i to the i	mean int	ernal ter	mperatui	re obtain	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	1	0.99	0.97	0.93	0.84	0.67	0.48	0.54	0.79	0.95	0.99	1		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	636.49	803.33	934.32	1014.34	977.29	767.07	531.31	551.62	747.76	762.59	648.71	589.51		(95)
Month	nly aver	age exte	ernal tem	perature	e from Ta	able 8								<i></i>
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m·	– (96)m]				(07)
(97)m=	2278.19	2214.31	2007.8	1675.06	1284.4	852.68	548.47	577.82	920.62	1405.35	1874	2271.05		(97)
Space	e heatin	g require	ement fo	or each n	nonth, k۱	/Vh/mont	:h = 0.02	4 x (97)m – (95)m x (4′	1)m			
(0.0)									,	, <u>,</u> (, , , , ,			
(98)m=	1221.43	948.18	798.67	475.72	228.49	0	0	0	0	478.21	882.21	1251.07		
(98)m=	1221.43	948.18	798.67	475.72	228.49	0	0	0 Tota	0 I per year	478.21 (kWh/year	882.21) = Sum(9	1251.07 8) _{15,912} =	6283.97	(98)
(98)m=	1221.43 e heatin	948.18 g require	798.67 ement in	475.72 kWh/m ²	228.49 ?/year	0	0	0 Tota	0 I per year	478.21 (kWh/year	882.21) = Sum(9	1251.07 8) _{15,912} =	6283.97 61.06	(98) (99)
(98)m= Space 8c. Sp	1221.43 e heatin pace co	948.18 g require oling rec	798.67 ement in juiremer	475.72 kWh/m ² nt	228.49 ?/year	0	0	0 Tota	0 I per year	478.21 (kWh/year	882.21) = Sum(9	1251.07 8) _{15,912} =	6283.97	(98) (99)
(98)m= Space 8c. Sp Calcu	1221.43 e heatin pace co lated fo	948.18 g require oling rec r June, .	798.67 ement in juiremer	475.72 kWh/m² nt August.	228.49 ?/year <u>See Tal</u>	0 Die 10b	0	0 Tota	0 I per year	478.21 (kWh/year	882.21 ;) = Sum(9	1251.07 8) _{15,912} =	6283.97 61.06	(98) (99)
(98)m= Space 8c. Sp Calcu	1221.43 e heatin pace co lated fo Jan	948.18 g require oling rec r June, Feb	798.67 ement in juiremer July and Mar	475.72 kWh/m² nt August. Apr	228.49 ² /year See Tal May	0 Die 10b Jun	0 Jul	0 Tota Aug	0 I per year Sep	478.21 (kWh/year Oct	882.21) = Sum(9 Nov	1251.07 8) _{15.912} = Dec	6283.97 61.06	(98) (99)
(98)m= Space 8c. Sp Calcu Heat	1221.43 e heatin pace co lated fo Jan loss rate	948.18 g require oling rec r June, C Feb e Lm (ca	798.67 ement in uiremer July and Mar Iculated	475.72 kWh/m ² nt August. Apr using 25	228.49 /year See Tat May 5°C inter	0 ble 10b Jun nal temp	0 Jul perature	0 Tota Aug and exte	0 I per year Sep ernal ten	478.21 (kWh/year Oct	882.21) = Sum(9 Nov e from T	1251.07 8)15.912 = Dec fable 10)	6283.97 61.06	(98) (99)
(98)m= Space 8c. Sp Calcu Heat (100)m=	1221.43 e heatin Dace co lated fo Jan loss rate	948.18 g require oling rec r June, Feb e Lm (ca 0	798.67 ement in juiremen July and Mar Iculated 0	475.72 kWh/m ² t August. Apr using 25 0	228.49 2/year See Tal May 5°C inter 0	0 ble 10b Jun nal temp 1476.07	0 Jul perature 1162.01	Aug and exte	0 I per year Sep ernal ten 0	478.21 (kWh/year Oct nperatur 0	882.21) = Sum(9 Nov e from T 0	1251.07 8) ₁₅₉₁₂ = Dec able 10) 0	6283.97	(98) (99) (100)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa	1221.43 e heatin pace co lated fo Jan loss rate 0 ation fac	948.18 g require oling rec r June, C Feb e Lm (ca 0 tor for lo	798.67 ement in juiremer July and Mar Iculated 0 oss hm	475.72 kWh/m ² August. Apr using 25 0	228.49 /year See Tat May 5°C inter 0	0 ble 10b Jun nal temp 1476.07	0 Jul perature 1162.01	Aug and exte	0 I per year Sep ernal ten 0	478.21 (kWh/year Oct operatur	882.21) = Sum(9 Nov e from T 0	1251.07 8)15912 = Dec able 10) 0	6283.97)(98))(99) (100)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m=	1221.43 e heatin Dace co lated fo Jan loss rate 0 ation fac	948.18 g require oling rec r June, Feb e Lm (ca 0 tor for lo	798.67 ement in juiremen July and Mar Iculated 0 oss hm 0	475.72 kWh/m ² nt August. Apr using 25 0	228.49 P/year See Tal May 5°C inter 0	0 ble 10b Jun nal temp 1476.07 0.79	0 Jul perature 1162.01 0.87	Aug and exte 1191.63	0 I per year Sep ernal ten 0	478.21 (kWh/year Oct nperatur 0	882.21) = Sum(9 Nov e from T 0 0	1251.07 8)15912 = Dec able 10) 0	6283.97)(98))(99) (100) (101)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu	1221.43 e heatin bace co lated fo Jan loss rate 0 ation fac 0 ll loss, h	948.18 g require oling rec r June, C Feb e Lm (ca 0 tor for lo 0 mLm (W	798.67 ement in juiremen July and Mar Iculated 0 oss hm 0 Vatts) = 0	475.72 kWh/m ² August. Apr using 25 0 (100)m x	228.49 /year See Tab May 5°C inter 0 (101)m	0 ble 10b Jun nal temp 1476.07 0.79	0 Jul perature 1162.01 0.87	Aug and exte 1191.63	0 I per year Sep ernal ten 0	478.21 (kWh/year Oct operatur 0	882.21) = Sum(9 Nov e from T 0 0	1251.07 8)15912 = Dec able 10) 0	6283.97)(98))(99) (100) (101)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	1221.43 e heatin Dace co lated fo Jan loss rate 0 ation fac 0 I loss, h 0	948.18 g require oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0	798.67 ement in juiremen July and Mar Iculated 0 oss hm 0 Vatts) = 0	475.72 kWh/m ² August. Apr using 28 0 (100)m x 0	228.49 2/year See Tab May 5°C inter 0 0 (101)m 0	0 ble 10b Jun 1476.07 0.79 1170.38	0 Jul perature 1162.01 0.87 1006.05	0 Tota Aug and exte 1191.63 0.84 997	0 I per year Sep ernal ten 0 0	478.21 (kWh/year Oct nperatur 0 0	882.21) = Sum(9 Nov e from T 0 0 0	1251.07 8)15.912 = Dec able 10) 0	6283.97)(98))(99) (100) (101) (102)
(98)m= Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains	1221.43 e heatin bace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 s (solar g	948.18 g require r June, c Feb e Lm (ca 0 tor for lo 0 mLm (W 0 gains ca	798.67 ement in juirement July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated	475.72 kWh/m ² August. Apr using 25 0 (100)m x 0 for appli	228.49 /year See Tab May 5°C inter 0 (101)m 0 cable we	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Jul perature 1162.01 0.87 1006.05 egion, se	Aug and exte 1191.63 0.84 997 e Table	0 I per year Sep ernal ten 0 0 0 10)	478.21 (kWh/year Oct nperatur 0 0	882.21 = Sum(9 Nov e from T 0 0 0	1251.07 8)15.912 = Dec able 10) 0	6283.97 61.06)(98))(99) (100) (101) (102)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	1221.43 e heatin pace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 s (solar g 0	948.18 g require oling red r June, C Feb e Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0	798.67 ement in juirement July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0	475.72 kWh/m ² August. Apr using 25 0 (100)m x 0 for appli 0	228.49 See Tab May 5°C inter 0 (101)m 0 cable we 0	0 ble 10b Jun nal temp 1476.07 0.79 1170.38 eather re 1445.55	0 Jul perature 1162.01 0.87 1006.05 egion, se 1389.02	0 Tota Aug and exte 1191.63 0.84 997 e Table 1306.71	0 I per year Sep ernal ten 0 0 10) 0	478.21 (kWh/year Oct nperatur 0 0 0 0	882.21) = Sum(9 Nov e from T 0 0 0 0	1251.07 8)15.912 = Dec able 10) 0 0	6283.97)(98))(99) (100) (101) (102) (103)
(98)m= Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	1221.43 e heatin bace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 s (solar g 0 e coolin 04)m to	948.18 g require r June, c Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require zero if (798.67 ement in $uiremer$ $July and$ Mar $Iculated$ 0 $vatts) = 0$ $Iculated$ 0 $Vatts) = 0$ $Iculated$ 0 $Iculated$ 0 0 0 $104 m c$	475.72 kWh/m ² August. Apr using 25 0 (100)m x 0 (100)m x 0 for appli 0 <i>r month</i> ,	228.49 See Tab May 5°C inter 0 (101)m 0 cable we 0 whole com	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Jul perature 1162.01 0.87 1006.05 egion, se 1389.02 continuo	Aug and exte 1191.63 0.84 997 e Table 1306.71 Dus (kW)	0 I per year Sep ernal ten 0 0 10) 0 (h) = 0.0	478.21 (kWh/year Oct nperatur 0 0 0 0 0 0 0 0 0 0 0 0 0 0	882.21 = Sum(9 Nov e from T 0 0 0 0 0 0 0 0 0 0 0 0 0	1251.07 8)15912 = Dec able 10) 0 0 0 102)m] 5	6283.97 61.06)(98))(99) (100) (101) (102) (103)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	1221.43 e heatin pace co lated fo Jan oss rate 0 ation fac 0 il loss, h 0 s (solar g 0 e cooling 04)m to	948.18 g require oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (798.67 ement in juirement July and Nar Iculated 0 lculated 0 lculated 0 ement fo 104)m 0	475.72 kWh/m ² August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98	228.49 //year See Tat May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c m 0	0 ble 10b Jun nal temp 1476.07 0.79 1170.38 eather re 1445.55 <i>lwelling</i> , 198.12	0 Jul perature 1162.01 0.87 1006.05 egion, se 1389.02 continuo 284.93	0 Tota Aug and exte 1191.63 0.84 997 e Table 1306.71 0us (kW 230.42	0 I per year Sep ernal ten 0 0 10) 0 (h) = 0.0. 0	478.21 (kWh/year Oct nperatur 0	882.21 882.21 Nov e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1251.07 8)15.912 = Dec able 10) 0 0 0 102)m] 3	6283.97 61.06)(98))(99) (100) (101) (102) (103)
(98)m= Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	1221.43 e heatin bace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 s (solar g 0 e cooling 04)m to 0	948.18 g require r June, Feb E Lm (ca 0 tor for lc 0 mLm (V 0 gains ca 0 g require zero if (0	798.67 ement in juirement July and Nar July and 0 0 0 0 10 0 0 104)m 0	475.72 kWh/m ² August. Apr using 25 0 0 (100)m x 0 (100)m x 0 for appli 0 r month, 3 x (98 0	228.49 /year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c m 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Jul perature 1162.01 0.87 1006.05 egion, se 1389.02 continuo 284.93	0 Tota Aug and exte 1191.63 0.84 997 e Table 1306.71 ous (kW) 230.42	0 I per year Sep ernal ten 0 0 10) 0 (h) = 0.0. 0 Total	478.21 (kWh/year 0 0 0 24 x [(10 0 = Sum(882.21 882.21 Nov e from T 0 0 0 0 0 0 0 0	1251.07 8)15912 = Dec able 10) 0 0 0 102)m] 3 0 =	6283.97 61.06 ((41)m)(98))(99) (100) (101) (102) (103)
(98)m= Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolect	1221.43 e heatin Dace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il loss, h 0 il loss, h 0 c (solar g 0 e coolin 0 04)m to 0	948.18 g require oling rec r June, C Feb e Lm (ca 0 tor for lo 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if (0	798.67 ement in puirement July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement fo 104)m < 0	475.72 kWh/m ² August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98 0	228.49 2/year See Tab May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c)m 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Jul perature 1162.01 0.87 1006.05 egion, se 1389.02 continuo 284.93	0 Tota Aug and exte 1191.63 0.84 997 e Table 1306.71 bus (kW 230.42	0 I per year Sep ernal ten 0 0 10) 0 10) 0 (h) = 0.0 0 Total f C =	478.21 (kWh/year (kWh/year 0	882.21 882.21 882.21 882.21 0 0 0 0 0 0 0 0	1251.07 8)15912 = Dec able 10) 0 0 0 102)m] 2 0 = 4) =	6283.97 61.06 ((41)m 713.47 1	(98) (99) (100) (101) (102) (103) (104) (105)
(98)m= Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolecc Intermi	1221.43 e heatin Dace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il loss, h 0 il loss, h 0 c (solar g 0 e coolin 0 04)m to 0 l fraction ttency f	948.18 g require oling rec r June, Feb e Lm (ca 0 tor for lc 0 mLm (V 0 gains ca 0 g require zero if (0	798.67 ement in juirement July and 0 0 0 10ulated 0 able 10b	475.72 kWh/m ² August. Apr using 25 0 0 (100)m x 0 for appli 0 r month, 3 x (98 0	228.49 //year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c)m 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Jul perature 1162.01 0.87 1006.05 egion, se 1389.02 continuo 284.93	0 Tota Aug and exte 1191.63 0.84 997 e Table 1306.71 Dus (kW 230.42	0 I per year Sep ernal ten 0 0 10) 0 10) 0 (h) = 0.0 0 Total f C =	$\begin{array}{c} 478.21 \\ 478.21 \\ (kWh/year \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 24 x [(10 \\ 0 \\ 24 x [(10 \\ 0 \\ 0 \\ 24 x [(10 \\ 0 \\ 0 \\ 25 \\ $	882.21 882.21 Nov $from T$ 0 0 0 0 0 0 0 0 0 0	1251.07 8)15912 = Dec able 10) 0 0 0 0 102)m] 2 0 = 4) =	<u>6283.97</u> 61.06 ((41)m 713.47 1	(98) (99) (100) (101) (102) (103) (104) (105)
(98)m= Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolect Intermi (106)m=	1221.43 e heatin bace co lated fo Jan loss rate 0 ation fac 0 ation fac 0 il loss, h 0 s (solar g 0 e cooling 0 d)m to 0 f fraction ttency f 0	948.18 g require oling rec r June, C Feb e Lm (ca 0 tor for lo 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if (0 n actor (Ta 0	798.67ement inuirementJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly andJuly and0Vatts) = 0Iculated0Iculated0able 10b0	475.72 kWh/m ² August. Apr using 25 0 (100)m x 0 (100)m x 0 for appli 0 r month, 3 x (98 0	228.49 2/year See Tab May 5°C inter 0 (101)m (101)m (101)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Jul perature 1162.01 0.87 1006.05 2gion, se 1389.02 continuo 284.93	0 Tota Aug and exte 1191.63 0.84 997 e Table 1306.71 Dus (kW 230.42	0 I per year Sep ernal ten 0 0 10) 0 10) 0 //h) = 0.0/ 0 Total f C = 0	$\begin{array}{c} $	882.21 882.21 Nov e from T 0 0 0 0 0 0 0 0	$ \begin{array}{c} 1251.07\\ 8)_{15912} = \\ \hline Dec\\ \hline able 10)\\ 0\\ \hline 0\\ 0\\ 0\\ 102)m] \\ 2\\ \hline 0\\ =\\ 4) = \\ 0\\ \end{array} $	6283.97 61.06 (41)m 713.47 1	(98) (99) (100) (101) (102) (103) (104) (105)



Space	cooling	requiren	nent for	month =	(104)m	× (105)	× (106)r	n							
(107)m=	0	0	0	0	0	49.53	71.23	57.61	0	0	0		0		
_	Total = Sum(1,0,7) =														(107)
Space	bace cooling requirement in kWh/m²/year $(107) \div (4) =$														
8f. Fab	ic Ener	gy Effici	ency (ca	alculated	l only un	der spec	cial cond	litions, se	ee sectio	on 11)					-
Fabric	Energy	/ Efficier	псу						(99) -	+ (108) =	=			62.79	(109)
Targe	t Fabrie	c Energy	y Efficie	ency (TF	EE)									72.21	(109)



APPENDIX D. DER WORKSHEETS (BE LEAN)

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User Details:	
Assessor Name: Panagiotis Dalapas Stroma Number: STRO030082	
Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5	.41
Property Address: Be Lean-First Floor Flat	
Address :238 KILBURN HIGH ROAD, LONDON, NW6 2BS	
1. Overall dwelling dimensions:	
Area(m²)Av. Height(m)VolurGround floor 50.18 $(1a) \times$ 2.5 $(2a) =$ 128	1 e(m³) .45 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 50.18 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 125$.45 (5)
2. Ventilation rate:	- h
Main heatingSecondary heatingOthertotalImport totalNumber of chimneys 0 $+$ 0 $+$ 0 $=$ 0 $\times 40$ $=$	(6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$	(6b)
Number of intermittent fans 0 x 10 =	(7a)
Number of passive vents 0 × 10 =	(7b)
Number of flueless gas fires $0 \times 40 = 0$	(7c)
Air changes	er hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	
Number of storeys in the dwelling (ns)	(9)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	(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	(11)
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	(13)
Percentage of windows and doors draught stripped	(14)
Window infiltration $0.25 - [0.2 \times (14) \div (10) = 0.000 $ (0) $\div (10) \div (10) \div (10) \div (10) \div (10) $	(15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$	(16)
All permeability value, dou, expressed in cubic metres per nour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] \pm (8)$ otherwise $(18) = (16)$	(17)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	5 (18)
Number of sides sheltered	(19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0	7 (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0	1 (21)
Infiltration rate modified for monthly wind speed	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed from Table 7	
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	
Wind Factor (22a)m = (22)m \div 4	



	ed infiltra	ation rate	e (allowin	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
	0.13	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12		
Calcula	ate effec	tive air (change r	ate for t	he appli	cable ca	se						0.5	(220)
lf exh	aust air he	at pump i	using Appe	endix N. (2	(3b) = (23a	i) x Fmv (e	equation (N	v5)), other	rwise (23b) = (23a)			0.5	(23a)
If bala	anced with	heat reco	overv: effici	iencv in %	allowing f	or in-use fa	actor (from	n Table 4h) =) (200)			77.05	(230)
a) If	halanco	d mech	anical ve	ntilation	with he	at recove	2rv (M/\/F	-IR) (2/1s	a)m = (2)	2b)m ± ('	23h) v [1	1 _ (23c)	1001 ± 1001	(230)
(24a)m=	0.25	0.24	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(24a)
(, b) If	halance	d mech:	anical ve	ntilation	without	heat rec	overv (N	///) (24h	m = (22)	2h)m + (2	23h)	•		
(24b)m=	0	0		0	0	0) (22		0	0		(24b)
c) If	whole h		tract ven	tilation (or positiv	e input v		n from c	utside					
i i	f (22b)m	$1 < 0.5 \times$	د (23b), t	hen (24	c) = (23t); otherv	vise (24	c) = (22t	o) m + 0.	5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	/entilatio	on or wh	ole hous	e positiv	/e input	ventilatic	on from I	oft					
i	f (22b)m	n = 1, the	en (24d):	m = (22	ວ)m othe	erwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effec	ctive air	change	rate - en	iter (24a) or (24t	o) or (240	c) or (24	d) in box	: (25)			i		
(25)m=	0.25	0.24	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25)
3. Hea	at losses	s and he	eat loss p	baramet	er:									
ELEN	IENT	Gros area	3S (m²)	Openin rr	gs I ²	Net Ar A .r	ea n²	U-valı W/m2	le K	A X U (W/ł	()	k-value kJ/m²⋅l	e ≺	A X k kJ/K
Doors			()			2.15	x	1		2.15				(26)
Windov	ws Type	1				3.26	 	L/[1/(1.2)+	0.04] =	3.73				(27)
Windov	ws Type	2				3 26		/[1/(1.2)+	0.04] =	3 73				(27)
Window	ws Type	3				2		/[1/(1.2)+	0.04] =	2.29	\exists			(27)
Window	ws Type	4				1.7		/[1/(1.2)+	0.04] =	1.95				(27)
Window	ws Type	5					=		L		=			(27)
	51					2	x1/	/[1/(1.2)+	0.04] =	2.29				
Floor						2	x ^{1/}	/[1/(1.2)+	0.04] = [2.29				(28)
Floor Walls 1	Type1	53.6	18	12.2	>	2 50.18	x1/	/[1/(1.2)+	0.04] = [2.29 7.527 7.46				(28)
Floor Walls 1 Walls 1	Гуре1 Гуре2	53.6)8 '3	12.2	2	2 50.18 41.46	x ^{1/}	/[1/(1.2)+ 0.15 0.18	0.04] = [2.29 7.527 7.46 2.91				(28) (29) (29)
Floor Walls 1 Walls 1 Walls 1	Гуре1 Гуре2 Гуре3	53.6 14.7 3.34)8 3 4	12.2 0 2.15	2	2 50.18 41.46 14.73	x1/ x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22	0.04] = [= [= [= [2.29 7.527 7.46 2.91 0.26				(28) (29) (29) (29)
Floor Walls T Walls T Walls T Total a	Гуре1 Гуре2 Гуре3 rea of e	53.6 14.7 3.34)8 '3 4 , m²	12.2 0 2.15	2	2 50.18 41.46 14.73 1.19 121.93	x1/ x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22	0.04] = [= [= [= [2.29 7.527 7.46 2.91 0.26				(28) (29) (29) (29) (29) (31)
Floor Walls T Walls T Walls T Total a Party w	Гуре1 Гуре2 Гуре3 ırea of e vall	53.6 14.7 3.34 lements	38 73 4 , m ²	12.2 0 2.15	2	2 50.18 41.46 14.73 1.19 121.93 22.09	x1/ x x x x x x x x x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22	0.04] = [2.29 7.527 7.46 2.91 0.26				(28) (29) (29) (29) (29) (31) (32)
Floor Walls T Walls T Walls T Total a Party w * for wine ** includ	Type1 Type2 Type3 rea of e vall dows and e the area	53.6 14.7 3.34 lements	3 3 4 , m ² ws, use ei sides of in	12.2 0 2.15	2 ndow U-va	2 50.18 41.46 14.73 1.19 121.93 22.09 alue calcula	x1/ x x x x x x x x x x x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0.22	0.04] = [] = [] = [] = [] = [] = [//(//-value)	2.29 7.527 7.46 2.91 0.26 0 ue)+0.04] a	[] [[[[] [[] [[] [[] [] [[] [_] [paragraph		(28) (29) (29) (29) (31) (32)
Floor Walls T Walls T Walls T Total a Party w * for wind ** includ Fabric	Гуре1 Гуре2 Гуре3 Irea of e vall dows and le the area heat los	53.6 14.7 3.34 dements roof windo s on both s, W/K =	38 73 4 , m ² ws, use ex- sides of in = S (A x	12.2: 0 2.15 ffective wi ternal walk	2 ndow U-va	2 50.18 41.46 14.73 1.19 121.93 22.09 alue calcula	x1/ x x x x x 3 x ated using	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0.22 0 formula 1, (26)(30)	0.04] = [= [= [= [= [= [= [/((1/U-valu) + (32) =]	2.29 7.527 7.46 2.91 0.26 0 re)+0.04] a	[] [[] [[] [[] [[] [[] [] [[] [_] [paragraph		(28) (29) (29) (29) (31) (32)
Floor Walls T Walls T Walls T Total a Party w * for wind ** includ Fabric Heat ca	Fype1 Fype2 Fype3 rea of ei vall dows and e the area heat los apacity (53.6 14.7 3.34 Tements roof winder s on both s, W/K = Cm = S(38 73 4 , m ² bws, use existence of in = S (A x A x k)	12.2 0 2.15 ffective wi ternal walk	2 ndow U-va	2 50.18 41.46 14.73 1.19 121.9 22.09 alue calcula titions	x1/ x x x x x x x x x x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0.22 0.22 0.22 (0 formula 1, (26)(30)	$\begin{array}{c} 0.04] = \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	2.29 7.527 7.46 2.91 0.26 0 re)+0.04] a	[] [[] [[] [] [[] [_] [paragraph (32e) =		(28) (29) (29) (29) (31) (32) (33) (33)
Floor Walls T Walls T Walls T Total a Party w * for wind ** includ Fabric Heat ca Therma	Type1 Type2 Type3 rea of e vall dows and te the area heat los apacity (al mass	53.6 14.7 3.34 lements roof winde s on both s, W/K = Cm = S(parame	38 73 4 5 5 5 5 5 5 5 5 5 5 5 5 5	$\begin{bmatrix} 12.2 \\ 0 \\ 2.15 \end{bmatrix}$ ffective with ternal walk U) $h^{2} = Cm \div h^{2}$	2 ndow U-va Is and pan	2 50.18 41.46 14.73 1.19 121.9 22.09 alue calcula titions	x1/ x x x x x x x x ated using	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0.22 0.22 0.22 (26)(30)	0.04] = [= [= [= [= [= [= [= [= [(1/U-valu) + (32) = ((28) Indicat	2.29 7.527 7.46 2.91 0.26 0 re)+0.04] a .(30) + (32 tive Value:	[] [[] [[] [] [[] [_] [paragraph (32e) =	34.3 34.3 10578.29	(28) (29) (29) (31) (32) (33) (33) (34) (35)
Floor Walls T Walls T Walls T Total a Party w * for wind ** includ Fabric Heat ca Therma For desig can be u	Fype1 Fype2 Fype3 Irea of e vall dows and le the area heat los apacity (al mass gn assess used instea	53.6 14.7 3.34 $roof winders on both$ $s, W/K =$ $Cm = S($ $parame$ $ments wh$ $ad of a deal$	38 73 4 73 4 73 4 73 7 7 7 7 7 7 7 7 7 7 7 7 7	12.2. 0 2.15 ffective wi ternal walk U) ' = Cm ÷ tails of the lation.	2 ndow U-va Is and part - TFA) ir construct	2 50.18 41.46 14.73 1.19 121.93 22.09 alue calcula ititions	x1/ x x x x x x x x x x x x x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0 formula 1, (26)(30) ecisely the	0.04] = [= [= [= [= [= [= [/[(1/U-valu) + (32) = ((28)) Indicative	2.29 7.527 7.46 2.91 0.26 0 re)+0.04] a .(30) + (32 tive Value: 9 values of	[] [[[] [[] [[] [_] [paragraph (32e) = able 1f	34.3 10578.29 250	(28) (29) (29) (31) (32) (33) (33) (34) (35)
Floor Walls T Walls T Walls T Total a Party w * for wind * include Fabric Heat ca Therma For designation Can be u	Type1 Type2 Type3 Trea of ei vall dows and te the area heat los apacity (al mass gn assess used instea al bridge	53.6 14.7 3.34 $coof winder s on both s, W/K = Cm = S(0) parame ments wh ad of a der es : S (L$	$\frac{38}{73}$ $\frac{4}{3}$ $\frac{3}{4}$ $\frac{4}{3}$ $\frac{3}{5}$	12.2 0 2.15 ffective wi ternal walk U) 2 = Cm ÷ values of the values of t	2 ndow U-va ls and part - TFA) ir construct	2 50.18 41.46 14.73 1.19 121.9 22.09 alue calcula titions	x1/ x x x x x x x x x x x x x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0.22 0.22 (26)(30) ecisely the	0.04] = [= [= [= [= [= [= [= [= [= [(1/U-valu) + (32) = ((28) Indicative	2.29 7.527 7.46 2.91 0.26 0 re)+0.04] a .(30) + (32 tive Value: e values of) + (32a). Medium	paragraph (32e) = able 1f	34.3 34.3 10578.29 250	(28) (29) (29) (31) (32) (33) (33) (34) (35) (36)



Total fa	abric he	at loss							(33) +	(36) =			50.67	(37)
Ventila	tion hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)		l	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	10.23	10.12	10.01	9.47	9.36	8.82	8.82	8.71	9.04	9.36	9.58	9.8		(38)
Heat tr	ansfer c	coefficier	nt, W/K				-		(39)m	= (37) + (38)m	-		
(39)m=	60.9	60.79	60.68	60.14	60.03	59.49	59.49	59.38	59.7	60.03	60.25	60.46		
Heat lo	ss para	meter (H	HLP), W/	′m²K			-		(40)m	Average = = (39)m ÷	Sum(39) ₁ . · (4)	12 /12=	60.11	(39)
(40)m=	1.21	1.21	1.21	1.2	1.2	1.19	1.19	1.18	1.19	1.2	1.2	1.2		
Numbe	er of day	rs in moi	nth (Tab	le 1a)						Average =	Sum(40)1.	12 /12=	1.2	(40)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ing ener	gy requi	irement:								kWh/ye	ear:	
Assum	ed occu	ipancy, l	N								1	.7		(42)
if TF	A > 13.9	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0)013 x (TFA -13	.9)			
Annual	averad	e hot wa	ater usad	ne in litre	s per da	av Vd.av	erade =	(25 x N)	+ 36		74	.47		(43)
Reduce	the annua	al average	hot water	usage by s	5% if the a	lwelling is	designed t	to achieve	a water us	se target o	f i i i			()
not more	e that 125	litres per p	person per	[.] day (all w	ater use, l	hot and co	ld)						I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage II	n litres per	day for ea	ach month	Vd,m = fa	ctor from 1	l able 1c x	(43)			i	r	l	
(44)m=	81.91	78.93	75.96	72.98	70	67.02	67.02	70	72.98	75.96	78.93	81.91		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600	kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	893.59	(44)
(45)m=	121.47	106.24	109.63	95.58	91.71	79.14	73.33	84.15	85.16	99.24	108.33	117.64		
lf instant	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)) to (61)	Total = Su	m(45) ₁₁₂ =	-	1171.64	(45)
(46)m=	18.22	15.94	16.44	14.34	13.76	11.87	11	12.62	12.77	14.89	16.25	17.65		(46)
Water	storage	loss:						·						
Storag	e volum	e (litres)	includir	ig any so	plar or W	/WHRS	storage	within sa	ime ves	sel		0		(47)
If comr Otherw	nunity h vise if no	eating a stored	nd no ta hot wate	nk in dw er (this in	elling, e Icludes i	nter 110 nstantar) litres in neous co	(47) ombi boile	ers) ente	er '0' in (47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/dav).					0		(48)
Tempe	rature fa	actor fro	m Table	2b		(" a a j) :					0		(49)
Energy	lost fro	m water	storage	_~ kWh/ve	ar			(48) x (49)	=			0		(50)
b) If m	anufact	urer's de	eclared of	ylinder l	oss fact	or is not	known:	()				0		(00)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If comr	nunity h	eating s	ee secti	on 4.3									I	/
	e tactor rature f	Irom Tal	ule Za m Tahlo	2h								0		(52)
Enorm		m wotor			ar			(17) v (54)	v (50) v (53) -		0		(53)
Entergy	(50) or (54) in (5	50 age	, rvvii/ye	ai			(+ <i>r</i>) X (31)	~ (52) X (55j =		0		(54) (55)
	(, 0, (-1									~	l	(00)



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 cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(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)
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	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	32.02	28.88	31.9	30.8	31.77	30.68	31.66	31.73	30.74	31.85	30.91	32		(61)
Total h	neat req	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=	153.49	135.12	141.53	126.38	123.48	109.82	104.99	115.88	115.9	131.09	139.24	149.64		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix C	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=	153.49	135.12	141.53	126.38	123.48	109.82	104.99	115.88	115.9	131.09	139.24	149.64		_
								Outp	out from wa	ater heate	r (annual)₁	12	1546.55	(64)
Heat g	ains fro	m water	heating	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m]	
(65)m=	48.39	42.54	44.43	39.48	38.44	33.98	32.3	35.91	36	40.96	43.75	47.11		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	is (Table	5), Wat	ts			-			-				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77		(66)
Lightin	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5					
(67)m=	13.17	11.7	9.51	7.2	5.38	4.54	4.91	6.38	9.57	40.00	40.7	13 53		(67)
Applia	nces ga	ins (calc	ulated ir	Δ					0.57	10.88	12.7	10.00		(0.)
(68)m=			alatoa li	i Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	12.7	10.00		(0.)
Cookir	147.7	149.23	145.37	137.15	dix L, eq 126.77	uation L ⁻ 117.02	13 or L1 110.5	3a), alsc 108.97	see Ta 112.83	10.88 ble 5 121.05	12.7	141.18		(68)
COOKII	147.7 ng gains	149.23 (calcula	145.37 Ited in A	137.15 ppendix	dix L, eq 126.77 L, equat	uation L ⁻ 117.02 ion L15	13 or L1 110.5 or L15a)	3a), alsc 108.97), also se	see Ta 112.83 ee Table	10.88 ble 5 121.05 5	12.7	141.18		(68)
(69)m=	147.7 ng gains 31.48	149.23 (calcula 31.48	145.37 ited in A 31.48	137.15 ppendix 31.48	dix L, eq 126.77 L, equat 31.48	uation L ⁻ 117.02 ion L15 31.48	13 or L1 110.5 or L15a) 31.48	3a), alsc 108.97), also se 31.48	5.57 5 see Ta 112.83 ee Table 31.48	10.88 ble 5 121.05 5 31.48	12.7 131.43 31.48	141.18		(68) (69)
(69)m= Pumps	147.7 ng gains 31.48 s and fai	149.23 (calcula 31.48 ns gains	145.37 ited in A 31.48 (Table !	137.15 ppendix 31.48 5a)	dix L, eq 126.77 L, equat 31.48	uation L 117.02 ion L15 31.48	13 or L1 110.5 or L15a) 31.48	3a), also 108.97), also se 31.48	9.57 9 see Ta 112.83 2ee Table 31.48	10.88 ble 5 121.05 5 31.48	12.7 131.43 31.48	141.18 31.48		(68) (69)
(69)m= Pumps (70)m=	147.7 ng gains 31.48 s and fai	149.23 (calcula 31.48 ns gains 3	145.37 ted in A 31.48 (Table 9	137.15 ppendix 31.48 5a) 3	dix L, eq 126.77 L, equat 31.48 3	uation L 117.02 ion L15 31.48	13 or L1 110.5 or L15a) 31.48 3	3a), also 108.97), also se 31.48 3	31.48	10.88 ble 5 121.05 5 31.48 3	12.7 131.43 31.48 3	141.18 31.48 3		(68) (69) (70)
(69)m= Pumps (70)m= Losses	147.7 ng gains 31.48 s and fa 3 s e.g. ev	149.23 (calcula 31.48 ns gains 3 vaporatic	145.37 ited in A 31.48 (Table \$ 3 on (nega	137.15 ppendix 31.48 5a) 3	dix L, eq 126.77 L, equat 31.48 3 es) (Tab	uation L 117.02 ion L15 31.48 3 le 5)	13 or L1 110.5 or L15a) 31.48 3	3a), also 108.97), also se 31.48	3.37 see Ta 112.83 se Table 31.48	10.88 ble 5 121.05 5 31.48 3	12.7 131.43 31.48 3	141.18 31.48 3		(68) (69) (70)
(69)m= Pumps (70)m= Losses (71)m=	147.7 ng gains 31.48 s and fa 3 s e.g. ev -67.82	149.23 (calcula 31.48 ns gains 3 vaporatic -67.82	145.37 ited in A 31.48 (Table 9 3 on (nega -67.82	137.15 ppendix 31.48 5a) 3 tive valu -67.82	dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82	uation L 117.02 ion L15 31.48 3 le 5) -67.82	13 or L1 110.5 or L15a) 31.48 3 -67.82	3a), also 108.97), also se 31.48 3	3.37 5 see Ta 112.83 2 e Table 31.48 3 -67.82	10.88 ble 5 121.05 5 31.48 3 -67.82	12.7 131.43 31.48 3 -67.82	141.18 31.48 3 -67.82		(68) (69) (70) (71)
(69)m= Pumps (70)m= Losses (71)m= Water	147.7 ng gains 31.48 s and fat s e.g. ev -67.82 heating	149.23 (calcula 31.48 ns gains 3 vaporatic -67.82 gains (T	145.37 ited in A 31.48 (Table 9 3 on (nega -67.82 Table 5)	137.15 ppendix 31.48 5a) 3 tive valu -67.82	dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82	uation L 117.02 ion L15 31.48 3 le 5) -67.82	13 or L1 110.5 or L15a) 31.48 3 -67.82	3a), also 108.97), also se 31.48 3 -67.82	3.37 5 see Ta 112.83 2ee Table 31.48 3 -67.82	10.88 ble 5 121.05 5 31.48 3 -67.82	12.7 131.43 31.48 3 -67.82	141.18 31.48 3 -67.82		(68) (69) (70) (71)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m=	147.7 ng gains 31.48 s and fai s e.g. ev -67.82 heating 65.05	149.23 (calcula 31.48 ns gains 3 vaporatic -67.82 gains (T 63.31	145.37 ited in A 31.48 (Table 8 3 on (nega -67.82 Table 5) 59.72	Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82 54.83	dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82 51.66	uation L 117.02 ion L15 31.48 3 le 5) -67.82 47.2	13 or L1 110.5 or L15a) 31.48 3 -67.82 43.41	3a), also 108.97), also se 31.48 3 -67.82 48.27	31.48 50 50	10.88 ble 5 121.05 5 31.48 3 -67.82 55.05	12.7 131.43 31.48 3 -67.82 60.76	141.18 31.48 3 -67.82 63.33		 (68) (69) (70) (71) (72)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	147.7 ng gains 31.48 s and fa 3 s e.g. ev -67.82 heating 65.05 internal	149.23 (calcula 31.48 ns gains 3 vaporatic -67.82 gains (T 63.31 gains =	145.37 ited in A 31.48 (Table 9 3 on (nega -67.82 fable 5) 59.72	Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82 54.83	dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82 51.66	uation L 117.02 ion L15 31.48 3 le 5) -67.82 47.2 (66)	13 or L1 110.5 or L15a) 31.48 3 -67.82 43.41 m + (67)m	3a), also 108.97), also se 31.48 3 -67.82 48.27 + (68)m +	3.37 9 see Ta 112.83 9e Table 31.48 3 -67.82 50 + (69)m + (69)m + (69)m + (69)m + (100)	10.88 ble 5 121.05 5 31.48 3 -67.82 55.05 (70)m + (7	12.7 131.43 31.48 3 -67.82 60.76 1)m + (72)	141.18 31.48 3 -67.82 63.33 m		 (68) (69) (70) (71) (72)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	147.7 ng gains 31.48 s and fai s e.g. ev -67.82 heating 65.05 internal 277.35	149.23 (calcula 31.48 ns gains 3 /aporatic -67.82 gains (T 63.31 gains = 275.67	145.37 ited in A 31.48 (Table 9 3 on (nega -67.82 Table 5) 59.72 266.03	Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82 54.83 250.61	dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82 51.66 235.24	uation L 117.02 ion L15 31.48 3 le 5) -67.82 47.2 (66) 220.19	13 or L1 110.5 or L15a) 31.48 3 -67.82 43.41 m + (67)m 210.25	3a), also 108.97), also se 31.48 3 -67.82 48.27 1 + (68)m - 215.05	5.37 5 see Ta 112.83 2 e Table 31.48 3 -67.82 50 - (69)m + (222.83	10.88 ble 5 121.05 5 31.48 3 -67.82 55.05 (70)m + (7 238.41	12.7 131.43 31.48 3 -67.82 60.76 1)m + (72) 256.32	141.18 31.48 3 -67.82 63.33 m 269.48		 (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.



Orientation:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.7	x	11.28	×	0.4	x	0.7	=	3.72	(75)
Northeast 0.9x	0.77	x	1.7	x	22.97	×	0.4	x	0.7	i =	7.58	(75)
Northeast 0.9x	0.77	x	1.7	x	41.38	×	0.4	x	0.7	i =	13.65	(75)
Northeast 0.9x	0.77	x	1.7	x	67.96	×	0.4	x	0.7	=	22.42	(75)
Northeast 0.9x	0.77	x	1.7	x	91.35	×	0.4	x	0.7	=	30.13	(75)
Northeast 0.9x	0.77	x	1.7	x	97.38	×	0.4	x	0.7] =	32.12	(75)
Northeast 0.9x	0.77	x	1.7	x	91.1	×	0.4	x	0.7	=	30.05	(75)
Northeast 0.9x	0.77	x	1.7	x	72.63	×	0.4	x	0.7	=	23.96	(75)
Northeast 0.9x	0.77	x	1.7	x	50.42	×	0.4	x	0.7] =	16.63	(75)
Northeast 0.9x	0.77	x	1.7	x	28.07	x	0.4	x	0.7] =	9.26	(75)
Northeast 0.9x	0.77	x	1.7	x	14.2	x	0.4	x	0.7] =	4.68	(75)
Northeast 0.9x	0.77	x	1.7	x	9.21	×	0.4	x	0.7] =	3.04	(75)
Southeast 0.9x	0.77	x	3.26	x	36.79	×	0.4	x	0.7] =	23.27	(77)
Southeast 0.9x	0.77	x	3.26	x	36.79	×	0.4	x	0.7] =	23.27	(77)
Southeast 0.9x	0.77	x	2	x	36.79	×	0.4	x	0.7	=	14.28	(77)
Southeast 0.9x	0.77	x	2	x	36.79	×	0.4	x	0.7] =	14.28	(77)
Southeast 0.9x	0.77	x	3.26	x	62.67	×	0.4	x	0.7] =	39.65	(77)
Southeast 0.9x	0.77	x	3.26	x	62.67	×	0.4	x	0.7	=	39.65	(77)
Southeast 0.9x	0.77	x	2	x	62.67	x	0.4	x	0.7] =	24.32	(77)
Southeast 0.9x	0.77	x	2	x	62.67	×	0.4	x	0.7] =	24.32	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	×	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7] =	54.24	(77)
Southeast 0.9x	0.77	x	2	x	85.75	×	0.4	x	0.7] =	33.28	(77)
Southeast 0.9x	0.77	x	2	x	85.75	×	0.4	x	0.7	=	33.28	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	2	x	106.25	×	0.4	x	0.7	=	41.23	(77)
Southeast 0.9x	0.77	x	2	x	106.25	x	0.4	x	0.7	=	41.23	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	×	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	2	x	119.01	x	0.4	x	0.7	=	46.19	(77)
Southeast 0.9x	0.77	x	2	x	119.01	x	0.4	x	0.7	=	46.19	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	×	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	2	x	118.15	x	0.4	x	0.7] =	45.85	(77)
Southeast 0.9x	0.77	x	2	x	118.15	×	0.4	x	0.7] =	45.85	(77)
Southeast 0.9x	0.77	x	3.26	x	113.91	×	0.4	x	0.7] =	72.06	(77)
Southeast 0.9x	0.77	x	3.26	x	113.91	x	0.4	x	0.7] =	72.06	(77)
Southeast 0.9x	0.77	x	2	x	113.91	x	0.4	x	0.7] =	44.21	(77)



Southea	ast <mark>0.9x</mark>	0.77		x	2		x	1	13.91	x		0.4	x	0.7		=	44.21	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	1	04.39	x		0.4	x	0.7		=	66.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	1	04.39	x		0.4	×	0.7		=	66.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	1	04.39	x		0.4	x	0.7		=	40.51	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	1	04.39) x		0.4	x	0.7		=	40.51	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	9	92.85	x		0.4	×	0.7		=	58.74	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	ę	92.85	x		0.4	×	0.7		=	58.74	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	Ę.	92.85	x		0.4	×	0.7		=	36.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	ę	92.85	x		0.4	×	0.7		=	36.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	e	69.27	x		0.4	x	0.7		=	43.82	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	e	69.27	x		0.4	x	0.7		=	43.82	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	e	69.27	x		0.4	x	0.7		=	26.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	6	69.27	x		0.4	x	0.7		=	26.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	4	44.07	x		0.4	x	0.7		=	27.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	2	44.07	x		0.4	x	0.7		=	27.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	2	44.07	x		0.4	x	0.7		=	17.1	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	2	44.07	x		0.4	x	0.7		=	17.1	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	31.49	x		0.4	×	0.7		=	19.92	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	31.49	x		0.4	x	0.7		=	19.92	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	3	31.49	x		0.4	x	0.7		=	12.22	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	3	31.49	x		0.4	x	0.7		=	12.22	(77)
Solar g	ains in	watts, ca	alcula	ted	for eac	n mont	th		T	(83)m	n = Su	m(74)m	.(82)m				1	(00)
(83)m=	78.83	135.51	188.	7	239.31	273.07		273.3	262.57	237	.05	206.17	150.6	5 94.64	67	.32		(83)
					(04)111 =	= (73)II		03/11	, walls	45	24	400	200.0	7 250.00	220	2 70	1	(84)
(04)11=	330.18	411.10	404.	3	469.92	508.3		193.49	472.83	454	2.1	429	369.0	7 350.96	330	5.79		(04)
7. Me	an inter	rnal temp	eratu	re (heating	seaso	on)					(1.0)						
Temp	erature	during h	eatin	g pe	eriods ir	the liv	ving	area	from Tak	ole 9	, Th1	(°C)					21	(85)
Utilisa	ation fac	tor for ga	ains f	or li	ving are	a, h1,	m (s		able 9a)								1	
(96)m	Jan		IVIE	ar S	Apr	May	/	Jun	Jui		ug	Sep						(96)
(00)11=	I	0.99	0.90	,	0.95	0.87		0.71	0.54	0.8	00	0.81	0.96	0.99		I		(00)
Mean	interna	l tempera	ature	in li	iving are	ea T1	(folle	ow ste	ps 3 to 7	7 in T	Table	9c)		-1			1	
(87)m=	19.77	19.94	20.2	2	20.51	20.78		20.94	20.99	20.	.98	20.88	20.53	3 20.09	19	.74		(87)
Temp	erature	during h	eatin	g pe	eriods ir	rest o	of d	velling) from Ta	able	9, Th	2 (°C)		-			1	
(88)m=	19.91	19.91	19.9	1	19.92	19.92		19.93	19.93	19.	.93	19.93	19.92	2 19.92	19	.92		(88)
Utilisa	ation fac	ctor for ga	ains f	or r	est of d	velling	, h2	2,m (se	e Table	9a)							_	
(89)m=	0.99	0.99	0.97	7	0.93	0.82		0.61	0.42	0.4	46	0.73	0.94	0.99		1		(89)
Mean	interna	l tempera	ature	in t	he rest	of dwe	lling	g T2 (f	ollow ste	eps 3	8 to 7	in Table	e 9c)					
(90)m=	18.81	18.97	19.2	2	19.53	19.78		19.91	19.93	19.	.93	19.87	19.56	6 19.13	18	.78		(90)
												fl	LA = Li	ving area ÷ (4) =		0.48	(91)

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$



(92)m=	19.27	19.44	19.69	20	20.26	20.4	20.44	20.44	20.36	20.03	19.59	19.24		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate	Į	Į		
(93)m=	19.27	19.44	19.69	20	20.26	20.4	20.44	20.44	20.36	20.03	19.59	19.24		(93)
8. Sp	ace hea	ting requ	uirement	t										
Set T	i to the i	mean int	ernal ter	mperatur	e obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	linsation	Eob	Mar		May	lup	lul	Δυσ	Son	Oct	Nov	Dec		
Utilisa	ation fac	tor for a	ains hm). hi	iviay	Jun	Jui	Aug	Seb	001	NOV	Dec		
(94)m=	0.99	0.99	0.97	0.93	0.83	0.66	0.48	0.52	0.77	0.94	0.99	0.99		(94)
Usefu	l gains,	ı hmGm	, W = (94	ـــــــــــــــــــــــــــــــــــــ	4)m									
(95)m=	353.82	405.63	441.43	455.37	424.01	324.84	224.98	234.55	329.51	367.05	346.3	335.06		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	nal tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	-			
(97)m=	911.81	883.93	800.53	667.84	513.92	345.32	228.35	239.65	373.5	566.16	752.71	909.42		(97)
Space	e heatin	g require	ement fo	or each m	nonth, k	Wh/mont	th = 0.02	24 x [(97])m – (95)m] x (4 ⁻	1)m		l	
(98)m=	415.15	321.42	267.17	152.98	66.89	0	0	0	0	148.14	292.62	427.33		٦
								Tota	l per year	(kWh/year	') = Sum(9	8)15,912 =	2091.69	(98)
Space	e heatin	g require	ement in	1 kWh/m²	/year								41.68	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												_
Fracti	on of sp	ace hea	at from s	econdary	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								89.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	ı, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c	calculate	d above)								
	415.15	321.42	267.17	152.98	66.89	0	0	0	0	148.14	292.62	427.33		
(211)m	n = {[(98)m x (20	4)] } x 1	100 ÷ (20	6)		-		-					(211)
	463.85	359.13	298.51	170.92	74.74	0	0	0	0	165.52	326.95	477.46		
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u>_</u>	2337.08	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month									
= {[(98)m x (20	01)] } x 1	00 ÷ (20)8)			r		r		r		1	
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		-
								lota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}		0	(215)
Water	heating]			,									
Output	153 49	ater hea	$\frac{\text{ter}(\text{calc})}{141.53}$	ulated al	00VE)	109.82	104.99	115.88	115.9	131.09	139.24	149 64		
Efficier		ater hea	ter	120.00	120.40	100.02	104.00	110.00	110.0	101.00	100.24	140.04	86.7	7(216)
(217)m-	88 73	88 65	88.51	88 21	87 66	86.7	86 7	86 7	86 7	88 16	88 58	88 76	00.7	(217)
Fuel fo			I	00.2	01.00	L 00.7	00.7	00.7	00.1	00.10	00.00	00.70		()
	n watar	hosting	k \//h/m/	onth										
(219)m	or water <u>1 = (64</u>)	heating, m x 100	kWh/mo (217) ÷ (217)	onth)m										
(219)m (219)m=	or water 1 = (64) 173	heating, m x 10(152.41	kWh/mo) ÷ (217) 159.91	onth)m 143.26	140.85	126.66	121.1	133.66	133.68	148.69	157.2	168.59		



Annual totals	kWh/year	kWh/year	
Space heating fuel used, main system 1		2337.08	
Water heating fuel used		1759.01]
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	80.35]	(230a)
central heating pump:	30]	(230c)
boiler with a fan-assisted flue	45]	(230e)
Total electricity for the above, kWh/year sum of	f (230a)(230g) =	155.35	(231)
Electricity for lighting		232.55	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =	4483.99	(338)	
12a. CO2 emissions – Individual heating systems including micro-CHP			

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	504.81 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	379.95 (264)
Space and water heating	(261) + (262) + (263) + (264) =		884.76 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	80.63 (267)
Electricity for lighting	(232) x	0.519 =	120.69 (268)
Total CO2, kg/year	sum	n of (265)(271) =	1086.07 (272)
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =	21.64 (273)
El rating (section 14)			85 (274)



User Details:	
Assessor Name: Panagiotis Dalapas Stroma Number: STRO	030082
Software Name: Stroma FSAP 2012 Software Version: Versio	n: 1.0.5.41
Property Address: Be Lean-Second Floor Flat	
Address :238 KILBURN HIGH ROAD, LONDON, NW6 2BS	
1. Overall dwelling dimensions:	
Area(m²) Av. Height(m) Ground floor 61.28 (1a) x 2.5 (2a) =	Volume(m³) 153.2 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 61.28 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	153.2 (5)
2. Ventilation rate:	
main secondary other total heating heating	m ³ per hour
Number of chimneys 0 + 0 + 0 = 0 × 40 =	0 (6a)
Number of open flues 0 + 0 = 0 x 20 =	0 (6b)
Number of intermittent fans	0 (7a)
Number of passive vents $0 \times 10 =$	0 (7b)
Number of flueless gas fires $0 \times 40 =$	0 (7c)
Air ch	anges per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	
Number of storeys in the dwelling (ns)	0 (9)
Additional infinitration: $(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	0 (11)
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 $0.25 - [0.2 \times (14) \div 100] =$ (10) (10) (10)	0 (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)
Air permeability value, q50, expressed in cubic metres per nour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ otherwise $(18) = (16)$	3 (17)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.15 (18)
Number of sides sheltered	4 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7 (20)
Infiltration rate incorporating shelter factor (21) = (18) x (20) =	0.1 (21)
Infiltration rate modified for monthly wind speed	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed from Table 7	
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 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 infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.13	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12		
Calculate effec	tive air (change i ition:	rate for t	he appli	cable ca	se						0.5	(220)
If exhaust air he	eat pump i	using Appe	endix N. (2	3b) = (23a	a) x Fmv (e	equation (N	(15)), othe	rwise (23b) = (23a)			0.5	(234)
If balanced with	heat reco	overv: effic	iencv in %	allowing f	or in-use fa	actor (from	n Table 4h) =	, (,			0.5	(230)
a) If halance	d mech:	anical ve	ntilation	with he	at recove	≏rv (M\/⊦	HR) (24a	/ a)m = (2:	2h)m + (23h) x [′	1 – (23c)	<u> </u>	(200)
(24a)m= 0.25	0.24	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(24a)
b) If balance	d mecha	anical ve	ntilation	without	heat rec	covery (N	и ЛV) (24b	m = (22)	1 2b)m + (2	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 of	or positiv	ve input v	ventilatio	n from c	outside					
if (22b)m	า < 0.5 ×	(23b), t	hen (240	c) = (23b); otherv	wise (24	c) = (22k	o) m + 0.	5 × (23b)	-		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft	0.51				
If (22b)m	n = 1, the n = 1	en (24d)	m = (22)	$\frac{1}{2}$ $\frac{1}{2}$	erwise (2	(4a)m = 0	0.5 + [(2	2b)m² x	0.5	0	0	l	(24d)
	ohongo		0) or (2.4k)	$\int_{-\infty}^{0} (24)$	$rac{0}{24}$		(25)	0	0	0		(244)
(25)m = 0.25	0 24		0.23	0 23				0.22	0.23	0.23	0.24		(25)
(20)11- 0.20	0.21	0.21	0.20	0.20	0.21	0.21	0.21	0.22	0.20	0.20	0.21		()
Heat losses	s and he	eat loss p	paramete	er:									
	_												
ELEMENT	Gros area	ss (m²)	Openin m	gs I ²	Net Ar A ,r	rea m²	U-valı W/m2	ue !K	A X U (W/I	K)	k-value kJ/m²∙I		A X k kJ/K
ELEMENT Doors	Gros area	ss (m²)	Openin m	gs I²	Net Ar A ,r 2.15	rea m² x	U-valı W/m2	ue 2K =	A X U (W/I 2.15	K)	k-value kJ/m²·I		A X k kJ/K (26)
ELEMENT Doors Windows Type	Gros area	88 (m²)	Openin m	gs 1 ²	Net Ar A ,r 2.15	ea m² x x ^{1/}	U-valı W/m2 1 /[1/(1.2)+	ue 2K = [.0.04] = [A X U (W/I 2.15 2.27	K)	k-value kJ/m²-I	> <	A X k kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area	SS (m²)	Openin m	gs ²	Net Arr A ,r 2.15 1.98 1.98	ea n ² x x x ¹ / x x ¹ /	U-valı W/m2 [ue K 0.04] = [0.04] = [A X U (W/I 2.15 2.27 2.27	K)	k-value kJ/m²·I	9 <	A X k kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3	5S (m²)	Openin m	gs ²	Net Ar A ,r 2.15 1.98 1.98 1.98	ea n ² x x ^{1/} x ^{1/} x ^{1/}	U-vali W/m2 [ue K 0.04] = [0.04] = [0.04] = [A X U (W/I 2.15 2.27 2.27 2.27	K)	k-value kJ/m²·I	9 K	A X k kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4	ss (m²)	Openin m	gs ²	Net Ar A ,r 2.15 1.98 1.98 1.98	ea n ² x x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/}	U-vali W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	ue K = [0.04] = [0.04] = [0.04] = [A X U (W/I 2.15 2.27 2.27 2.27 2.27 2.27	<>	k-value kJ/m²·I	9 K	A X k kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5	ss (m²)	Openin m	gs ²	Net Ar A ,r 2.15 1.98 1.98 1.98 3.26	ea n ² x x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/}	U-vali W/m2 (1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73	<>	k-value kJ/m²·I	9 {	A X k kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6	ss (m²)	Openin m	gs 2	Net Ar A ,r 2.15 1.98 1.98 1.98 3.26 1.98	ea n ² x x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/}	U-valu W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} \text{ue} \\ \text{K} \\ \hline 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27	<>	k-value kJ/m²·I	≥ ≺	A X k kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7	ss (m²)	Openin m	gs 2	Net Ar A ,r 2.15 1.98 1.98 1.98 1.98 3.26 3.26	ea n ² x x ¹ /	U-vali W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73	<>	k-value kJ/m²·I	9 K	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7 8	ss (m²)	Openin m	gs '²	Net Ar A ,r 2.15 1.98 1.98 1.98 3.26 1.98 3.26 1.76	ea n ² x x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/}	U-vali W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.27	\diamond	k-value kJ/m²·I	≥ ≺	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7 8 59.8	5S (m ²) 38	Openin m	gs ² 3	Net Ar A ,r 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.76 41.7	ea n ² x x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/}	U-vali W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} \text{ue}\\ \text{K}\\ \hline 0.04] = \begin{bmatrix} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \hline 0.04] = \\ \hline \end{array} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.27 3.73		k-value kJ/m²·I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 8 59.8 59.8	5S (m ²) 88 8	Openin m 18.18	gs ² B	Net Ar A ,r 2.15 1.98 1.98 1.98 3.26 1.98 3.26 1.76 41.7 5.48	ea n ² x x ^{1/}	U-value W/m2 1 (1/(1.2)+) (1/(1.2)+ (1/(1.2)+) (1/(1.2)+ (1/(1.2)+) (1/(1.2)+	$ \begin{array}{c} \text{ue}\\ \text{K}\\ = & \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ \end{array} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.02 7.51 1.08		k-value kJ/m²+l		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type3	Gros area 1 2 3 4 5 6 7 8 59.8 5.44 16.3	38 8 37	Openin m 18.18 0 2.15	gs 2 8	Net Ar A ,r 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.76 41.7 5.48	ea n ² x x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾	U-value W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ 0.18 0.2	$\begin{array}{c} \text{ue} \\ \text{S} \\ 0.04 \\ \text{o} \\ 0.04 \\ \text{o} \\ 0.04 \\ \text{o} \\ \text{o} \\ 0.04 \\ \text{o} \\ \text$	A X U (W/I 2.15 2.27 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09		k-value kJ/m²-I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Total area of e	Gros area 1 2 3 4 5 6 7 8 5 9.8 5.44 16.3 lements	38 (m ²) 38 8 37 , m ²	Openin m 18.10 0 2.15	gs ² 3	Net Ar A ,r 2.15 1.98 1.98 1.98 3.26 1.98 3.26 1.98 3.26 1.76 41.7 5.48 14.22 81.73	ea n ² x x ¹ / x ² / x ² / x ³ /	U-value W/m2 $\begin{bmatrix} 1\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ 0.18\\ 0.2\\ 0.22\\ 0.$	$ \begin{array}{c} = \\ 0.04] = \\ 0.04 = \\ $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09		k-value kJ/m²-I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Total area of e Party wall	Gros area 1 2 3 4 5 6 7 8 59.8 59.8 5.44 16.3	38 (m ²) 38 38 37 37 , m ²	Openin m 18.18 0 2.15	gs 2 ² 8	Net Ar A ,r 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.76 41.7 5.48 14.22 81.73 24.18	ea n ² x x ^{1/} x ² x ² x ³ x ³ x ³ x ³ x ³	U-value W/m2 1 (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) 0.18 0.2 0.22 0	$\begin{array}{c} \text{ue} \\ \text{K} \\ = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ = \\ \end{bmatrix}$	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09 0		k-value kJ/m²-I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Total area of e Party wall * for windows and ** include the area	Gross area 1 2 3 4 5 6 7 8 59.8 59.8 59.8 59.8 59.8 16.3 lements roof windows on both	38 (m ²) 38 38 37 , m ² ows, use e sides of ir	Openin m 18.18 0 2.15	gs ² B ndow U-va	Net Ar A ,r 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.98 3.26 1.76 41.7 5.48 14.22 81.73 24.18 alue calculations	ea m ² x x x x x x x x x x x x x x x x x x x	U-value W/m2 $\begin{bmatrix} 1\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ (1/(1.2)+\\ 0.18\\ 0.2\\ 0.22\\ 0.22\\ 0.22\\ 0.22\\ 0.18\\ 0.2\\ 0.22\\ 0$	$\begin{array}{c} \text{ue} \\ \text{SK} \\ = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ 0.04] = \\ 0.0$	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09 0 ue)+0.04] a	K)	k-value kJ/m²-I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

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

Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K

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

(34)

(35)

7043.88

250

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

Indicative Value: Medium



can be u	ised instea	ad of a det	tailed calc	ulation.										
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						11.59	(36)
if details	of therma	l bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			46.24	(37)
Ventila	tion hea	t loss ca	alculated	I monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.49	12.36	12.23	11.56	11.43	10.77	10.77	10.64	11.03	11.43	11.7	11.96		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	58.73	58.6	58.47	57.8	57.67	57.01	57.01	56.87	57.27	57.67	57.94	58.2		
									/	Average =	Sum(39)1.	12 /12=	57.77	(39)
Heat Ic	oss para	meter (H	ILP), W/	′m²K					(40)m	= (39)m ÷	(4)		I	
(40)m=	0.96	0.96	0.95	0.94	0.94	0.93	0.93	0.93	0.93	0.94	0.95	0.95		_
Numbe	er of dav	rs in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁ .	12 /12=	0.94	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
	-	_	-		-		-	_		-		_		
4) 0 / -	1	•												
4. vva	iter neat	ing ener	gy requ	rement:								KVVN/Y	ear:	
Assum	ed occu	ipancy, I	N								2.	02		(42)
if TF	A > 13.9	9, N = 1 N = 1	+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9))2)] + 0.0)013 x (TFA -13.	9)			
Annual	l averad	e hot wa	ater usad	ae in litre	s per da	ıv Vd.av	erade =	(25 x N)	+ 36		82	12		(43)
Reduce	the annua	average	hot water	usage by	5% if the d	welling is	designed t	o achieve	a water us	se target o	f02	.12		(10)
not more	e that 125	litres per p	person per	day (all w	ater use, h	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	90.33	87.04	83.76	80.48	77.19	73.91	73.91	77.19	80.48	83.76	87.04	90.33		
									-	Total = Su	m(44) ₁₁₂ =	-	985.41	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4.$	190 x Vd,r	n x nm x D)Tm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	133.96	117.16	120.9	105.4	101.13	87.27	80.87	92.8	93.91	109.44	119.46	129.73		
									-	Total = Su	m(45) ₁₁₂ =	=	1292.03	(45)
If instant	aneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,) to (61)		-		L	
(46)m=	20.09	17.57	18.13	15.81	15.17	13.09	12.13	13.92	14.09	16.42	17.92	19.46		(46)
Storeg	storage	IOSS:	includir		lor or M		otorogo	within or	mayaa			-		(47)
Sillay				iy any su				(47)		561		0		(47)
Otherw	nunity n visa if no	eating a	ha no la	nk in aw ar (this in	elling, e cludes i	nter 110 nstantar		(47) mbi boili	are) ente	ər '()' in (47)			
Water	storage	loss.	not wate			istantai					47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is knov	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b		,	2,					0		(49)
Energy	lost fro	m water	storage	kWh/ve	ar			(48) x (49)	_			0		(50)
b) If m	anufact	urer's de	eclared of	ylinder l	oss facto	or is not	known:	(40) x (40)				0		(50)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kWł	n/litre/da	ıy)					0		(51)
If comr	nunity h	eating s	ee secti	on 4.3										
Volume	e factor	from Tal	ble 2a									0	,	(52)
Tempe	rature fa	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		(54)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m		0		(00)
(56)m-						0	0	0	0	0	0	0		(56)
lf cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (50	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	(00)
(57)~~		0	0	0,,,			,, (<i>,,</i> ,	, ,	, ,	,	0		(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	ry circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	ry circuit	loss cal	culated I		month (59)m = ((58) ÷ 36 or bootiu	55 × (41)	m Novlindo	r tharma	ctot)			
(110) (59)m=												0		(59)
(00)									Ů	•	Ŭ	•		()
Combi	i loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	55 × (41))m						(04)
(61)m=	32.17	29.01	32.03	30.9	31.87	30.76	31.73	31.82	30.84	31.96	31.04	32.15		(61)
Total h	neat requ	uired for	water he	eating ca	alculatec	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	166.13	146.17	152.93	136.31	133	118.03	112.6	124.62	124.75	141.4	150.51	161.88		(62)
Solar DI	HW input o	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WHRS	applies	, see Ap	pendix (ز از		-			(00)
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter		i	i	i							
(64)m=	166.13	146.17	152.93	136.31	133	118.03	112.6	124.62	124.75	141.4	150.51	161.88		
								Out	out from wa	ater heate	r (annual)₁	12	1668.32	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	ו] + 0.8 ×	(46)m	+ (57)m	+ (59)m]	
(65)m=	52.58	46.21	48.21	42.77	41.59	36.71	34.82	38.81	38.93	44.38	47.48	51.17		(65)
inclu	ude (57)	m in calo	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gain	s (Table	e 5), Wat	ts	-	-			-					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88		(66)
Lightin	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.71	13.95	11.34	8.59	6.42	5.42	5.86	7.61	10.22	12.97	15.14	16.14		(67)
Applia	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	176.16	177.99	173.38	163.58	151.2	139.56	131.79	129.96	134.57	144.38	156.76	168.39		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09		(69)
Pumps														
	s anu iai	is uallis	(Table 5	5a)										
(70)m=		is gains	(Table 5	5a) 3	3	3	3	3	3	3	3	3		(70)
(70)m=		3	(Table 5 3 on (negat	5a) 3 tive valu	3 es) (Tab	3 le 5)	3	3	3	3	3	3		(70)
(70)m= Losses (71)m=	s and fai 3 s e.g. ev	3 aporatic	(Table 5 3 on (negat	5a) 3 tive valu -80.7	3 es) (Tab -80.7	3 le 5) -80.7	3	3	3	3	3	3		(70)
(70)m= Losses (71)m= Water	s e.g. ev	aporatic -80.7	(Table 5 3 on (negat -80.7	5a) 3 tive valu -80.7	3 es) (Tab -80.7	3 le 5) -80.7	3	3	3	3	3 -80.7	3 -80.7		(70) (71)
(70)m= Losses (71)m= Water (72)m=	s e.g. ev -80.7 heating 70.68	aporatic -80.7 gains (1	(Table 5) 3 -80.7 -80.7 -able 5) 64.79	5a) 3 tive valu -80.7	3 es) (Tab -80.7	3 le 5) -80.7	3 -80.7 46.8	3 -80.7 52.16	3 -80.7 54.07	3 -80.7 59.65	3 -80.7 65.95	3 -80.7 68.78		(70) (71) (72)
(70)m= Losses (71)m= Water (72)m=	3 s e.g. ev -80.7 heating 70.68	3 raporatic -80.7 gains (T 68.76	(Table 5 3 on (negat -80.7 able 5) 64.79	5a) 3 tive valu -80.7 59.41	3 es) (Tab -80.7 55.91	3 le 5) -80.7 50.98	3 -80.7 46.8 m + (67)m	3 -80.7 52.16	3 -80.7 54.07	3 -80.7 59.65 (70)m + (7	3 -80.7 65.95	3 -80.7 68.78		(70) (71) (72)
(70)m= Losses (71)m= Water (72)m= Total i	3 s e.g. ev -80.7 heating 70.68 internal	3 aporatic -80.7 gains (1 68.76 gains =	(1 able 5 3 on (negat -80.7 -80.7 -able 5) 64.79 	5a) 3 tive valu -80.7 59.41	3 es) (Tab -80.7 55.91	3 le 5) -80.7 50.98 (66)	3 -80.7 46.8 m + (67)m 240.72	3 -80.7 52.16 + (68)m -	3 -80.7 54.07 + (69)m + (255.13	3 -80.7 59.65 (70)m + (7 273.26	3 -80.7 65.95 1)m + (72) 294 11	3 -80.7 68.78 m		 (70) (71) (72) (73)

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	1.76	x	11.28	×	0.4	x	0.7] =	3.85	(75)
Northeast 0.9x	0.77	x	1.76	x	22.97	×	0.4	x	0.7	i =	7.84	(75)
Northeast 0.9x	0.77	x	1.76	x	41.38	×	0.4	x	0.7	i =	14.13	(75)
Northeast 0.9x	0.77	x	1.76	x	67.96	×	0.4	x	0.7	=	23.21	(75)
Northeast 0.9x	0.77	x	1.76	x	91.35	×	0.4	x	0.7	=	31.2	(75)
Northeast 0.9x	0.77	x	1.76	x	97.38	×	0.4	x	0.7] =	33.26	(75)
Northeast 0.9x	0.77	x	1.76	x	91.1	x	0.4	x	0.7] =	31.11	(75)
Northeast 0.9x	0.77	x	1.76	x	72.63	x	0.4	x	0.7] =	24.8	(75)
Northeast 0.9x	0.77	x	1.76	x	50.42	×	0.4	x	0.7	=	17.22	(75)
Northeast 0.9x	0.77	x	1.76	x	28.07	×	0.4	x	0.7	=	9.59	(75)
Northeast 0.9x	0.77	x	1.76	x	14.2	x	0.4	x	0.7] =	4.85	(75)
Northeast 0.9x	0.77	x	1.76	x	9.21	×	0.4	x	0.7	=	3.15	(75)
Southeast 0.9x	0.77	x	1.98	x	36.79	×	0.4	x	0.7	=	14.14	(77)
Southeast 0.9x	0.77	x	3.26	x	36.79	x	0.4	x	0.7	=	23.27	(77)
Southeast 0.9x	0.77	x	1.98	x	36.79	×	0.4	x	0.7	=	14.14	– (77)
Southeast 0.9x	0.77	x	3.26	x	36.79	×	0.4	x	0.7	=	23.27	(77)
Southeast 0.9x	0.77	x	1.98	x	62.67	×	0.4	x	0.7	=	24.08	(77)
Southeast 0.9x	0.77	x	3.26	x	62.67	×	0.4	x	0.7	=	39.65	(77)
Southeast 0.9x	0.77	x	1.98	x	62.67	×	0.4	x	0.7	=	24.08	(77)
Southeast 0.9x	0.77	x	3.26	x	62.67	x	0.4	x	0.7	=	39.65	(77)
Southeast 0.9x	0.77	x	1.98	x	85.75	×	0.4	x	0.7	=	32.95	– (77)
Southeast 0.9x	0.77	x	3.26	x	85.75	×	0.4	x	0.7] =	54.24	(77)
Southeast 0.9x	0.77	x	1.98	x	85.75	×	0.4	x	0.7] =	32.95	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7] =	54.24	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7] =	40.82	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	×	0.4	x	0.7] =	67.21	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	×	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7] =	45.39	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	×	0.4	x	0.7] =	74.74	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	×	0.4	x	0.7] =	43.76	(77)
Southeast 0.9x	0.77	x	3.26	x	113.91	x	0.4	x	0.7	=	72.06	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	×	0.4	x	0.7	=	43.76	(77)



Southeast 0.9x	0.77	x	3.26	x	113.91	x	0.4	x	0.7] =	72.06	(77)
Southeast 0.9x	0.77	x	1.98	x	104.39	×	0.4	x	0.7	j =	40.11	(77)
Southeast 0.9x	0.77	x	3.26	x	104.39	×	0.4	x	0.7	=	66.03	(77)
Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7] =	40.11	(77)
Southeast 0.9x	0.77	x	3.26	x	104.39	x	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7] =	35.67	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7	=	35.67	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7] =	58.74	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	3.26	x	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	3.26	x	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7] =	12.1	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7] =	12.1	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southwest0.9x	0.77	x	1.98	x	36.79]	0.4	x	0.7	=	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	36.79		0.4	x	0.7	=	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	36.79]	0.4	x	0.7	=	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest0.9x	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest0.9x	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest0.9x	0.77	x	1.98	x	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest0.9x	0.77	x	1.98	x	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest0.9x	0.77	x	1.98	x	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest0.9x	0.77	x	1.98	x	106.25		0.4	x	0.7	=	40.82	(79)
Southwest0.9x	0.77	x	1.98	x	106.25]	0.4	x	0.7	=	40.82	(79)
Southwest0.9x	0.77	x	1.98	x	106.25]	0.4	x	0.7	=	40.82	(79)
Southwest0.9x	0.77	x	1.98	x	119.01]	0.4	x	0.7	=	45.72	(79)
Southwest0.9x	0.77	x	1.98	x	119.01]	0.4	x	0.7	=	45.72	(79)
Southwest0.9x	0.77	x	1.98	x	119.01]	0.4	x	0.7] =	45.72	(79)
Southwest _{0.9x}	0.77	x	1.98	×	118.15]	0.4	×	0.7] =	45.39	(79)
Southwest0.9x	0.77	x	1.98	x	118.15]	0.4	x	0.7] =	45.39	(79)
Southwest _{0.9x}	0.77	x	1.98	x	118.15]	0.4	x	0.7	=	45.39	(79)
Southwest _{0.9x}	0.77	x	1.98	x	113.91]	0.4	x	0.7	=	43.76	(79)
Southwest _{0.9x}	0.77	x	1.98	x	113.91]	0.4	x	0.7	=	43.76	(79)



Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	1	13.91	Ι Γ	0.4	x	0.7	=	43	.76	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	1	04.39	ΪĒ	0.4	x	0.7	=	40	.11	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	1	04.39	ΪĒ	0.4	x	0.7	=	40	.11	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	1	04.39	ίĒ	0.4	x	0.7	=	40	.11	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	g	2.85	ίĒ	0.4	×	0.7	=	35	.67	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	g	2.85	ίĒ	0.4	x	0.7	=	35	.67	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	9	2.85	ίĒ	0.4	×	0.7	= =	35	.67	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.9	98	x	6	9.27	ίĒ	0.4	x	0.7	=	26	.61	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.9	98	x	6	9.27	ίĒ	0.4	×	0.7	= =	26	.61	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	6	9.27	ίĒ	0.4	×	0.7	= =	26	.61	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.9	98	x	4	4.07	ίĒ	0.4	x	0.7	=	16	.93	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.9	98	x	4	4.07	ίĒ	0.4	×	0.7	= =	16	.93	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	4	4.07	ίĒ	0.4	×	0.7	=	16	.93	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.9	98	x	3	31.49	ίĒ	0.4	×	0.7	=	12	2.1	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	3	31.49	ίĒ	0.4	×	0.7	=	12	2.1	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	3	31.49	ίĒ	0.4	×	0.7	= =	12	2.1	(79)
Solar ((83)m= Total g	gains in 121.08 gains – in	watts, ca 207.53 nternal ar	lculated 287.35 nd solar	for eac 361.74 (84)m =	h mont 410.38 = (73)m	:h 3 4 1 + (409.7 (83)m	394.04 , watts	<mark>(83)m</mark> : 357.4	= Sum(74)m . 1 313.06	(<mark>82)m</mark> 230.28	3 145.26	103.47			(83)
(84)m=	439.89	524.49	593.14	649.58	680.17	7 6	61.93	634.76	603.4	1 568.18	503.54	4 439.37	413.05	7		(84)
7. Me	ean inter	nal temp	erature	(heating	seaso	n)										
7. Me Temp	ean inter perature	nal tempo during he	erature eating p	(heating eriods ir	i seaso n the liv	on) ving	area	from Tat	ole 9, [°]	Th1 (°C)				2	:1	(85)
7. Me Temp Utilisa	ean inter perature ation fac	nal tempo during he ctor for ga	erature (eating p ains for l	(heating eriods ir iving are	seaso n the live a, h1,i	ving m (s	area f see Ta	from Tat ble 9a)	ole 9, [°]	Th1 (°C)				2	:1	(85)
7. Me Temp Utilisa	ean inter perature ation fac Jan	nal tempo during he ctor for ga Feb	erature eating p lins for I Mar	(heating eriods ir iving are Apr	seaso n the liv ea, h1,i May	on) /ing m (s /	area t see Ta Jun	from Tat ble 9a) Jul	ole 9, ⁻ Au	Th1 (°C) g Sep	Oct	Nov	Dec	 	1	(85)
7. Me Temp Utilisa (86)m=	ean inter perature ation fac Jan 0.99	nal tempo during he ctor for ga Feb 0.99	erature eating p lins for I Mar 0.96	(heating eriods ir iving are Apr 0.88	seaso n the liv ea, h1,i May 0.74	on) /ing m (s /	area f see Ta Jun 0.54	from Tab ble 9a) Jul 0.39	ole 9, Au 0.43	Th1 (°C) g Sep 0.67	Oct 0.92	Nov 0.99	Dec 1	2	1	(85)
7. Me Temp Utilisa (86)m= Mean	ean inter perature ation fac Jan 0.99	nal tempo during he ctor for ga Feb 0.99	erature eating p lins for I Mar 0.96	(heating eriods ir iving are Apr 0.88 iving are	seaso n the liv ea, h1,i May 0.74 ea T1 (n) ving m (s /	area f see Ta Jun 0.54	from Tab ble 9a) Jul 0.39 ps 3 to 7	ole 9, Au 0.43 7 in Ta	Th1 (°C) g Sep 0.67 ble 9c)	Oct 0.92	Nov 0.99	Dec 1	2	1	(85)
7. Me Temp Utilisa (86)m= Mean (87)m=	ean inter perature ation fac Jan 0.99 interna 20.14	nal temperative during he	erature eating p tins for I Mar 0.96 ature in I 20.56	(heating eriods ir iving are Apr 0.88 iving are 20.8	seaso n the liv ea, h1,i May 0.74 ea T1 (20.95	on) ving m (s / (follo	area f see Ta Jun 0.54 ow ste 20.99	from Tab ble 9a) Jul 0.39 ps 3 to 7 21	Die 9, Au 0.43 7 in Ta 21	Th1 (°C) g Sep 0.67 ble 9c) 20.98	Oct 0.92 20.78	Nov 0.99 20.41	Dec 1 20.1	[2]]	1	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp	ean inter perature ation fac Jan 0.99 interna 20.14	during he during he ctor for ga Feb 0.99 I tempera 20.32 during he	erature eating p ins for I Mar 0.96 ature in I 20.56	(heating eriods ir iving are Apr 0.88 iving are 20.8 eriods ir	seaso n the liv ea, h1,i May 0.74 ea T1 (20.95	on) ving m (s / (follo 2 of dw	area f see Ta Jun 0.54 ow ste 20.99 velling	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta	ole 9, Au 0.43 7 in Ta 21 able 9.	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C)	Oct 0.92 20.78	Nov 0.99 20.41	Dec 1 20.1	2]]	1	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	ean inter perature ation fac Jan 0.99 interna 20.14 perature 20.12	nal tempo during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12	erature eating p tins for I Mar 0.96 ature in I 20.56 eating p 20.12	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13	seaso n the liv ea, h1, May 0.74 ea T1 (20.95 n rest c 20.13	on) ving m (s / (follo	area f see Ta Jun 0.54 ow ste 20.99 velling 20.14	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14	Au 0.43 7 in Ta 21 able 9, 20.1	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14	Oct 0.92 20.78 20.13	Nov 0.99 20.41 20.13	Dec 1 20.1 20.13	[2]]]	1	(85) (86) (87) (88)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	ean inter perature ation fac Jan 0.99 interna 20.14 perature 20.12	nal tempo during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12	erature eating p lins for I Mar 0.96 ature in I 20.56 eating p 20.12	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13	seaso n the live ea, h1,i May 0.74 ea T1 (20.95 n rest c 20.13	n) ving m (s / (follo (follo 2 (follo 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	area 1 see Ta Jun 0.54 ow ste 20.99 velling 20.14	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14	Au 0.43 7 in Ta 21 able 9, 20.14	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14	Oct 0.92 20.78 20.13	Nov 0.99 20.41 20.13	Dec 1 20.1 20.13	[2]]]	1	(85) (86) (87) (88)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99	nal temper during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dr 0.85	seaso n the live ea, h1,i May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68	n) wing m (s / (follc (follc) f dw 1, h2	area 1 see Ta Jun 0.54 ow ste 20.99 velling 20.14 ,m (se 0.47	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32	Au 0.43 7 in Ta 21 able 9, 20.1 9a) 0.35	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14	Oct 0.92 20.78 20.13	Nov 0.99 20.41 20.13	Dec 1 20.1 20.13]]]	1	(85) (86) (87) (88) (88)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Moon	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99	nal tempo during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga	erature eating p nins for I Mar 0.96 ature in I 20.56 eating p 20.12 nins for r 0.95	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dr 0.85	seaso n the live ea, h1, i May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68	n) ving m (s / (follo (follo) f dw 1, h2	area 1 see Ta Jun 0.54 20.99 velling 20.14 ,m (se 0.47	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32	Au 0.43 7 in Ta 21 able 9, 20.11 9a) 0.35	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0.6	Oct 0.92 20.78 20.13 0.89	Nov 0.99 20.41 20.13 0.98	Dec 1 20.1 20.13]]]	1	(85) (86) (87) (88) (89)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna	nal tempor during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in 1 19.75	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 est of dr 0.85 the rest	seaso n the live ea, h1, i May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68 of dwe 20.1	n) ving m (s / (follo (follo (follo), h2) h2) h2),	area 1 see Ta Jun 0.54 20.99 velling 20.14 ,m (se 0.47 172 (fe 20.14	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14	Au 0.43 0.43 7 in Ta 21 able 9, 20.14 9a) 0.35 eps 3 f 20.14	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13	Oct 0.92 20.78 20.13 0.89 e 9c)	Nov 0.99 20.41 20.13 0.98	Dec 1 20.1 20.13]]]]	1	(85) (86) (87) (88) (89) (90)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34	nal tempor during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in 1 19.75	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dr 0.85 the rest 19.98	seaso n the live ea, h1, i May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68 of dwe 20.1	n) ving m (s / (follc (follc 1 2 1 1, h2 1 1 1 1 1 1 2 1 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 1 1 2 1 2 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1	area 1 see Ta Jun 0.54 20.99 velling 20.14 ,m (se 0.47 12 (fr 20.14	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14	Au 0.43 0.43 7 in Ta 21 able 9, 20.14 9a) 0.35 eps 3 f 20.14	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv	Nov 0.99 20.41 20.13 0.98 19.61	Dec 1 20.1 20.13 1 19.3 4) =		45	(85) (86) (87) (88) (89) (90) (90)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34	nal tempor during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in 1 19.75	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dr 0.85 the rest 19.98	seaso a the live ea, h1, I May 0.74 ea T1 (20.95 a rest of 20.13 welling 0.68 of dwe 20.1	n) ving m (s / / (follc 2 (follc 2 2 3 4 4 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2	area 1 see Ta Jun 0.54 20.99 velling 20.14 ,m (se 0.47 1 T2 (fr 20.14	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14	Au 0.43 7 in Ta 21 able 9, 20.17 9a) 0.35 eps 3 t 20.17	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13 f	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4	Dec 1 20.1 20.13 1 19.3 4) =		45	(85) (86) (87) (88) (89) (90) (91)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an internation factor Jan 0.99 interna 20.14 oerature 20.12 ation factor 0.99 interna 19.34	nal temp during he ctor for ga 0.99 I temperation 20.32 during he 20.12 ctor for ga 0.98 I temperation 19.52	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in 1 19.75	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dv 0.85 the rest 19.98	seaso n the live ea, h1, I May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68 of dwe 20.1	n) ving m (s / (follc (follc (follc 1, h2 1,	area f see Ta Jun 0.54 0.5	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14	Au 0.43 0.43 7 in Ta 21 able 9, 20.11 9a) 0.35 eps 3 1 20.11 + (1 - 20.5	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 20.14 0.6 0 7 in Tabl 20.13 fLA) x T2 20.51	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4	Dec 1 20.1 20.13 1 19.3 4) =		45	(85) (86) (87) (88) (89) (90) (91)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m=	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34 interna	nal tempor during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52 I tempera 19.88	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in 1 19.75 ature (fo 20.11	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dr 0.85 the rest 19.98 r the wh 20.35	seaso n the live ea, h1, i May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68 of dwe 20.1 ole dw 20.48	n) ving m (s / (follc (follc (follc) (follc) (follc) (follc) (follc) (follc) (follc) (follc) (follc) (follc)) (follc)) (follc))) (follc)))) (follc))))) (follc)))))))))))))	area f see Ta Jun 0.54 0.52 0.52 0.52	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14 LA × T1 20.52 m Table	Au 0.43 7 in Ta 21 able 9, 20.1 9a) 0.35 eps 3 t 20.1 + (1 - 20.5 46 yr	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13 f fLA) × T2 2 20.51 bere approximates	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv 20.33	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4) 19.97	Dec 1 20.1 20.13 1 19.3 4) = 19.66		45	(85) (86) (87) (88) (89) (90) (91) (92)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m=	an interna perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34 interna 19.69 r adjustn 19.69	nal tempor during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52 I tempera 19.88 nent to th	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in 1 19.75 ature (fo 20.11 ie mean 20.11	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 est of dr 0.85 the rest 19.98 r the wh 20.35 internal 20.35	seaso a the live aa, h1, May 0.74 ea T1 (20.95 a rest of 20.13 welling 0.68 of dwe 20.1 oole dwe 20.48 1 tempe 20.48	n) ving m (s / (follc (fo	area 1 see Ta Jun 0.54 20.99 velling 20.14 ,m (se 0.47 0.47 0.47 20.14 mg) = fl 20.52 ure fro 20.52	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14 LA × T1 20.52 m Table 20.52	 Au 0.43 7 in Ta 21 able 9, 20.1 able 9, 20.1 9a) 0.35 eps 3 f 20.1 4e, w 20.5 	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13 f fLA) × T2 2 20.51 here approx 2 20.51	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv 20.33 opriate 20.33	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4 19.97	Dec 1 20.1 20.13 1 19.3 4) = 19.66		45	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m=	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34 interna 19.69 v adjustn 19.69 ace hea	nal tempor during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52 I tempera 19.88 nent to th 19.88 ting requ	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in I 19.75 ature (fo 20.11 ie mean 20.11	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dv 0.85 the rest 19.98 r the wh 20.35 internal 20.35	seaso n the live ea, h1,i May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68 of dwe 20.1 welling 0.68 of dwe 20.1 welling 0.68 of dwe 20.1	n) ving m (s / (follc (follc i, h2 i i, h2 i i, h2 i i i i i i i i i i i i i i i i i i i	area f see Ta Jun 0.54 0.54 0.54 0.54 0.54 0.54 0.52 0.14 0.47 0.47 0.47 0.47 0.47 0.47 0.47 0.47 0.52 0.52 0.52 0.52	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14 LA × T1 20.52 m Table 20.52	Au 0.43 7 in Ta 21 able 9, 20.13 9a) 0.35 298 3 1 20.14 + (1 - 20.53 4e, w 20.53	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 20.14 0.6 0 7 in Tabl 20.13 f LA) x T2 2 20.51 here approx 2 20.51	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv 20.33 opriate 20.33	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4 19.97	Dec 1 20.1 20.13 1 19.3 4) = 19.66		45	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Sp Set T	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34 interna 19.69 r adjustn 19.69 r adjustn 19.69 r adjustn	nal temp during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52 I tempera 19.88 nent to th 19.88 nent to th 19.88 nent to th 19.88 nent to th	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in I 19.75 ature (fo 20.11 ie mean 20.11 irement ernal ten	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dr 0.85 the rest 19.98 r the wh 20.35 internal 20.35	seaso n the live ea, h1, I May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68 of dwe 20.1 nole dw 20.48 tempe 20.48 re obta	n) ving m (s / / (follc (follc 2 (follc 2 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	area f see Ta Jun 0.54 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14 LA × T1 20.52 m Table 20.52	Au 0.43 7 in Ta 21 able 9, 20.1 9a) 0.35 eps 3 1 20.1 + (1 - 20.5 4e, w 20.5 4e, w 20.5 Table	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13 fLA) × T2 2 20.51 here appro 2 20.51 9b, so tha	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv 20.33 opriate 20.33 t Ti,m=	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4 19.97 19.97 =(76)m an	Dec 1 20.1 20.13 1 19.3 4) = 19.66 19.66 d re-ca	2]]]]]]]]]]]]]]]]]]]	45	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Sp Set T the ut	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34 interna 19.69 adjustra 19.69 ace hea i to the n tillisation	nal temp during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52 I tempera 19.88 nent to th 19.88 nent to th 19.88 ting requ mean inte factor for	erature in l mar 0.96 ature in l 20.56 eating p 20.12 ature in l 20.12 ature in l 20.12 ature in l 19.75 ature (fo 20.11 ie mean 20.11 irement ernal ten r gains u	(heating eriods ir iving are Apr 0.88 iving are 20.8 eriods ir 20.13 est of dr 0.85 the rest 19.98 r the wh 20.35 internal 20.35	seaso a the live aa, h1,i May 0.74 ea T1 (20.95 a rest c 20.13 welling 0.68 of dwe 20.1 ole dw 20.13 welling 0.68 of dwe 20.1 ole dw 20.48 tempe 20.48 re obta able 9a	n) ving m (s / (follc (follc (follc i, h2 i, h2 velling velling velling inec	area 1 see Ta Jun 0.54 20.99 velling 20.14 ,m (se 0.47 0 T2 (fa 20.14 20.52 ure fro 20.52 Jure fro 20.52	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14 LA × T1 20.52 m Table 20.52 m Table	Au 0.43 0.43 7 in Ta 21 able 9, 20.11 able 9, 20.11 9a) 0.35 eps 3 f 20.11 + (1 - 20.51 44e, w 20.51 Table	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13 f fLA) × T2 2 20.51 here appro 2 20.51 so that	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv 20.33 ppriate 20.33 t Ti,m=	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4 19.97 19.97 (76)m an	Dec 1 20.1 20.13 1 19.3 4) = 19.66 19.66 d re-ca	2]]]]]]]]]]]]]]]]]]]	45	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)



Utilisa	ation fac	tor for a	ains. hm	:										
(94)m=	0.99	0.98	0.95	0.86	0.71	0.51	0.35	0.39	0.63	0.9	0.98	0.99		(94)
Usefu	ul gains,	hmGm ,	, W = (94	4)m x (84	ـــــــــــــــــــــــــــــــــــــ			1						
(95)m=	436.48	513.75	561.91	560.6	480.28	334.48	223.42	234.09	356.77	451.97	431.18	410.73		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	904.12	877.72	795.71	661.7	506.15	337.46	223.71	234.59	366.86	561.29	745.56	899.76		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	h = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	347.92	244.59	173.95	72.79	19.25	0	0	0	0	81.34	226.36	363.84		-
								Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	1530.03	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year							[24.97	(99)
9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:										-		_
Fracti	ion of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	– (201) =				1	(202)
Fracti	ion of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		Ī	1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1							Ī	89.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %					ļ	0	(208)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec	kWh/vea	⊐ ar
Space	e heatin	g require	ement (c	alculate	d above)								
•	347.92	244.59	173.95	72.79	19.25	0	0	0	0	81.34	226.36	363.84		
(211)m	ר 1 = {[(98)m x (20	4)] } x 1	00 ÷ (20)6)									(211)
()	388.74	273.28	194.35	81.33	21.5	0	0	0	0	90.88	252.92	406.52		
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	1709.53	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							L		
= {[(98)m x (20)1)]}x1	00 ÷ (20	8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	ll (kWh/yea	ar) =Sum(2	215) _{15,1012}	-	0	(215)
Water	heating	1										•		-
Output	from w	ater hea	ter (calc	ulated a	bove)									
	166.13	146.17	152.93	136.31	133	118.03	112.6	124.62	124.75	141.4	150.51	161.88		-
Efficier	ncy of w	ater hea	iter								i		86.7	(216)
(217)m=	88.58	88.43	88.17	87.65	87.04	86.7	86.7	86.7	86.7	87.7	88.36	88.62		(217)
Fuel fo	or water	heating,	kWh/m	onth										
(219)m	1 = (64)	M X 100	$\frac{1}{17345}$	m 155.5	152.8	136 14	129.88	143 74	143 88	161 23	170.33	182 67		
()							0.00	Tota	I = Sum(2 ⁻	19a), =			1902 46	7(210)
Δnnua	al totale								```	r112	Wh/vear	. l	kWh/voar	
Space	heating	fuel use	ed, main	system	1					ň	year	[1709.53	٦
Wator	haating	fuel แระ	ď	-								L T	1002.46	
vvaler	nearing	iuei use	u										1902.46	1

Electricity for pumps, fans and electric keep-hot



mechanical ventilation - balanced, extract or positive input from outside			98.12		(230a)
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	city for the above, kWh/year sum of (230a)(230g) =		[173.12	(231)
Electricity for lighting			[277.36	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =				4062.47	(338)
12a. CO2 emissions – Individual heating systems including micro-CHP					
	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216	= [369.26	(261)
Space heating (secondary)	(215) x	0.519	= [0	(263)
Water heating	(219) x	0.216	= [410.93	(264)
Space and water heating	(261) + (262) + (263) + (264) =		[780.19	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= [89.85	(267)
Electricity for lighting	(232) x	0.519	= [143.95	(268)
Total CO2, kg/year	sum	of (265)(271) =	[1013.99	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			16.55	(273)
El rating (section 14)			[87	(274)


			User D	etails:						
Assessor Name:	Panagiotis	Dalapas		Strom	a Num	ber:		STRO	030082	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versio	on: 1.0.5.41	
		Р	roperty a	Address:	Be Lea	n-Top Fl	loor Flat			
Address :	238 KILBUF	RN HIGH ROAD	, LONDO	ON, NWE	6 2BS					
1. Overall dwelling dimer	isions:									
Ground floor				a(m²) 02.92	(1a) x	Av. He i	i ght(m) .45	(2a) =	252.15	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+((1d)+(1e)+(1r	ר) (ו	02.92	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	252.15	(5)
2. Ventilation rate:	main			athau		totol				
Number of chimneys	heating	heating	у] + [_] -] = [0	x 4	40 =	0	(6a)
Number of open flues	0	÷ 0		0	」⁼∟	0	× 2	20 =	0	(6b)
Number of intermittent fan	S					0	x 1	10 =	0	(7a)
Number of passive vents						0	x 1	10 =	0	(7b)
Number of flueless gas fire	es				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	_ ur
Infiltration due to chimney	e flues and f	anc = (6a) + (6b) + (7b)	/a)+(7h)+(7c) -	Г			. (E)		
If a pressurisation test has be	en carried out or	r is intended, procee	d to (17), d	otherwise d	continue fro	0 0 (9) to ((16)	, (၁) =	0	(0)
Number of storeys in the	e dwelling (ns	5)	()/				,		0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	25 for steel or sent, use the va ns); if equal user	timber frame or lue corresponding to 0.35	0.35 foi the great	r masonr er wall are	y constr a (after	uction			0	(11)
If suspended wooden flo	por, enter 0.2	(unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else e	enter 0							0	(13)
Window infiltration	and doors dr	augnt stripped		0 25 - [0 2	x (14) ∸ 1	001 =			0	
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(15)
Air permeability value, o	50. expresse	ed in cubic metre	s per ho	our per so	ouare m	etre of e	nvelope	area	3	(17)
If based on air permeabilit	y value, then	(18) = [(17) ÷ 20]+(8), otherwi	se (18) = (16)				0.15	(18)
Air permeability value applies	if a pressurisatio	on test has been dor	ne or a deg	gree air pei	rmeability i	is being us	sed			
Number of sides sheltered	l			(00)	0.075 (4	0.1			2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter fac	tor		(21) = (18)) x (20) =				0.13	(21)
Infiltration rate modified to	r monthly win		1.1	A	0	Ort	Neur	Dec	1	
	viar Apr	_ way Jun ⊸	Jui	Aug	Sep	Uct	INOV	Dec	J	
Monthly average wind spe	ed trom Tabl	e /	2.0	0.7	А	4.0	AE	47	1	
(22)111= 0.1 0 2	4.9 4.4	4.3 3.8	3.8	3.1	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22)$)m ÷ 4			1					1	
(22a)m= 1.27 1.25 1	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		



Adjusted infilt	ration rat	e (allow	ing for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe	ective air	change	rate for t	he appli	cable ca	se						0.5	(232)
If exhaust air h	neat pump	usina App	endix N. (2	3b) = (23a) × Fmv (e	auation (N	15)) . othe	rwise (23b) = (23a)			0.5	(23a)
If balanced wit	th heat reco	overy: effic	ciency in %	allowing for	or in-use fa	actor (from	n Table 4h) =	, (,			76.5	(23c)
a) If balanc	ed mech	, anical ve	entilation	with her	at recove	erv (MVH	HR) (24a) m = (22	2b)m + (2	23b) x [′	l – (23c)	- 1001	(200)
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(24a)
b) If balanc	ed mech	anical ve	entilation	without	heat rec	overy (N	I /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 I	house ex m < 0.5 x	tract ver	ntilation of then (24)	or positiv	e input v	ventilatio	on from c	butside m + 0	5 x (23h)	1		
(24c)m= 0	0	0		0	0	0	0	0	0	0	0		(24c)
d) If natural	ventilati	on or wh	nole hous	se positiv	re input y	ventilatio	n from l	oft					
if (22b)	m = 1, th	en (24d))m = (22l	o)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	r change	rate - ei	nter (24a) or (24b) or (240	c) or (24	d) in boy	k (25)			-		
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros	SS	Openin	gs	Net Are	ea	U-valu	ue	ΑXU		k-value	9	AXk
	area	(m²)	rr	1 ²	A ,n	∩²	W/m2	2K	(W/ł	<)	kJ/m²·l	<	KJ/K
Doors	area	(m²)	ſſ	1 ²	A ,n 2.15	∩² ×	W/m2	:к = [(W/ł 2.15	<)	kJ/m²₊I	ζ.	KJ/K (26)
Doors Windows Typ	area e 1	(m²)	ſſ	J ²	A ,n 2.15 1.98	∩² x x1/	W/m2 1 /[1/(1.2)+	2K = [0.04] = [(W/ł 2.15 2.27	<) 	kJ/m²∙I	ζ.	KJ/K (26) (27)
Doors Windows Typ Windows Typ	area e 1 e 2	(m²)	rr	12	A ,n 2.15 1.98 1.98	n ² x x ^{1/} x ^{1/}	W/m2 1 /[1/(1.2)+ /[1/(1.2)+	K 0.04] = [0.04] = [(W/ł 2.15 2.27 2.27	<) 	kJ/m²•I	ζ.	KJ/K (26) (27) (27)
Doors Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3	(m²)	rr	12	A ,n 2.15 1.98 1.98 1.98	n ² x x x 1/ x 1/ x 1/ x 1/ x 1/	W/m2 1 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ $	(W/ł 2.15 2.27 2.27 2.27		kJ/m²∙I	<	KJ/K (26) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4	(m²)	rr	12	A ,n 2.15 1.98 1.98 1.98 1.98	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$K = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04$	(W/ł 2.15 2.27 2.27 2.27 2.27	\diamond	kJ/m²·I	<.	KJ/K (26) (27) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 [1/(1.2)+ [1/(1.2)+ [1/(1.2)+ [1/(1.2)+ [1/(1.2)+ [1/(1.2)+	$K = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27	\diamond	kJ/m²·I	<.	KJ/K (26) (27) (27) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27	\diamond	kJ/m²·I	<.	KJ/K (26) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} $	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²·I	<.	KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²·I	<.	KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98	n ² x x x x x x x x x x x x x x x x x x x	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²-I	<.	KJ/K (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	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26	n ² x x x x x x x x x x x x x x x x x x x	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \\ = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²-I	ς	KJ/K (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 Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 3.26	n ² x x x x x x x x x x x x x x x x x x x	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \\ = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²-I	<.	KJ/K (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 Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 3.26 1.87 1.2	$\begin{array}{c c} n^{2} & x \\ x^{1/} \\ $	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \\ = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²-I	ς	KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 [128	.(m ²)	m 26.7	1	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 (1/(1.2)+) (1/(1.2)+ (1/(1.2)+) (1/(1.2)+) (1/(1.2)+ (1/(1.2)+)) (1/(1.2)+))	$\begin{array}{c} \mathbf{K} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ 0.04] &= \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= $	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	<pre>> </pre>	kJ/m²-I	< <	 KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29)
Doors Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> 22.8	.4 33	m 	1	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 $(1/(1.2)+)$ $(1/(1$	$\begin{array}{c} \mathbf{K} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ 0.04] &= \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ 0.04] &= \\ 0.04] &= \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	<>	kJ/m²-I		KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>22.8</u> <u>19.2</u>	.4 33 21	m 26.7 0 2.15	1	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 3.26 1.87 1.2 101.69 22.83 17.06	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 $(1/(1.2)+)$ $(1/(1$	$\begin{array}{c} \mathbf{K} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ 0.04] &= $	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	<pre>> </pre>	kJ/m²-I		 KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)
Doors Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>22.8</u> <u>19.2</u>	.4 33 21 92	m 26.7 0 2.15 0	1;	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 3.26 1.87 1.2 101.69 22.83 17.06 102.92	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 [1/(1.2)+ [1	$\begin{array}{c} \mathbf{K} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04]$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\[\lefty \] \[\l	kJ/m²-I		 KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29) (29) (30)
Doors Windows Typ Windows pe1 Walls Type2 Walls Type3 Roof Total area of o	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>19.2</u> elements	.4 33 21 92 5, m ²	m 26.7 0 2.15 0	1 	A ,n 2.15 1.98	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 $(1/(1.2)+)$ $(1/(1$	$\begin{array}{c} \mathbf{K} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ 0.04] &= \begin{bmatrix} \\ \\ \\ 0.04] &= \begin{bmatrix} \\ \\ \\ 0.04] &= \begin{bmatrix} \\ \\ 0.04] &= \begin{bmatrix} \\ \\ 0.04] &= \begin{bmatrix} \\ \\ 0.04] &= \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ 0.04] &= \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ 0.04] &= \\ 0.04] &= \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ $	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2		kJ/m²-I		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) =

72.64 (33)



Heat o	capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	16692.33	(34)
Therm	al mass	parame	ter (TMF		- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35)
For des can be	ign assess used inste	ments wh ad of a dei	ere the de tailed calci	tails of the ulation.	construct	ion are noi	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						39.78	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								_
Total f	abric he	at loss							(33) +	(36) =			112.41	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y I	i			(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	23.3	23.04	22.77	21.45	21.18	19.86	19.86	19.59	20.39	21.18	21.71	22.24		(38)
Heat t	ransfer o	coefficier	nt, W/K		-	-			(39)m	= (37) + (3	38)m			
(39)m=	135.72	135.45	135.19	133.86	133.6	132.27	132.27	132	132.8	133.6	134.13	134.66		_
Heat l	oss para	meter (H	HLP), W/	/m²K			-		(40)m	Average = = (39)m ÷	Sum(39) _{1.} (4)	₁₂ / 12=	133.79	(39)
(40)m=	1.32	1.32	1.31	1.3	1.3	1.29	1.29	1.28	1.29	1.3	1.3	1.31		
Numb	er of day	rs in mor	nth (Tab	le 1a)	-	-			,	Average =	Sum(40) _{1.}	12 /12=	1.3	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
Assun if TF if TF Annua <i>Reduce</i>	ned occu FA > 13.9 FA £ 13.9 al average the annua	ipancy, I 9, N = 1 9, N = 1 e hot wa al average	N + 1.76 x ater usag <i>hot water</i>	[1 - exp ge in litre usage by	(-0.0003 es per da 5% if the o	849 x (TF ay Vd,av Iwelling is	FA -13.9) erage = designed t)2)] + 0.((25 x N) to achieve)013 x (⁻ + 36 a water us	TFA -13. se target o	2. 9)	.87]	(42) (43)
not mor	e that 125	litres per p	person per	r day (all w	ater use, l	hot 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=	109.85	105.86	101.87	97.87	93.88	89.88	89.88	93.88	97.87	101.87	105.86	109.85		_
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D)Tm / 3600	kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1198.41	(44)
(45)m=	162.91	142.48	147.03	128.18	123	106.14	98.35	112.86	114.21	133.1	145.29	157.77		_
lf instar	ntaneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46,) to (61)	Total = Su	m(45) ₁₁₂ =	:	1571.31	(45)
(46)m=	24.44	21.37	22.05	19.23	18.45	15.92	14.75	16.93	17.13	19.96	21.79	23.67		(46)
Water	storage	loss:	includin		alar or M		storado	within ea	me ves	sol		0	1	(47)
Sillaç				iy ariy su		ntor 110		(47)		501		0		(47)
Others Water	wise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	(47) ombi boil	ers) ente	er '0' in (47)			
a) If n	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temp	erature f	actor fro	m Table	2b		`	• /					0		(49)
Energ	y lost fro	m water urer's de	storage	, kWh/ye cvlinder l	ear loss fact	or is not	known:	(48) x (49)	=			0		(50)
D) II II	lanalaot													



Hot wa If comr Volume Tempe	ater stora munity h e factor erature f	age loss leating s from Ta actor fro	factor fr ee secti ble 2a m Table	rom Tabl on 4.3 2b	e 2 (kW	h/litre/da	y)					0		(51) (52) (53)
Energy	/ lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter	(50) or ((54) in (5	55)									0		(55)
Water	storage	loss cal	culated	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	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (50	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 Primar (moo	y circuit y circuit dified by	loss (ar loss cal factor fi	nual) fro culated rom Tab	om Table for each le H5 if t	e 3 month (here is s	59)m = (solar wat	(58) ÷ 36 er heatir	65 × (41) ng and a	m cylinde	r thermo	stat)	0		(58)
(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=	32.48	29.3	32.36	31.2	32.13	30.98	31.94	32.07	31.1	32.26	31.34	32.44		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.39	171.78	179.39	159.38	155.13	137.12	130.29	144.93	145.31	165.36	176.63	190.21		(62)
Solar DH	HW input of	calculated	using App	endix G o	Appendix	H (negativ	ve quantity	/) (enter '0	if no sola	r contributi	ion to wate	er heating)		
(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	-										
(64)m=	195.39	171.78	179.39	159.38	155.13	137.12	130.29	144.93	145.31	165.36	176.63	190.21		
								Outp	out from wa	ater heate	r (annual)₁	12	1950.91	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m]	
(65)m=	62.29		-							r in the second s	1			
inclu		54.7	56.98	50.42	48.93	43.04	40.69	45.54	45.75	52.32	56.14	60.57		(65)
	ıde (57)	54.7 m in calo	56.98	50.42 of (65)m	48.93 only if c	43.04 Sylinder is	40.69 s in the c	45.54 dwelling	45.75 or hot w	52.32 ater is fr	56.14 rom com	60.57 munity h	eating	(65)
5. Int	ide (57)i ternal ga	54.7 m in calo ains (see	56.98 culation	50.42 of (65)m 5 and 5a	48.93 only if c):	43.04 Sylinder is	40.69 s in the c	45.54 dwelling	45.75 or hot w	52.32 ater is fr	56.14 om com	60.57 munity h	eating	(65)
5. Int Metabo	ide (57)i ternal ga olic gain	54.7 m in calo ains (see as (Table	56.98 culation Table 5 e 5), Wat	50.42 of (65)m 5 and 5a ts	48.93 only if c):	43.04 ylinder is	40.69 s in the c	45.54 dwelling	45.75 or hot w	52.32 ater is fr	56.14 rom com	60.57 munity h	eating	(65)
5. Int Metabo	ide (57)i ernal ga olic gain Jan	54.7 m in calo ains (see s (Table Feb	56.98 culation Table 5 5), Wat Mar	50.42 of (65)m 5 and 5a ts Apr	48.93 only if c): May	43.04 ylinder is Jun	40.69 s in the c Jul	45.54 dwelling Aug	45.75 or hot w Sep	52.32 ater is fr Oct	56.14 Form corm	60.57 munity h Dec	eating	(65)
5. Int Metabo (66)m=	ide (57)i ternal ga olic gain Jan 138.25	54.7 m in calo ains (see s (Table Feb 138.25	56.98 culation (Table 5 5), Wat Mar 138.25	50.42 of (65)m 5 and 5a ts Apr 138.25	48.93 only if c): May 138.25	43.04 ylinder is Jun 138.25	40.69 s in the c Jul 138.25	45.54 dwelling Aug 138.25	45.75 or hot w Sep 138.25	52.32 ater is fr Oct 138.25	56.14 rom com Nov 138.25	60.57 munity h Dec 138.25	eating	(65)
5. Int Metabo (66)m= Lightin	ide (57) ernal ga olic gain Jan 138.25 g gains	54.7 m in calo ains (see s (Table Feb 138.25 (calcula	56.98 culation (Table 5 e 5), Wat Mar 138.25 ted in Ap	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix	48.93 only if c): May 138.25 L, equati	43.04 ylinder is Jun 138.25 ion L9 of	40.69 s in the c Jul 138.25 r L9a), a	45.54 dwelling Aug 138.25 lso see	45.75 or hot w Sep 138.25 Table 5	52.32 ater is fr Oct 138.25	56.14 rom com Nov 138.25	60.57 munity h Dec 138.25	eating	(65)
5. Int Metabo (66)m= Lightin (67)m=	ide (57) iernal ga olic gain Jan 138.25 g gains 23.27	54.7 m in calo s (Table Feb 138.25 (calcula 20.66	56.98 culation (5), Wat (138.25 ted in Ap (16.8	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72	48.93 only if c): May 138.25 L, equati 9.51	43.04 ylinder is Jun 138.25 ion L9 of 8.03	40.69 s in the c Jul 138.25 r L9a), a 8.68	45.54 dwelling Aug 138.25 Iso see 11.28	45.75 or hot w Sep 138.25 Table 5 15.14	52.32 ater is fr Oct 138.25 19.22	56.14 rom com Nov 138.25 22.43	60.57 munity h Dec 138.25 23.91	eating	(65) (66) (67)
5. Int Metabo (66)m= Lightin (67)m= Appliar	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga	54.7 m in calo ains (see Feb 138.25 (calcula 20.66 ins (calc	56.98 culation (Table 5 5), Wat Mar 138.25 ted in Ap 16.8 ulated ir	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 n Append	48.93 only if c): May 138.25 L, equati 9.51 dix L, eq	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13	45.54 dwelling 138.25 lso see 11.28 3a), also	45.75 or hot w Sep 138.25 Table 5 15.14 o see Ta	52.32 ater is fr Oct 138.25 19.22 ble 5	56.14 rom com Nov 138.25 22.43	60.57 munity h Dec 138.25 23.91	eating	(65) (66) (67)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96	54.7 m in calo ains (see s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67	56.98 culation (Table 5 5), Wat Mar 138.25 ted in Ap 16.8 ulated in 256.85	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 Append 242.32	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L ² 206.75	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52	45.75 or hot w Sep 138.25 Table 5 15.14 see Ta 199.35	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88	56.14 om com Nov 138.25 22.43 232.21	60.57 munity h Dec 138.25 23.91 249.45	eating	 (65) (66) (67) (68)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin	ide (57) iernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains	54.7 m in calo s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula	56.98 culation (5), Wat 138.25 ted in Ap 16.8 ulated in 256.85 tted in A	50.42 of (65)m and 5a ts Apr 138.25 opendix 12.72 Appendix 242.32 ppendix	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a)	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52 , also se	45.75 or hot w Sep 138.25 Table 5 15.14 o see Ta 199.35 ee Table	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5	56.14 rom com Nov 138.25 22.43 232.21	60.57 munity h Dec 138.25 23.91 249.45	eating	(65) (66) (67) (68)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m=	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82	54.7 m in calo s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82	56.98 culation (Table 5 5), Wat 038.25 ted in Ap 16.8 culated in 256.85 ted in A 36.82	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 n Appendix 242.32 ppendix 36.82	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52 , also se 36.82	45.75 or hot w Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82	56.14 om com Nov 138.25 22.43 232.21 36.82	60.57 munity h Dec 138.25 23.91 249.45 36.82	eating	 (65) (66) (67) (68) (69)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai	54.7 m in calo ains (see s (Table Teb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains	56.98 culation (Table 5 5), Wat 4 Mar 138.25 ted in Ap 16.8 ulated in 256.85 ted in A 36.82 (Table 5	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 a Append 242.32 ppendix 36.82 5a)	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52), also se 36.82	45.75 or hot w Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82	56.14 om com Nov 138.25 22.43 232.21 36.82	60.57 munity h Dec 138.25 23.91 249.45 36.82	eating	 (65) (66) (67) (68) (69)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	ide (57) iernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai	54.7 m in calo ains (see s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3	56.98 culation (56.98 culation (5), Wat 138.25 ted in Ap 16.8 ulated in 256.85 ted in A 36.82 (Table \$ 3	50.42 of (65)m and 5a ts Apr 138.25 opendix 12.72 Appendix 242.32 ppendix 36.82 5a) 3	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52 , also se 36.82	45.75 or hot w Sep 138.25 Table 5 15.14 o see Ta 199.35 ee Table 36.82	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82 3	56.14 om com Nov 138.25 22.43 232.21 36.82 3	60.57 munity h Dec 138.25 23.91 249.45 36.82	eating	 (65) (66) (67) (68) (69) (70)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai 3 s e.g. ev	54.7 m in calo ains (see s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 vaporatic	56.98 culation (Table 5 5), Wat 138.25 ted in Ap 16.8 ulated in 256.85 ited in A 36.82 (Table 5 3 on (nega	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 n Appendix 242.32 ppendix 36.82 5a) 3 tive valu	48.93 only if c): 138.25 L, equati 9.51 dix L, equati 223.98 L, equat 36.82 3 es) (Tab	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82 3 le 5)	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52), also se 36.82	45.75 or hot w Sep 138.25 Table 5 15.14 0 see Ta 199.35 ee Table 36.82	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82 3	56.14 om com Nov 138.25 22.43 232.21 36.82 3	60.57 munity h Dec 138.25 23.91 249.45 36.82 3	eating	 (65) (66) (67) (68) (69) (70)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai 3 s e.g. ev -110.6	54.7 m in calo ains (see s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 raporatic -110.6	56.98 culation (Table 5 e 5), Wat Mar 138.25 ted in Ap 16.8 culated in 256.85 ted in A 36.82 (Table 5 3 on (nega -110.6	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 n Appendix 242.32 ppendix 36.82 5a) 3 tive valu -110.6	48.93 only if c): 138.25 L, equati 9.51 dix L, equati 223.98 L, equati 36.82 3 es) (Tab -110.6	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82 3 	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82 3 -110.6	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52), also se 36.82 3 3	45.75 or hot w Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82 3 3	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82 3 3 -110.6	56.14 om com Nov 138.25 22.43 232.21 36.82 3 -110.6	60.57 munity h Dec 138.25 23.91 249.45 36.82 3 -110.6	eating	 (65) (66) (67) (68) (69) (70) (71)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	ide (57) iernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai 3 s e.g. ev -110.6 heating	54.7 m in calc ains (see is (Table Is (Table 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 raporatic -110.6 gains (T	56.98 culation (Table 5 5), Wat 138.25 ted in Ap 16.8 ulated in 256.85 ted in A 36.82 (Table 5 3 on (nega -110.6 Table 5)	50.42 of (65)m and 5a ts Apr 138.25 opendix 12.72 Appendix 242.32 opendix 36.82 5a) 3 tive valu -110.6	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82 3 es) (Tab -110.6	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L9 206.75 ion L15 36.82 3 le 5) -110.6	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82 3 -110.6	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52 36.82 36.82 3 3	45.75 or hot w Sep 138.25 Table 5 15.14 o see Ta 199.35 ee Table 36.82 3 -110.6	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82 3 3 -110.6	56.14 om com Nov 138.25 22.43 232.21 36.82 3 -110.6	60.57 munity h Dec 138.25 23.91 249.45 36.82 3 3 -110.6	eating	 (65) (66) (67) (68) (69) (70) (71)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai 3 s e.g. ev -110.6 heating 83.72	54.7 m in calo ains (see s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 aporatic -110.6 gains (T 81.4	56.98 culation (Table 5 5), Wat Mar 138.25 ted in Ap 16.8 ulated in A 36.82 (Table 5 able 5) 76.58	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 n Appendix 242.32 ppendix 36.82 5a) 3 tive valu -110.6	48.93 only if c): 138.25 L, equati 9.51 dix L, equati 223.98 L, equat 36.82 3 es) (Tab -110.6	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L9 206.75 ion L15 36.82 3 le 5) -110.6	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82 3 -110.6	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52), also se 36.82 3 -110.6	45.75 or hot w Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82 3 -110.6	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82 3 -110.6	56.14 om com 138.25 22.43 232.21 36.82 3 -110.6 77.98	60.57 munity h Dec 138.25 23.91 249.45 36.82 3 3 -110.6 81.41	eating	 (65) (66) (67) (68) (69) (70) (71) (72)



Total	interna	l gains =						(66))m + (67)m	n + (68	3)m + (69)	m + (7	0)m +	(71)m + (72)	m			
(73)m=	435.42	433.21	417	.71	392.55	366.73	3	42.02	326.07	332	.49 345	5.5	370.89	9 400.09	422.24	4		(73)
6. Sc	lar gain	s:																
Solar	gains are	calculated	using	solar	flux from	Table 6a	a and	lassoc	iated equa	ations	to convert	to the	applic	able orientat	ion.			
Orient	ation:	Access F Table 6d	acto	r	Area m²			Flu Tal	x ble 6a		g_ Table	6b		FF Table 6c			Gains (W)	
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	1	1.28	x	0.4	ļ	x	0.7	=	- [4.09	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	1	1.28	x	0.4	ļ	x	0.7	=	= [2.63	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	2	2.97	x	0.4	ļ	x	0.7		= [8.33	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	2	2.97	x	0.4		x	0.7	=	• [5.35	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	4	1.38	x	0.4	-	x	0.7	=	• [15.01	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	4	1.38	x	0.4		x	0.7	=	- [9.63	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	6	37.96	x	0.4		x	0.7	=	- [24.66	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	6	37.96	x	0.4		x	0.7	=	- [15.82	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	g	91.35	x	0.4		x	0.7	=	- [33.15	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	9	91.35	x	0.4		x	0.7	=	- [21.27	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	9	97.38	x	0.4		x	0.7	=	- [35.34	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	9	97.38	x	0.4		x	0.7	=	- [22.68	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x		91.1	x	0.4		x	0.7	=	- [33.06	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x		91.1	x	0.4	ļ	x	0.7	=	- [21.21	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	7	'2.63	x	0.4		x	0.7	=	- [26.35	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	7	'2.63	x	0.4		x	0.7	=	- [16.91	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	5	50.42	x	0.4		x	0.7	=	- [18.3	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	5	50.42	x	0.4		x	0.7	=	- [11.74	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	2	28.07	x	0.4		x	0.7	=	- [10.18	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	2	28.07	x	0.4		x	0.7	=	- [6.54	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x		14.2	x	0.4		x	0.7	=	- [5.15	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x		14.2	x	0.4		x	0.7	=	- [3.31	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x		9.21	x	0.4	ļ	x	0.7	=	- [3.34	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x		9.21	x	0.4		x	0.7	=	- [2.15	(75)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	3	36.79	x	0.4	-	x	0.7	=	- [14.14	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	3	36.79	x	0.4		x	0.7	=	- [14.14	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	3	36.79	x	0.4		x	0.7	=	- [14.14	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	3	36.79	x	0.4		x	0.7	=	- [14.14	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	36.79	x	0.4		x	0.7	=	• [23.27	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	36.79	x	0.4		x	0.7	=	• [23.27	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	36.79	x	0.4		x	0.7		• [23.27	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	6	67	x	0.4		x	0.7	=	- [24.08	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	6	32.67	x	0.4		x	0.7	=	- [24.08	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	6	67 62.67	x	0.4		×	0.7		٠Ē	24.08	(77)



Southeast 0.9x	0.77	x	1.98	x	62.67	x	0.4	x	0.7] =	24.08	(77)
Southeast 0.9x	0.77	x	3.26	×	62.67	×	0.4	x	0.7	j =	39.65	– (77)
Southeast 0.9x	0.77	x	3.26	×	62.67	×	0.4	x	0.7	i =	39.65	(77)
Southeast 0.9x	0.77	x	3.26	×	62.67	×	0.4	x	0.7] =	39.65	(77)
Southeast 0.9x	0.77	×	1.98	×	85.75	×	0.4	x	0.7	=	32.95	(77)
Southeast 0.9x	0.77	x	1.98	×	85.75	×	0.4	x	0.7] =	32.95	(77)
Southeast 0.9x	0.77	x	1.98	×	85.75	×	0.4	x	0.7] =	32.95	(77)
Southeast 0.9x	0.77	x	1.98	x	85.75	×	0.4	x	0.7] =	32.95	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	3.26	×	106.25	×	0.4	x	0.7] =	67.21	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7] =	45.72	(77)
Southeast 0.9x	0.77	x	1.98	×	119.01	x	0.4	x	0.7] =	45.72	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7] =	75.28	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	3.26	×	119.01	×	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	3.26	×	118.15	×	0.4	x	0.7] =	74.74	(77)
Southeast 0.9x	0.77	x	1.98	×	113.91	×	0.4	x	0.7] =	43.76	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	x	0.4	x	0.7	=	43.76	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	×	0.4	x	0.7	=	43.76	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	x	0.4	x	0.7	=	43.76	(77)
Southeast 0.9x	0.77	x	3.26	x	113.91	×	0.4	x	0.7	=	72.06	(77)
Southeast 0.9x	0.77	×	3.26	×	113.91	×	0.4	×	0.7	=	72.06	(77)
Southeast 0.9x	0.77	x	3.26	×	113.91	×	0.4	x	0.7] =	72.06	(77)
Southeast 0.9x	0.77	×	1.98	×	104.39	×	0.4	×	0.7	=	40.11	(77)
Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7	=	40.11	(77)



Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7] =	40.11	(77)
Southeast 0.9x	0.77	x	1.98	×	104.39	×	0.4	x	0.7	j =	40.11	(77)
Southeast 0.9x	0.77	x	3.26	×	104.39	×	0.4	x	0.7	=	66.03	(77)
Southeast 0.9x	0.77	x	3.26	×	104.39	×	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	x	3.26	×	104.39	×	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	×	0.4	x	0.7] =	35.67	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7	=	35.67	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7	=	35.67	(77)
Southeast 0.9x	0.77	x	1.98	×	92.85	x	0.4	x	0.7] =	35.67	(77)
Southeast 0.9x	0.77	x	3.26	×	92.85	×	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	3.26	×	92.85	x	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	1.98	×	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	3.26	×	69.27	x	0.4	x	0.7] =	43.82	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	3.26	×	44.07	×	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	3.26	×	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	3.26	x	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7	=	12.1	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7	=	12.1	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7	=	12.1	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7	=	12.1	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southwest0.9x	0.77	x	1.98	x	36.79]	0.4	x	0.7] =	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	36.79]	0.4	x	0.7] =	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	36.79]	0.4	x	0.7] =	14.14	(79)
Southwest _{0.9x}	0.77	x	1.98	×	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest0.9x	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest _{0.9x}	0.77	x	1.98	×	62.67]	0.4	x	0.7] =	24.08	(79)
Southwest _{0.9x}	0.77	x	1.98	×	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest _{0.9x}	0.77	x	1.98	×	85.75]	0.4	x	0.7	=	32.95	(79)



Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	8	5.75		0.4	>		0.7		=	32.95	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	06.25]	0.4	>	[0.7		=	40.82	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	06.25]	0.4	>		0.7		=	40.82	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	06.25]	0.4	>	Ē	0.7		=	40.82	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	19.01	Ī	0.4	>	Ē	0.7		=	45.72	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	19.01	Ī	0.4	>	Ē	0.7		=	45.72	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	19.01	Ī	0.4	,	Ē	0.7		=	45.72	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	18.15	İ	0.4	,	Ē	0.7		=	45.39	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	18.15	Ī	0.4	,	Ē	0.7		=	45.39	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	18.15]	0.4	>	Ē	0.7		=	45.39	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	13.91	Ī	0.4	,	Ē	0.7		=	43.76	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	13.91	j	0.4	>	Ē	0.7		=	43.76	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	13.91	j	0.4	>	Ē	0.7		=	43.76	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	04.39	İ	0.4	,	Ē	0.7		=	40.11	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	04.39	İ	0.4	,	Ē	0.7		=	40.11	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	04.39	Ī	0.4	,	Ē	0.7		=	40.11	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	9	2.85	İ	0.4	,	Ē	0.7		=	35.67	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	9	2.85	Ī	0.4	,	Ē	0.7		=	35.67	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	9	2.85	İ	0.4	,	Ī	0.7		=	35.67	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	6	9.27	İ	0.4	,	Ē	0.7		=	26.61	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	6	9.27	İ	0.4	,	Ē	0.7		=	26.61	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	6	9.27	İ	0.4	,	Ē	0.7		=	26.61	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	4	4.07	İ	0.4	,	Ē	0.7		=	16.93	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	4	4.07	İ	0.4	,	Ē	0.7		=	16.93	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	4	4.07	İ	0.4	,	Ē	0.7		=	16.93	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	3	31.49	İ	0.4	,	Ē	0.7		=	12.1	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	3	31.49	Ī	0.4	,	Ē	0.7		=	12.1	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	3	31.49	İ	0.4	,	Ē	0.7		=	12.1	(79)
	•					•			•					•			-
Solar g	ains in	watts, cal	culated	for eac	h mon	th			(83)m	i = Sum(74)m	(82)	m	_	-			
(83)m=	175.5	301.17	418.01	527.87	600.3	3 5	99.98	576.78	522	.11 455.96	334	.46	210.61	149	.93		(83)
Total g	ains – i	internal ar	nd solai	r (84)m	= (73)n	1 + (83)m	, watts					-	-		I	
(84)m=	610.92	734.38	835.72	920.41	967.00	6	942	902.85	854	.6 801.45	705	.35	610.71	572	.17		(84)
7. Mea	an inte	rnal tempe	erature	(heating	g seaso	on)											
Temp	erature	e during he	eating p	eriods	n the li	ving	area	from Tab	ole 9	Th1 (°C)						21	(85)
Utilisa	tion fac	ctor for ga	ins for	living ar	ea, h1,	m (s	ee Ta	ble 9a)									_
	Jan	Feb	Mar	Apr	Ma	y	Jun	Jul	A	ug Sep	0	ct	Nov	D	ec		
(86)m=	1	1	0.99	0.97	0.91		0.78	0.61	0.6	6 0.87	0.9	8	1	1			(86)
Mean	interna	al tempera	ture in	living a	ea T1	(follo	<u>w ste</u>	ps <u>3</u> to 7	7 in T	able 9c)							
(87)m=	19.53	19.72	19.99	20.35	20.67		20.9	20.97	20.	96 20.81	20.	38	19.88	19	.5		(87)
Temp	erature	during he	eating p	eriods	n rest o	of dw	velling	from Ta	able 9	9, Th2 (°C)							
(88)m=	19.83	19.83	19.83	19.84	19.84		19.85	19.85	19.	85 19.85	19.	84	19.84	19.	83		(88)
-												_					



Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.98	0.95	0.87	0.68	0.47	0.52	0.8	0.97	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	le 9c)				
(90)m=	18.5	18.68	18.96	19.32	19.62	19.8	19.85	19.84	19.74	19.35	18.86	18.47		(90)
									f	fLA = Livin	g area ÷ (4	4) =	0.33	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = fl	A 🗙 T1	+ (1 – fl	A) x T2			I		_
(92)m=	18.84	19.03	19.3	19.66	19.97	20.17	20.22	20.22	20.09	19.69	19.2	18.81		(92)
Apply	v adjustn	nent to t	he mear	n internal	temper	i ature fro	n Table	4e, whe	ere appro	n Spriate				
(93)m=	18.84	19.03	19.3	19.66	19.97	20.17	20.22	20.22	20.09	19.69	19.2	18.81		(93)
8. Sp	ace hea	ting requ	uirement	t										
Set T	i to the i	mean int	ernal te	mperatui	re obtain	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm		0.07	0.74	0.50	0.57	0.00	0.00	0.00			(04)
(94)m=		0.99	0.98	0.95	0.87	0.71	0.52	0.57	0.82	0.96	0.99	1		(94)
Usefu	Il gains,	hmGm	, W = (9)	4)m x (84	4)m	00740	400.07	404.50	055 70	070.07	000.04	570.00		(05)
(95)m=	608.79	/28.3/	819.4	873.4	841.68	667.18	466.37	484.58	655.79	679.37	606.24	570.68		(95)
IVIONTI	niy avera	age exte	ernal tem				10.0	16.4	1 4 4	10.6	7.4	4.2		(96)
	4.3	4.9				14.0	10.0	10.4	14.1 (06)m	10.0	7.1	4.2		(30)
	1055 1216	1012 47				LIII , VV =	=[(39)m	x [(93)///	- (96)III	1214 61	1622.05	1067.07		(97)
(97)III=	- 1973.0		$\frac{1731.04}{2}$	r oach n	$r_{104.02}$	//b/mon	470.07	303.04	m (05)	$\frac{1214.01}{1201}$	1)m	1907.97		(37)
(98)m-	1015 57	796 38	678.26	408 29	195 77		11 = 0.02		0	398.22	732.1	1039 59		
(00)11-	1010.07	100.00	070.20	400.20	100.11	Ŭ	Ŭ	Tota		(k\\/b/yea	$r_{02.1}$	8)	5264 19	(98)
•								TOTA	i per year	(KVVII/yeai) – Sum(3	0)15,912 -	5204.19	
Space	e heatin	g require	ement in	i kvvh/m²	/year								51.15	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:			, .									٦
Fracti	ion of sp	bace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from n	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								89.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ו, %					ĺ	0	(208)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec	kWh/vea	⊐ ar
Space	e heatin	g require	ement (c	alculate	d above)							·····,	
•	1015.57	796.38	678.26	408.29	195.77	0	0	0	0	398.22	732.1	1039.59		
(211)m	ר 1 = {[(98)m x (20	1 4)] } x 1	$100 \div (20)$)6)									(211)
(=)	1134.71	889.81	757.83	456.19	218.74	0	0	0	0	444.94	817.99	1161.55		· · ·
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15.10} 12	=	5881.77	(211)
Snac	e heatin	a fuel (s	econdar	·v) k\//h/	month							l		
= {[(98)m x (20)1)]}x1	00 ÷ (20)8)	monu									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
				•				Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
												1		_



Water heating

Output	from w	ater hea	ter (calc	ulated a	bove)						-			
	195.39	171.78	179.39	159.38	155.13	137.12	130.29	144.93	145.31	165.36	176.63	190.21		
Efficie	ncy of w	ater hea	iter										86.7	(216)
(217)m=	89.04	88.99	88.9	88.7	88.24	86.7	86.7	86.7	86.7	88.66	88.94	89.06		(217)
Fuel fo (219)m	or water 1 = (64)	heating, m x 100	kWh/mo) ÷ (217)	onth m										
(219)m=	219.45	193.04	201.79	179.69	175.81	158.15	150.28	167.16	167.6	186.51	198.59	213.59		-
								Tota	I = Sum(2)	19a) ₁₁₂ =			2211.64	(219)
Annua	I totals									k	Wh/year	r r	kWh/year	-
Space	heating	fuel use	ed, main	system	1								5881.77	
Water	heating	fuel use	d										2211.64	
Electri	city for p	oumps, fa	ans and	electric	keep-ho	t								
mech	anical v	entilatior	n - balan	iced, ext	ract or p	ositive i	nput fror	n outside	Э			199.96		(230a)
centra	al heatir	ig pump:	:									30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)
Total e	electricity	y for the	above, I	kWh/yea	r			sum	of (230a).	(230g) =			274.96	(231)
Electri	city for I	ighting										[410.87	(232)
Total c	lelivered	l energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=			[8779.24	(338)
12a.	CO2 em	issions -	– Individ	ual heati	ing syste	ems inclu	uding mi	cro-CHF)					
						En kW	ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ar

Space heating (main system 1)	(211) x	0.216	=	1270.46	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	477.71	(264)
Space and water heating	(261) + (262) + (263) + (26	64) =		1748.18	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	142.7	(267)
Electricity for lighting	(232) x	0.519	=	213.24	(268)
Total CO2, kg/year		sum of (265)(271) =		2104.12	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		20.44	(273)
EI rating (section 14)				81	(274)



APPENDIX E. DER WORKSHEETS (BE GREEN)

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			User D	etails:						
Assessor Name:	Panagiotis	Dalapas		Stroma	a Num	ber:		STRO	030082	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.41	
		F	Property A	Address:	Be Gre	en-First	Floor Fla	at		
Address :	238 KILBUF	RN HIGH ROAD	, LONDO	ON, NWE	6 2BS					
1. Overall dwelling dimen	sions:									
Ground floor			Area 5	a(m²) 60.18	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 125.45	(3a)
Total floor area TFA = (1a)	+(1b)+(1c)+	(1d)+(1e)+(1	n) 5	0.18	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	125.45	(5)
2. Ventilation rate:	main			athan		total				
Number of chimneys	heating	+ 0	ry +	0] = [0	x 4	40 =		(6a)
Number of open flues	0	+ 0	+	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fan	5					0	x ′	10 =	0	(7a)
Number of passive vents						0	x	10 =	0	(7b)
Number of flueless gas fire	es					0	x 4	40 =	0	(7c)
					L					
								Air ch	hanges per ho	ur
Infiltration due to chimneys	s, flues and fa	ans = (6a)+(6b)+(7a)+(7b)+(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has be	en carried out or	r is intended, procee	ed to (17), o	otherwise o	continue fro	om (9) to ((16)			_
Additional infiltration	e aweiling (ne	5)					[(0).	-11x0 1 -	0	(9)
Structural infiltration: 0.2	5 for steel or	timber frame o	0.35 foi	r masonr	v constr	uction	[(0)	110.1 -	0	$= \frac{1}{1}$
if both types of wall are pre deducting areas of opening	sent, use the va s); if equal user	lue corresponding to 0.35	o the great	er wall area	a (after				0	
If suspended wooden flo	or, enter 0.2	(unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	r 0.05, else e	enter 0							0	(13)
Percentage of windows	and doors dr	aught stripped		0.25 [0.2	$\mathbf{v}(1\mathbf{A}) \cdot 1$	001 -			0	(14)
VVINDOW INTIITration				$(8) \pm (10)$	x (14) ÷ 1 + (11) + (1	(00] =	⊾ (15) —		0	(15)
Air permeability value	50 expresse	d in cubic metre	s ner ho	ur ner so	nuare m	etre of e	nvelone	area	0	(10)
If based on air permeabilit	v value, then	(18) = [(17) ÷ 20]+(8), otherwi	ise (18) = (16)		invelope	uicu	0 15	
Air permeability value applies	if a pressurisatio	on test has been do	ne or a deg	gree air pei	rmeability	is being us	sed		0.10	
Number of sides sheltered									4	(19)
Shelter factor				(20) = 1 - [[0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporatir	ig shelter fac	tor		(21) = (18)) x (20) =				0.1	(21)
Infiltration rate modified for	monthly wir	nd speed	i					_	1	
Jan Feb M	lar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind spe	ed from Tabl	e7							1	
(22)m= 5.1 5 4	.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	J	
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	J	



	ed infiltra	ation rate	e (allowin	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
	0.13	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12		
Calcula	ate effec	tive air (change r	ate for t	he appli	cable ca	se						0.5	(220)
lf exh	aust air he	at pump i	using Appe	endix N. (2	(3b) = (23a	i) x Fmv (e	equation (N	v5)), other	rwise (23b) = (23a)			0.5	(23a)
If bala	anced with	heat reco	overv: effici	iencv in %	allowing f	or in-use fa	actor (from	n Table 4h) =) (200)			77.05	(230)
a) If	halanco	d mech	anical ve	ntilation	with he	at recove	2rv (M/\/F	-IR) (2/1s	a)m = (2)	2b)m ± ('	23h) v [1	1 _ (23c)	1001 ± 1001	(230)
(24a)m=	0.25	0.24	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(24a)
(, b) If	halance	d mech:	anical ve	ntilation	without	heat rec	overv (N	///) (24h	m = (22)	2h)m + (2	23h)	•		
(24b)m=	0	0		0	0	0) (22		0	0		(24b)
c) If	whole h		tract ven	tilation (or positiv	e input v		n from c	utside					
i i	f (22b)m	$1 < 0.5 \times$	د (23b), t	hen (24	c) = (23t); otherv	vise (24	c) = (22t	o) m + 0.	5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	/entilatio	on or wh	ole hous	e positiv	/e input	ventilatic	on from I	oft					
i	f (22b)m	n = 1, the	en (24d):	m = (22	ວ)m othe	erwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effec	ctive air	change	rate - en	iter (24a) or (24t	o) or (240	c) or (24	d) in box	: (25)			i		
(25)m=	0.25	0.24	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(25)
3. Hea	at losses	s and he	eat loss p	baramet	er:									
ELEN	IENT	Gros area	3S (m²)	Openin rr	gs I ²	Net Ar A .r	ea n²	U-valı W/m2	le K	A X U (W/ł	()	k-value kJ/m²⋅l	e ≺	A X k kJ/K
Doors			()			2.15	x	1		2.15				(26)
Window	ws Type	1				3.26	 	L/[1/(1.2)+	0.04] =	3.73				(27)
Windov	ws Type	2				3 26		/[1/(1.2)+	0.04] =	3 73				(27)
Window	ws Type	3				2		/[1/(1.2)+	0.04] =	2.29	\exists			(27)
Window	ws Type	4				1.7		/[1/(1.2)+	0.04] =	1.95				(27)
Window	ws Type	5					=		L		=			(27)
	51					2	x1/	/[1/(1.2)+	0.04] =	2.29				
Floor						2	x ^{1/}	/[1/(1.2)+	0.04] = [2.29				(28)
Floor Walls 1	Type1	53.6	18	12.2	>	2 50.18	x1/	/[1/(1.2)+	0.04] = [2.29 7.527 7.46				(28)
Floor Walls 1 Walls 1	Гуре1 Гуре2	53.6)8 '3	12.2	2	2 50.18 41.46	x ^{1/}	/[1/(1.2)+ 0.15 0.18	0.04] = [2.29 7.527 7.46 2.91				(28) (29) (29)
Floor Walls 1 Walls 1 Walls 1	Гуре1 Гуре2 Гуре3	53.6 14.7 3.34)8 3 4	12.2 0 2.15	2	2 50.18 41.46 14.73	x1/ x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22	0.04] = [= [= [= [2.29 7.527 7.46 2.91 0.26				(28) (29) (29) (29)
Floor Walls T Walls T Walls T Total a	Гуре1 Гуре2 Гуре3 rea of e	53.6 14.7 3.34)8 '3 4 , m²	12.2 0 2.15	2	2 50.18 41.46 14.73 1.19 121.93	x1/ x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22	0.04] = [2.29 7.527 7.46 2.91 0.26				(28) (29) (29) (29) (29) (31)
Floor Walls 1 Walls 1 Walls 1 Total a Party v	Гуре1 Гуре2 Гуре3 ırea of e vall	53.6 14.7 3.34 lements	38 73 4 , m ²	12.2 0 2.15	2	2 50.18 41.46 14.73 1.19 121.93 22.09	x1/ x x x x x x x x x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22	0.04] = [2.29 7.527 7.46 2.91 0.26				(28) (29) (29) (29) (29) (31) (32)
Floor Walls T Walls T Walls T Total a Party w * for wine ** includ	Type1 Type2 Type3 rea of e vall dows and e the area	53.6 14.7 3.34 lements	3 3 4 , m ² ws, use ei sides of in	12.2 0 2.15	2 ndow U-va	2 50.18 41.46 14.73 1.19 121.93 22.09 alue calcula	x1/ x x x x x x x x x x x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0.22	0.04] = [] = [] = [] = [] = [] = [//(//-value)	2.29 7.527 7.46 2.91 0.26 0 ue)+0.04] a	[] [[[[] [[] [[] [[] [] [[] [_] [paragraph		(28) (29) (29) (29) (31) (32)
Floor Walls T Walls T Walls T Total a Party w * for wind ** includ Fabric	Гуре1 Гуре2 Гуре3 Irea of e vall dows and le the area heat los	53.6 14.7 3.34 dements roof windo s on both s, W/K =	38 73 4 , m ² ws, use ex- sides of in = S (A x	12.2: 0 2.15 ffective wi ternal walk	2 ndow U-va	2 50.18 41.46 14.73 1.19 121.93 22.09 alue calcula	x1/ x x x x x 3 x ated using	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0.22 0 formula 1, (26)(30)	0.04] = [= [= [= [= [= [= [/((1/U-valu) + (32) =]	2.29 7.527 7.46 2.91 0.26 0 re)+0.04] a	[] [[] [[] [[] [[] [[] [] [[] [_] [paragraph		(28) (29) (29) (29) (31) (32)
Floor Walls T Walls T Walls T Total a Party w * for wind ** includ Fabric Heat ca	Fype1 Fype2 Fype3 rea of ei vall dows and e the area heat los apacity (53.6 14.7 3.34 Tements roof winder s on both s, W/K = Cm = S(38 73 4 , m ² bws, use existence of in = S (A x A x k)	12.2 0 2.15 ffective wi ternal walk	2 ndow U-va	2 50.18 41.46 14.73 1.19 121.9 22.09 alue calcula titions	x1/ x x x x x x x x x x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0.22 0.22 0.22 (0 formula 1, (26)(30)	$\begin{array}{c} 0.04] = \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	2.29 7.527 7.46 2.91 0.26 0 re)+0.04] a	[]]	paragraph (32e) =		(28) (29) (29) (29) (31) (32) (33) (33)
Floor Walls T Walls T Walls T Total a Party w * for wind ** includ Fabric Heat ca Therma	Type1 Type2 Type3 rea of e vall dows and te the area heat los apacity (al mass	53.6 14.7 3.34 lements roof winde s on both s, W/K = Cm = S(parame	38 73 4 5 5 5 5 5 5 5 5 5 5 5 5 5	$\begin{bmatrix} 12.2 \\ 0 \\ 2.15 \end{bmatrix}$ ffective with ternal walk U) $h^{2} = Cm \div h^{2}$	2 ndow U-va Is and pan	2 50.18 41.46 14.73 1.19 121.9 22.09 alue calcula titions	x1/ x x x x x x x x ated using	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0.22 0.22 0.22 (26)(30)	0.04] = [= [= [= [= [= [= [= [= [(1/U-valu) + (32) = ((28) Indicat	2.29 7.527 7.46 2.91 0.26 0 re)+0.04] a .(30) + (32 tive Value:	[]] _ [[[]] _ [[]] _ [[]] _ [[]] _ []] _ []]]]	paragraph (32e) =	34.3 34.3 10578.29	(28) (29) (29) (31) (32) (33) (33) (34) (35)
Floor Walls T Walls T Walls T Total a Party w * for wind ** includ Fabric Heat ca Therma For desig can be u	Fype1 Fype2 Fype3 Irea of e vall dows and le the area heat los apacity (al mass gn assess used instea	53.6 14.7 3.34 $roof winders on both$ $s, W/K =$ $Cm = S($ $parame$ $ments wh$ $ad of a deal$	38 73 4 73 4 73 4 73 7 7 7 7 7 7 7 7 7 7 7 7 7	12.2. 0 2.15 ffective wi ternal walk U) ' = Cm ÷ tails of the lation.	2 ndow U-va Is and part - TFA) ir construct	2 50.18 41.46 14.73 1.19 121.93 22.09 alue calcula ititions	x1/ x x x x x x x x x x x x x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0 formula 1, (26)(30) ecisely the	0.04] = [= [= [= [= [= [= [/((1/U-valu) + (32) = ((28)) Indicative	2.29 7.527 7.46 2.91 0.26 0 re)+0.04] a .(30) + (32 tive Value: 9 values of	[] [[[] [[] [[] [_] [paragraph (32e) = able 1f	34.3 10578.29 250	(28) (29) (29) (31) (32) (33) (33) (34) (35)
Floor Walls T Walls T Walls T Total a Party w * for wind * include Fabric Heat ca Therma For designation Can be u	Type1 Type2 Type3 Trea of ei vall dows and te the area heat los apacity (al mass gn assess used instea al bridge	53.6 14.7 3.34 $coof winder s on both s, W/K = Cm = S(0) parame ments wh ad of a der es : S (L$	$\frac{38}{73}$ $\frac{4}{3}$ $\frac{3}{4}$ $\frac{4}{3}$ $\frac{3}{5}$	12.2 0 2.15 ffective wi ternal walk U) 2 = Cm ÷ values of the values of t	2 ndow U-va ls and part - TFA) ir construct	2 50.18 41.46 14.73 1.19 121.9 22.09 alue calcula titions	x1/ x x x x x x x x x x x x x x x x x x	/[1/(1.2)+ 0.15 0.18 0.2 0.22 0.22 0.22 (26)(30) ecisely the	0.04] = [= [= [= [= [= [= [= [= [= [(1/U-valu) + (32) = ((28) Indicative	2.29 7.527 7.46 2.91 0.26 0 re)+0.04] a .(30) + (32 tive Value: e values of) + (32a). Medium	paragraph (32e) = able 1f	34.3 34.3 10578.29 250	(28) (29) (29) (31) (32) (33) (33) (34) (35) (36)



Total fa	abric he	at loss							(33) +	(36) =			50.67	(37)
Ventila	tion hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × (25)m x (5)		l	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	10.23	10.12	10.01	9.47	9.36	8.82	8.82	8.71	9.04	9.36	9.58	9.8		(38)
Heat tr	ansfer c	coefficier	nt, W/K				-		(39)m	= (37) + (38)m	-		
(39)m=	60.9	60.79	60.68	60.14	60.03	59.49	59.49	59.38	59.7	60.03	60.25	60.46		
Heat lo	ss para	meter (H	HLP), W/	′m²K			-		(40)m	Average = = (39)m ÷	Sum(39) ₁ . · (4)	12 /12=	60.11	(39)
(40)m=	1.21	1.21	1.21	1.2	1.2	1.19	1.19	1.18	1.19	1.2	1.2	1.2		
Numbe	er of day	rs in moi	nth (Tab	le 1a)						Average =	Sum(40)1.	12 /12=	1.2	(40)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ing ener	gy requi	irement:								kWh/ye	ear:	
Assum	ed occu	ipancy, l	N								1	.7		(42)
if TF	A > 13.9	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0)013 x (TFA -13	.9)			
Annual	averad	e hot wa	ater usad	ne in litre	s per da	av Vd.av	erade =	(25 x N)	+ 36		74	.47		(43)
Reduce	the annua	al average	hot water	usage by s	5% if the a	lwelling is	designed t	to achieve	a water us	se target o	f i i i			()
not more	e that 125	litres per p	person per	[.] day (all w	ater use, l	hot and co	ld)						I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage II	n litres per	day for ea	ach month	Vd,m = fa	ctor from 1	l able 1c x	(43)		i	i	r	l	
(44)m=	81.91	78.93	75.96	72.98	70	67.02	67.02	70	72.98	75.96	78.93	81.91		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600	kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	893.59	(44)
(45)m=	121.47	106.24	109.63	95.58	91.71	79.14	73.33	84.15	85.16	99.24	108.33	117.64		
lf instant	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)) to (61)	Total = Su	m(45) ₁₁₂ =	-	1171.64	(45)
(46)m=	18.22	15.94	16.44	14.34	13.76	11.87	11	12.62	12.77	14.89	16.25	17.65		(46)
Water	storage	loss:						·						
Storag	e volum	e (litres)	includir	ig any so	plar or W	/WHRS	storage	within sa	ime ves	sel		0		(47)
If comr Otherw	nunity h vise if no	eating a stored	nd no ta hot wate	nk in dw er (this in	elling, e Icludes i	nter 110 nstantar) litres in neous co	(47) ombi boile	ers) ente	er '0' in (47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/dav).					0		(48)
Tempe	rature fa	actor fro	m Table	2b		(" a a j) :					0		(49)
Energy	lost fro	m water	storage	_~ kWh/ve	ar			(48) x (49)	=			0		(50)
b) If m	anufact	urer's de	eclared of	ylinder l	oss fact	or is not	known:	()				0		(00)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If comr	nunity h	eating s	ee secti	on 4.3									I	/
	e tactor rature f	Irom Tal	ule Za m Tahlo	2h								0		(52)
Enorm		m wotor			ar			(17) v (54)	v (50) v (53) -		0		(53)
Entergy	(50) or (54) in (5	50 age	, rvvii/ye	ai			(+ <i>r</i>) X (31)	~ (52) X (55j =		0		(54) (55)
	(, 0, (-1									~	l	(00)



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 cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(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)
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	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	32.02	28.88	31.9	30.8	31.77	30.68	31.66	31.73	30.74	31.85	30.91	32		(61)
Total h	neat req	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=	153.49	135.12	141.53	126.38	123.48	109.82	104.99	115.88	115.9	131.09	139.24	149.64		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix C	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=	153.49	135.12	141.53	126.38	123.48	109.82	104.99	115.88	115.9	131.09	139.24	149.64		_
								Outp	out from wa	ater heate	r (annual)₁	12	1546.55	(64)
Heat g	ains fro	m water	heating	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m]	
(65)m=	48.39	42.54	44.43	39.48	38.44	33.98	32.3	35.91	36	40.96	43.75	47.11		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	is (Table	5), Wat	ts			-			-				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77	84.77		(66)
Lightin	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5					
(67)m=	13.17	11.7	9.51	7.2	5.38	4.54	4.91	6.38	9.57	40.00	40.7	13 53		(67)
Applia	nces ga	ins (calc	ulated ir	Δ					0.57	10.88	12.7	10.00		(0.)
(68)m=			alatoa li	i Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	12.7	10.00		(0.)
Cookir	147.7	149.23	145.37	137.15	dix L, eq 126.77	uation L 117.02	13 or L1 110.5	3a), alsc 108.97	see Ta 112.83	10.88 ble 5 121.05	12.7	141.18		(68)
COOKII	147.7 ng gains	149.23 (calcula	145.37 Ited in A	137.15 ppendix	dix L, eq 126.77 L, equat	uation L ⁻ 117.02 ion L15	13 or L1 110.5 or L15a)	3a), alsc 108.97), also se	see Ta 112.83 ee Table	10.88 ble 5 121.05 5	12.7	141.18		(68)
(69)m=	147.7 ng gains 31.48	149.23 (calcula 31.48	145.37 ited in A 31.48	137.15 ppendix 31.48	dix L, eq 126.77 L, equat 31.48	uation L ⁻ 117.02 ion L15 31.48	13 or L1 110.5 or L15a) 31.48	3a), alsc 108.97), also se 31.48	5.57 5 see Ta 112.83 ee Table 31.48	10.88 ble 5 121.05 5 31.48	12.7 131.43 31.48	141.18		(68) (69)
(69)m= Pumps	147.7 ng gains 31.48 s and fai	149.23 (calcula 31.48 ns gains	145.37 ited in A 31.48 (Table !	137.15 ppendix 31.48 5a)	dix L, eq 126.77 L, equat 31.48	uation L 117.02 ion L15 31.48	13 or L1 110.5 or L15a) 31.48	3a), also 108.97), also se 31.48	9.57 9 see Ta 112.83 2ee Table 31.48	10.88 ble 5 121.05 5 31.48	12.7 131.43 31.48	141.18 31.48		(68) (69)
(69)m= Pumps (70)m=	147.7 ng gains 31.48 s and fai	149.23 (calcula 31.48 ns gains 3	145.37 ted in A 31.48 (Table 9	137.15 ppendix 31.48 5a) 3	dix L, eq 126.77 L, equat 31.48	uation L 117.02 ion L15 31.48	13 or L1 110.5 or L15a) 31.48 3	3a), also 108.97), also se 31.48 3	31.48	10.88 ble 5 121.05 5 31.48 3	12.7 131.43 31.48 3	141.18 31.48 3		(68) (69) (70)
(69)m= Pumps (70)m= Losses	147.7 ng gains 31.48 s and fa 3 s e.g. ev	149.23 (calcula 31.48 ns gains 3 vaporatic	145.37 ited in A 31.48 (Table \$ 3 on (nega	137.15 ppendix 31.48 5a) 3	dix L, eq 126.77 L, equat 31.48 3 es) (Tab	uation L 117.02 ion L15 31.48 3 le 5)	13 or L1 110.5 or L15a) 31.48 3	3a), also 108.97), also se 31.48	3.37 see Ta 112.83 ee Table 31.48	10.88 ble 5 121.05 5 31.48 3	12.7 131.43 31.48 3	141.18 31.48 3		(68) (69) (70)
(69)m= Pumps (70)m= Losses (71)m=	147.7 ng gains 31.48 s and fa 3 s e.g. ev -67.82	149.23 (calcula 31.48 ns gains 3 vaporatic -67.82	145.37 ited in A 31.48 (Table 9 3 on (nega -67.82	137.15 ppendix 31.48 5a) 3 tive valu -67.82	dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82	uation L 117.02 ion L15 31.48 3 le 5) -67.82	13 or L1 110.5 or L15a) 31.48 3 -67.82	3a), also 108.97), also se 31.48 3	3.37 5 see Ta 112.83 2 e Table 31.48 3 -67.82	10.88 ble 5 121.05 5 31.48 3 -67.82	12.7 131.43 31.48 3 -67.82	141.18 31.48 3 -67.82		(68)(69)(70)(71)
(69)m= Pumps (70)m= Losses (71)m= Water	147.7 ng gains 31.48 s and fat s e.g. ev -67.82 heating	149.23 (calcula 31.48 ns gains 3 vaporatic -67.82 gains (T	145.37 ited in A 31.48 (Table 9 3 on (nega -67.82 Table 5)	137.15 ppendix 31.48 5a) 3 tive valu -67.82	dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82	uation L 117.02 ion L15 31.48 3 le 5) -67.82	13 or L1 110.5 or L15a) 31.48 3 -67.82	3a), also 108.97), also se 31.48 3 -67.82	3.37 5 see Ta 112.83 2ee Table 31.48 3 -67.82	10.88 ble 5 121.05 5 31.48 3 -67.82	12.7 131.43 31.48 3 -67.82	141.18 31.48 3 -67.82		(68) (69) (70) (71)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m=	147.7 ng gains 31.48 s and fai s e.g. ev -67.82 heating 65.05	149.23 (calcula 31.48 ns gains 3 vaporatic -67.82 gains (T 63.31	145.37 ited in A 31.48 (Table 8 3 on (nega -67.82 Table 5) 59.72	Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82 54.83	dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82 51.66	uation L 117.02 ion L15 31.48 3 le 5) -67.82 47.2	13 or L1 110.5 or L15a) 31.48 3 -67.82 43.41	3a), also 108.97), also se 31.48 3 -67.82 48.27	31.48 50 50	10.88 ble 5 121.05 5 31.48 3 -67.82 55.05	12.7 131.43 31.48 3 -67.82 60.76	141.18 31.48 3 -67.82 63.33		 (68) (69) (70) (71) (72)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	147.7 ng gains 31.48 s and fa 3 s e.g. ev -67.82 heating 65.05 internal	149.23 (calcula 31.48 ns gains 3 vaporatic -67.82 gains (T 63.31 gains =	145.37 ited in A 31.48 (Table 9 3 on (nega -67.82 fable 5) 59.72	Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82 54.83	dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82 51.66	uation L 117.02 ion L15 31.48 3 le 5) -67.82 47.2 (66)	13 or L1 110.5 or L15a) 31.48 3 -67.82 43.41 m + (67)m	3a), also 108.97), also se 31.48 3 -67.82 48.27 + (68)m +	0.37 0 see Ta 112.83 ee Table 31.48 3 -67.82 50 + (69)m + (69)m + (69)m + (69)m + (100)	10.88 ble 5 121.05 5 31.48 3 -67.82 55.05 (70)m + (7	12.7 131.43 31.48 3 -67.82 60.76 1)m + (72)	141.18 31.48 3 -67.82 63.33 m		 (68) (69) (70) (71) (72)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	147.7 ng gains 31.48 s and fai s e.g. ev -67.82 heating 65.05 internal 277.35	149.23 (calcula 31.48 ns gains 3 /aporatic -67.82 gains (T 63.31 gains = 275.67	145.37 ited in A 31.48 (Table 9 3 on (nega -67.82 able 5) 59.72 266.03	Appendix 137.15 ppendix 31.48 5a) 3 tive valu -67.82 54.83 250.61	dix L, eq 126.77 L, equat 31.48 3 es) (Tab -67.82 51.66 235.24	uation L 117.02 ion L15 31.48 3 le 5) -67.82 47.2 (66) 220.19	13 or L1 110.5 or L15a) 31.48 3 -67.82 43.41 m + (67)m 210.25	3a), also 108.97), also se 31.48 3 -67.82 48.27 1 + (68)m - 215.05	5.37 5 see Ta 112.83 2 e Table 31.48 3 -67.82 50 - (69)m + (222.83	10.88 ble 5 121.05 5 31.48 3 -67.82 55.05 (70)m + (7 238.41	12.7 131.43 31.48 3 -67.82 60.76 1)m + (72) 256.32	141.18 31.48 3 -67.82 63.33 m 269.48		 (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.



Orientation:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.7	x	11.28	×	0.4	x	0.7	=	3.72	(75)
Northeast 0.9x	0.77	x	1.7	x	22.97	×	0.4	x	0.7	i =	7.58	(75)
Northeast 0.9x	0.77	x	1.7	x	41.38	×	0.4	x	0.7	i =	13.65	(75)
Northeast 0.9x	0.77	x	1.7	x	67.96	×	0.4	x	0.7	=	22.42	(75)
Northeast 0.9x	0.77	x	1.7	x	91.35	×	0.4	x	0.7	=	30.13	(75)
Northeast 0.9x	0.77	x	1.7	x	97.38	×	0.4	x	0.7] =	32.12	(75)
Northeast 0.9x	0.77	x	1.7	x	91.1	×	0.4	x	0.7	=	30.05	(75)
Northeast 0.9x	0.77	x	1.7	x	72.63	×	0.4	x	0.7	=	23.96	(75)
Northeast 0.9x	0.77	x	1.7	x	50.42	×	0.4	x	0.7] =	16.63	(75)
Northeast 0.9x	0.77	x	1.7	x	28.07	x	0.4	x	0.7] =	9.26	(75)
Northeast 0.9x	0.77	x	1.7	x	14.2	x	0.4	x	0.7] =	4.68	(75)
Northeast 0.9x	0.77	x	1.7	x	9.21	×	0.4	x	0.7] =	3.04	(75)
Southeast 0.9x	0.77	x	3.26	x	36.79	×	0.4	x	0.7] =	23.27	(77)
Southeast 0.9x	0.77	x	3.26	x	36.79	×	0.4	x	0.7] =	23.27	(77)
Southeast 0.9x	0.77	x	2	x	36.79	×	0.4	x	0.7	=	14.28	(77)
Southeast 0.9x	0.77	x	2	x	36.79	×	0.4	x	0.7] =	14.28	(77)
Southeast 0.9x	0.77	x	3.26	x	62.67	×	0.4	x	0.7] =	39.65	(77)
Southeast 0.9x	0.77	x	3.26	x	62.67	×	0.4	x	0.7	=	39.65	(77)
Southeast 0.9x	0.77	x	2	x	62.67	x	0.4	x	0.7] =	24.32	(77)
Southeast 0.9x	0.77	x	2	x	62.67	×	0.4	x	0.7] =	24.32	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	×	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7] =	54.24	(77)
Southeast 0.9x	0.77	x	2	x	85.75	×	0.4	x	0.7] =	33.28	(77)
Southeast 0.9x	0.77	x	2	x	85.75	×	0.4	x	0.7	=	33.28	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	2	x	106.25	×	0.4	x	0.7	=	41.23	(77)
Southeast 0.9x	0.77	x	2	x	106.25	x	0.4	x	0.7	=	41.23	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	×	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	2	x	119.01	x	0.4	x	0.7	=	46.19	(77)
Southeast 0.9x	0.77	x	2	x	119.01	x	0.4	x	0.7	=	46.19	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	×	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	2	x	118.15	x	0.4	x	0.7] =	45.85	(77)
Southeast 0.9x	0.77	x	2	x	118.15	×	0.4	x	0.7] =	45.85	(77)
Southeast 0.9x	0.77	x	3.26	x	113.91	×	0.4	x	0.7] =	72.06	(77)
Southeast 0.9x	0.77	x	3.26	x	113.91	x	0.4	x	0.7] =	72.06	(77)
Southeast 0.9x	0.77	x	2	x	113.91	x	0.4	x	0.7] =	44.21	(77)



Southea	ast <mark>0.9x</mark>	0.77		x	2		x	1	13.91	x		0.4	x	0.7		=	44.21	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	1	04.39	x		0.4	x	0.7		=	66.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	1	04.39	x		0.4	×	0.7		=	66.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	1	04.39	x		0.4	x	0.7		=	40.51	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	1	04.39) x		0.4	x	0.7		=	40.51	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	9	92.85	x		0.4	×	0.7		=	58.74	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	ę	92.85	x		0.4	×	0.7		=	58.74	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	Ę.	92.85	x		0.4	×	0.7		=	36.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	ę	92.85	x		0.4	×	0.7		=	36.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	e	69.27	x		0.4	x	0.7		=	43.82	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	e	69.27	x		0.4	x	0.7		=	43.82	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	e	69.27	x		0.4	x	0.7		=	26.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	6	69.27	x		0.4	x	0.7		=	26.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	4	44.07	x		0.4	x	0.7		=	27.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	2	44.07	x		0.4	x	0.7		=	27.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	2	44.07	x		0.4	x	0.7		=	17.1	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	4	44.07	x		0.4	x	0.7		=	17.1	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	31.49	x		0.4	×	0.7		=	19.92	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	31.49	x		0.4	x	0.7		=	19.92	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	3	31.49	x		0.4	x	0.7		=	12.22	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	3	31.49	x		0.4	x	0.7		=	12.22	(77)
Solar g	ains in	watts, ca	alcula	ted	for eac	n mont	th		T	(83)m	n = Su	m(74)m	.(82)m				1	(00)
(83)m=	78.83	135.51	188.	7	239.31	273.07		273.3	262.57	237	.05	206.17	150.6	5 94.64	67	.32		(83)
					(04)111 =	= (73)II		03/11	, walls	45	24	400	200.0	7 250.00	220	2 70	1	(84)
(04)11=	330.18	411.10	404.	3	469.92	508.3		193.49	472.83	454	2.1	429	369.0	7 350.96	330	5.79]	(04)
7. Me	an inter	rnal temp	eratu	re (heating	seaso	on)					(1.0)						
Temp	erature	during h	eatin	g pe	eriods ir	the liv	ving	area	from Tak	ole 9	, Th1	(°C)					21	(85)
Utilisa	ation fac	tor for ga	ains f	or li	ving are	a, h1,	m (s		able 9a)								1	
(96)m	Jan		IVIE	ar S	Apr	May	/	Jun	Jui		ug	Sep						(96)
(00)11=	I	0.99	0.90	,	0.95	0.87		0.71	0.54	0.8	00	0.81	0.96	0.99		I		(00)
Mean	interna	l tempera	ature	in li	iving are	ea T1	(folle	ow ste	ps 3 to 7	7 in T	Table	9c)		-1			1	
(87)m=	19.77	19.94	20.2	2	20.51	20.78		20.94	20.99	20.	.98	20.88	20.53	3 20.09	19	.74		(87)
Temp	erature	during h	eatin	g pe	eriods ir	rest o	of d	velling) from Ta	able	9, Th	2 (°C)		-			1	
(88)m=	19.91	19.91	19.9	1	19.92	19.92		19.93	19.93	19.	.93	19.93	19.92	2 19.92	19	.92		(88)
Utilisa	ation fac	ctor for ga	ains f	or r	est of d	velling	, h2	2,m (se	e Table	9a)							_	
(89)m=	0.99	0.99	0.97	7	0.93	0.82		0.61	0.42	0.4	46	0.73	0.94	0.99		1		(89)
Mean	interna	l tempera	ature	in t	he rest	of dwe	lling	g T2 (f	ollow ste	eps 3	8 to 7	in Table	e 9c)					
(90)m=	18.81	18.97	19.2	2	19.53	19.78		19.91	19.93	19.	.93	19.87	19.56	6 19.13	18	.78		(90)
												fl	LA = Li	ving area ÷ (4) =		0.48	(91)

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$



(92)m=	19.27	19.44	19.69	20	20.26	20.4	20.44	20.44	20.36	20.03	19.59	19.24		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate	Į	Į		
(93)m=	19.27	19.44	19.69	20	20.26	20.4	20.44	20.44	20.36	20.03	19.59	19.24		(93)
8. Sp	ace hea	ting requ	uirement	t										
Set T	i to the i	mean int	ernal ter	mperatur	e obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	linsation	Eob	Mar		May	lup	lul	Δυσ	Son	Oct	Nov	Dec		
Utilisa	ation fac	tor for a	ains hm). hi	iviay	Jun	Jui	Aug	Seb	001	NOV	Dec		
(94)m=	0.99	0.99	0.97	0.93	0.83	0.66	0.48	0.52	0.77	0.94	0.99	0.99		(94)
Usefu	l gains,	ı hmGm	, W = (94	ـــــــــــــــــــــــــــــــــــــ	4)m									
(95)m=	353.82	405.63	441.43	455.37	424.01	324.84	224.98	234.55	329.51	367.05	346.3	335.06		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	nal tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	-			
(97)m=	911.81	883.93	800.53	667.84	513.92	345.32	228.35	239.65	373.5	566.16	752.71	909.42		(97)
Space	e heatin	g require	ement fo	or each m	nonth, k	Wh/mont	th = 0.02	24 x [(97])m – (95)m] x (4 ⁻	1)m			
(98)m=	415.15	321.42	267.17	152.98	66.89	0	0	0	0	148.14	292.62	427.33		٦
								Tota	l per year	(kWh/year	') = Sum(9	8)15,912 =	2091.69	(98)
Space	e heatin	g require	ement in	1 kWh/m²	/year								41.68	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												_
Fracti	on of sp	ace hea	at from s	econdary	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								89.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	ı, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c	calculate	d above)								
	415.15	321.42	267.17	152.98	66.89	0	0	0	0	148.14	292.62	427.33		
(211)m	n = {[(98)m x (20	4)] } x 1	100 ÷ (20	6)		-		-					(211)
	463.85	359.13	298.51	170.92	74.74	0	0	0	0	165.52	326.95	477.46		
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u>_</u>	2337.08	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month									
= {[(98)m x (20	01)] } x 1	00 ÷ (20)8)			r		r		r		1	
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		-
								lota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}		0	(215)
Water	heating]			,									
Output	153 49	ater hea	$\frac{\text{ter}(\text{calc})}{141.53}$	ulated al	00VE)	109.82	104.99	115.88	115.9	131.09	139.24	149 64		
Efficier		ater hea	ter	120.00	120.40	100.02	104.00	110.00	110.0	101.00	100.24	140.04	86.7	7(216)
(217)m-	88 73	88 65	88.51	88 21	87 66	86.7	86 7	86 7	86 7	88 16	88 58	88 76	00.7	(217)
Fuel fo			I	00.2	01.00	L 00.7	00.7	00.7	00.1	00.10	00.00	00.70		()
	n watar	hosting	k \//h/m/	onth										
(219)m	or water <u>1 = (64</u>)	heating, m x 100	kWh/mo (217) ÷ (217)	onth)m										
(219)m (219)m=	or water 1 = (64) 173	heating, m x 10(152.41	kWh/mo) ÷ (217) 159.91	onth)m 143.26	140.85	126.66	121.1	133.66	133.68	148.69	157.2	168.59		



Annual totals		kWh/year	·	kWh/year	_
Space heating fuel used, main system 1				2337.08	
Water heating fuel used			[1759.01]
Electricity for pumps, fans and electric keep-ho	t				
mechanical ventilation - balanced, extract or p	oositive input from outs	ide	80.35		(230a)
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	SL	um of (230a)(230g) =		155.35	(231)
Electricity for lighting			[232.55	(232)
Electricity generated by PVs			[-424.85	(233)
Total delivered energy for all uses (211)(221)	+ (231) + (232)(237	b) =	[4059.14	(338)
12a. CO2 emissions – Individual heating syste	ems including micro-Cl	ΗP			
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	504.81	(261)
Space heating (secondary)	(215) x	0.519	= [0	(263)

(219) x

(231) x

(232) x

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

0.216

0.519

0.519

0.519

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

(272) ÷ (4) =

=

=

=

=

379.95

884.76

80.63

120.69

-220.5

865.58

17.25

88

(264)

(265)

(267)

(268)

(269)

(272)

(273)

(274)

Dwelling CO2 Emission Rate

El rating (section 14)

Total CO2, kg/year

Water heating

Item 1

Space and water heating

Electricity for lighting

Electricity for pumps, fans and electric keep-hot

Energy saving/generation technologies



Assessor Name: Panagiotis Dalapas Stroma Number: STR0030082 Software Name: Stroma FSAP 2012 Storware Version: Version: 1.0.5.41 Concernity Address: Be Green/Second Floor Flat Address: Stroma Number: Stroma Number: Version: 1.0.5.41 Address: 238 KILBURN HIGH ROAD, LONDON, NW6 2BS Av. Height(m) Call Volume(m) Ground floor Call Av. Height(m) Call Volume(m) Ground floor (al.28) (al.48)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d				User D	Details:						
Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.41 Recently Address: Be Creen-Second Floor Flat Address : 238 KILBURN HIGH ROAD, LONDON, NW6 2BS I. Overall dwelling dimensions: Area(m ²) Av. Height(m) Volume(m ²) Ground floor Total floor area TFA = (1a) +(1b) +(1c) +(1d) +(1e) +(1n) Elstandia Total floor area TFA = (1a) +(1b) +(1c) +(1d) +(1e) +(1n) Elstandia Number of thimeys o Volume(m ²) Number of chinneys o ***********************************	Assessor Name:	Panagiotis	Dalapas		Strom	a Num	ber:		STRO	030082	
Nonperformation of the predict weak and the predict of the predict weak and the predict of	Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versio	n: 1.0.5.41	
Audress : 235 KLEDKN HIGH KOAD, CORD, CORD, CORD, CORD, WHE 263 I. Overall diveling dimensions: Area(m ²) Av. Height(m) Volume(m ²) Ground floor 5.28 (ia) x 2.5 (2a) = (55.2) (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 61.28 (ia) x 2.5 (2a) = (55.2) (5) 2. Ventilation rate: main secondary other total m^2 per hour Number of chimneys 0 + 0 = 0 $x40 =$ 0 (6a) Number of passive vents 0 + 0 + 0 = 0 $x40 =$ 0 (7a) Number of flueless gas fires 0 $x10 =$ 0 $(7b)$ 0 $(7c)$ Number of storeys in the dwelling (ns) $x10 =$ 0 $(7b)$ 0 $(7b)$ 0 $(7b)$ 0 $(7b)$ 0 $(7b)$ 0 $(7b)$ 0 $(7b)$ 0 $(7b)$ 0 $(7b)$ 0 $(7b)$ 0 $(7b)$				Property		Be Gre	en-Secc	ond Flooi	r Flat		
Area(m ²) Av. Height(m) Volume(m ²) Ground floor 5128 (a) 5332 (a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 6128 (a) 5332 (a) Dwelling volume (a)+(3b)+(3c)+(3c)+(3d)+(3c)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d	1 Overall dwelling dime	230 KILDUP		D, LOND		203					
Ground floor 0				Are	a(m²)		Av. He	iaht(m)		Volume(m ³)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $f(1)$ Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 153.2 (s) 2. Ventilation rate: main heating Number of chimneys 0 0 + 10 - 10 + 10 + 10 +	Ground floor			6	61.28	(1a) x	2	2.5	(2a) =	153.2	(3a)
Delling volume (3a)+(3b)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a	Total floor area TFA = (1a	a)+(1b)+(1c)+((1d)+(1e)+	(1n) e	61.28	(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 (7a) Number of intermittent fans 0 x10 = 0 (7b) 0 x40 = 0 (7c) Number of flueless gas fires 0 x40 = 0 (7c) (6b) (7b) Additional infiltration (7b) (7c) (7b) (7c) <td>Dwelling volume</td> <td></td> <td></td> <td></td> <td></td> <td>(3a)+(3b)</td> <td>+(3c)+(3d</td> <td>l)+(3e)+</td> <td>.(3n) =</td> <td>153.2</td> <td>(5)</td>	Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	153.2	(5)
main heating heatingsecondary heatingothertotalm³ per hourNumber of chimneys0+0=0x40 =0(6a)Number of open flues0+0+0=0x20 =0(6b)Number of passive vents0x10 =0(7a)0x10 =0(7b)Number of flueless gas fires0x40 =0(7c)0x40 =0(7c)Number of flueless gas fires0x40 =0(7c)0x40 =0(7c)Number of storeys in the dwelling (ns)Additional infiltration(9)(9)(9)(9)(9)(9)(9)(11)0(11)(9)(11)(11)(11)0(11)(11)(11)(11)(11)(11)(11)(11)(11)(11)(11)(11)(11)(11)(11)(11)(12)(11)(12)(11)(12)(11)(12)(11)(12)(11)(12)(11)(12)(11)(12)(11)(12)(12)(12)(12)(13)(14)	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 0 $x10$ = 0 $(7a)$ $x10$ = 0 $(7a)$ Number of passive vents 0 $x10$ = 0 $(7a)$ 0 $x40$ = 0 $(7c)$ Number of flueless gas fires 0 $x40$ = 0 $(7a)$ $(7b)(7a)$ $(7b)(7a)(7b)(7c)$ $(7c)$ 0 $(7c)$ <t< td=""><td></td><td>main heating</td><td>secono heatin</td><td>lary q</td><td>other</td><td></td><td>total</td><td></td><td></td><td>m³ per hour</td><td>•</td></t<>		main heating	secono heatin	lary q	other		total			m ³ per hour	•
Number of open flues0+0=0x 20 =0(6b)Number of intermittent fans0x10 =0(7a)Number of passive vents0x10 =0(7b)Number of flueless gas fires0x40 =0(7c)Number of flueless gas fires0x40 =0(7c)Air changes per hourInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =0+(6) =0(8)Number of storeys in the dwelling (ns)00(10)0(9)Additional infiltration(9)(10)0(10)Structural infiltration0.25 for steel or timber frame or 0.35 for masonry construction0(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(12)Percentage of windows and doors draught stripped0(14)Window infiltration rate(2) = (10,75 x (19) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area0.15Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area0.15Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area0.15Air permeability value applies if a pressurisation test has been done ora degree air permeability is being used<	Number of chimneys	0	+ 0	- + [0] = [0	X 4	40 =	0	(6a)
Number of intermittent fans 0 $x10 =$ 0 $(7a)$ 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)+(7c) = 0 $+$ (5) = 0 (6)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (18) 0 (9)Additional infiltration 0 0 0 0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11) If but hypes of wall are present, use the value corresponding to the greater wall area (after deducting areas of opening); If equal user 0.35 0 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 $0.25 - [0.2 \times (14) + 100] =$ 0 Infiltration rate $(6) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, g50, expressed in cubic metres per hour per square metre of envelope area 3 If based on air permeability value, then $(18) = [(17) + 20] + (8)$, otherwise $(18) = (16)$ 0.15 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 0 Number of sides sheltered 0 0.12 $0.$	Number of open flues	0	+ 0	+	0] = [0	x2	20 =	0	(6b)
Number of passive vents 0 $x 10 =$ 0 (76) Number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 0 $+(5) =$ 0 (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 (10) 0 (10) Additional 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 declucing areas of openings); if equal use 0.35 0 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 $0.25 - [0.2 \times (14) + 100] =$ 0 Infiltration rate $(6) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 3 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 4 Number of sides sheltered 0.7 (20) 0.7 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 4 Number of sides shel	Number of intermittent fa	ns					0	x ²	10 =	0	(7a)
Number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hourInfiltration due to chinneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 0 $+(5) =$ 0 (8) If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)Additional infiltration(9)Additional infiltrationIf suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 0If no draught lobby, enter 0.05, espented in cubic metres per hour per square metre of envelope areaAir permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value applies if a pressurisation test has been done or a degree ir permeability is being usedNumber of sides shelteredAir permeability value applies if a pressurisation test has been done or a degree ir permeability is being usedNumber of sides shelteredAir permeabili	Number of passive vents					Γ	0	x	10 =	0	(7b)
Air changes per hourAir changes per hourInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =0+ (6) =0(6)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]x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0(11)if both ypes of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.3500If 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(14)Window infiltration0.25 - [0.2 x (14) + 100] =0Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0Air premability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then (18) = [(17) + 20)+(8), otherwise (18) = (16)0.15Air permeability value apties if a pressurivation test has been done or a degree air permeability is being usedNumber of sides sheltered4Jan Feb Mar 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 3.8 3.7 4 4.3 4.5 4.7Wind Factor (22a)m = (22)m ÷ 4(22)m 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.0.8 1.12 1.18	Number of flueless gas fi	res				Г	0	x 4	40 =	0	(7c)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0 + (5) = 0$ 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) + (10) +									Air ch	anges per ho	_ ur
Initiation due to childreys, fues and rais = (0,0) (0,0) (10) (10) (10) (10) (10) (10) (10) (1	Infiltration due to chimned	ve flues and f	2000 - (62) + (6b)	±(7a)±(7b)±((7c) –	Г			. (5)		 7 (0)
Number of storeys in the dwelling (ns) 0 Additional infiltration (9) Additional infiltration (9) 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 (12) If no draught lobby, enter 0.05, else enter 0 0 0 Percentage of windows and doors draught stripped 0 0 Window infiltration $0.25 \cdot [0.2 \times (14) + 100] =$ 0 If based on air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 3 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 3 Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used 4 Number of sides sheltered 4 (19) Shelter factor $(20) = 1 \cdot [0.075 \times (19)] =$ 0.7 Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.1 Infiltration rate modified for monthly wind speed 4 (19) JanFebMarAprMayJunJulAugSepOctMonthly average wind speed from Table 7 (22) 5.1 5 (22) m= 5.1 5 4.9 4.4 (22) m= 5.1 5 4.9 (22) m= 5.1	If a pressurisation test has b	een carried out or	r is intended, prod	eed to (17),	otherwise o	ontinue fro	0 om (9) to ((16)	, (၁) =	0	(8)
Additional infiltration $[(9)-1]\times 0.1 =$ 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 infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3Air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16)0.15Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used4Number of sides sheltered4Shelter factor(20) = 1 - [0.075 x (19)] =0.1Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.1Infiltration rate modified for monthly wind speed01Monthly average wind speed from Table 720.12(22)m=5.154.94.44.33.83.744.34.5Wind Factor (22a)m = (22)m + 4(22a)m =1.081.121.18	Number of storeys in the	ne dwelling (na	5)							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 infiltration0.25 - [0.2 x (14) ÷ 100] =Infiltration rate(B) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used4Number of sides sheltered4Number of sides sheltered4Infiltration rate incorporating shelter factor(21) = (18) x (20) =Infiltration rate modified for monthly wind speed0.1Infiltration rate modified for monthly wind speed0.1Infiltration rate (22)m = 5.1 54.94.44.33.83.83.744.34.34.54.7Wind Factor (22a)m = (22)m ÷ 4(22)m =1.271.251.231.11.080.950.9211.081.121.18	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 0.35If 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 infiltration0.25 - [0.2 x (14) ÷ 100] =0(15)Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area1f 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 usedNumber of sides shelteredVindtration rate incorporating shelter factor(20) = 1 - [0.075 x (19)] =0.1(21)Infiltration rate modified for monthly wind speedInfiltration rate modified for monthly wind speedJanFebMarAprMayJunJunAugSepOctNovDecMonthly average wind speed from Table 7(22)m=5.151.271.251.231.11.080.950.9211.081.121.15	Structural infiltration: 0	.25 for steel or	r timber frame	or 0.35 fo	r masonr	y constr	uction			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 1 for ate $0.25 \cdot [0.2 \times (14) \pm 100] = 0.1(5)$ 1 nfiltration rate $0.25 \cdot [0.2 \times (14) \pm 100] = 0.1(5)$ 1 nfiltration rate $0.25 \cdot [0.2 \times (14) \pm 100] = 0.1(5)$ 1 nfiltration rate $0.25 \cdot [0.2 \times (14) \pm 100] = 0.1(5)$ 1 nfiltration rate $0.25 \cdot [0.2 \times (14) \pm 100] = 0.1(5)$ 1 nfiltration rate $0.25 \cdot [0.2 \times (14) \pm 100] = 0.1(5)$ 1 nfiltration rate $0.15 \cdot (16)$ 1 high permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $3 \cdot (17)$ 1 based on air permeability value, then $(18) = [(17) \pm 20] + (8)$, otherwise $(18) = (16)$ <i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i> Number of sides sheltered 1 follower of sides sheltered 1 nfiltration rate incorporating shelter factor $(20) = 1 \cdot [0.075 \times (19)] = 0.7$ (20) 1 nfiltration rate modified for monthly wind speed 1 nfiltration rate modified for monthly wind speed 2 n Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 1 nothly average wind speed from Table 7 (2)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 both types of wall are p deducting areas of openir	resent, use the va nas): if eaual user	lue corresponding 0.35	g to the great	ter wall are	a (after					
If no draught lobby, enter 0.05, else enter 0 0 Percentage of windows and doors draught stripped 0 Window infiltration $0.25 - [0.2 \times (14) + 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.15 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 0.15 Number of sides sheltered 4 Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate modified for monthly wind speed 0.1 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 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ $(22)m=$ 1.27 1.27 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.12 1.27 1.25 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 <	If suspended wooden f	loor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ 0Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.15Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used4Number of sides sheltered $(20) = 1 - [0.075 \times (19)] =$ 0.1Shelter factor $(21) = (18) \times (20) =$ 0.1Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.1Infiltration rate modified for monthly wind speed01.1Monthly average wind speed from Table 72.21.1(22)m=5.154.94.4(22)m=1.251.231.11.080.950.9211.081.121.121.18	If no draught lobby, en	ter 0.05, else e	enter 0							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 area3(17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.15(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.15(18)Number of sides sheltered $(20) = 1 \cdot [0.075 \times (19)] =$ (19) 0.7(20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.1 (21)Infiltration rate modified for monthly wind speed 0.15 0.1 (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 $\div 4$ $(22)m \div 4$ 1.08 1.12 1.18 1.12 1.18	Percentage of windows	s and doors dr	aught stripped	1						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 area3(17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.15(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used(19)Number of sides sheltered4(19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.7Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.1Infiltration rate modified for monthly wind speed0.1(21)Infiltration rate modified for Table 7(22)m = 5.1 5 4.9 (22)m = 5.1 5 4.9 4.4 4.3 3.8 Wind Factor (22a)m = (22)m $\div 4$ (22a)m = 1.27 1.25 1.23 1.1 (22a)m = 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	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 area3(17)If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ 0.15(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used(19)Number of sides sheltered4(19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.7Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.1Infiltration rate modified for monthly wind speed0.1(21)Infiltration rate modified for monthly wind speed0.1(21)Monthly average wind speed from Table 774.34.5(22)m=5.154.94.44.3Wind Factor (22a)m = (22)m ÷ 4(22a)m=1.271.251.231.1(22a)m=1.271.251.231.11.080.950.9211.081.121.18	Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
If based on air permeability value, then $(16) = [(17) \div 20] \div (8)$, 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 Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 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	Air permeability value,	q50, expresse	ed in cubic me	tres per ho	our per so	quare m	etre of e	envelope	area	3	(17)
All permeability value applies in a pressurgation test has been done of a degree an permeability is being doedNumber of sides sheltered 4 (19)Shelter factor $(20) = 1 \cdot [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed 0.1 (21)Infiltration rate modified for monthly wind speed 0.1 (21)Monthly average wind speed from Table 7 0.1 (22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4 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	ity value, then	$(18) = [(17) \div 20]$	(8), otherw	(18) = (16) moobility	is hoing u	ood		0.15	(18)
Shelter factor $(20) = 1 - [0.075 \times (19)] =$ (10) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21) Infiltration rate modified for monthly wind speed $(21) = (18) \times (20) =$ (21) Infiltration rate modified for monthly wind speed $(22) = (18) \times (20) =$ $(21) = (18) \times (20) =$ 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 $(22m =$ 1.27 1.25 1.23 1.1 1.08 0.92 1 1.08 1.12 1.18	Number of sides sheltere	d	on lest nas been		yree all pei	теалту	is being us	seu		4	(19)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.1(21)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 $\div 4$ (22a)m = 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Shelter factor	-			(20) = 1 -	0.075 x (1	9)] =			0.7	(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	Infiltration rate incorporat	ing shelter fac	tor		(21) = (18)	x (20) =				0.1	(21)
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 4.5 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	Infiltration rate modified f	or monthly wir	nd speed								
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 Ju	n 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 $\div 4$ (22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.92 1 1.08 1.12 1.18	Monthly average wind sp	eed from Tabl	e 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	(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 = (22	2)m ÷ 4									
	(22a)m= 1.27 1.25	1.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		



Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.13	0.13	0.13	0.12	0.11	0.1	0.1	0.1	0.1	0.11	0.12	0.12		
Calculate effec	tive air (change i ition:	rate for t	he appli	cable ca	se						0.5	(220)
If exhaust air he	eat pump i	using Appe	endix N. (2	3b) = (23a	a) x Fmv (e	equation (N	(15)), othe	rwise (23b) = (23a)			0.5	(234)
If balanced with	heat reco	overv: effic	iencv in %	allowing f	or in-use fa	actor (from	n Table 4h) =	, (,			0.5	(230)
a) If halance	d mech:	anical ve	ntilation	with he	at recove	≏rv (M\/⊦	HR) (24a	/ a)m = (2:	2h)m + (23h) x ['	1 – (23c)	<u> </u>	(200)
(24a)m= 0.25	0.24	0.24	0.23	0.23	0.21	0.21	0.21	0.22	0.23	0.23	0.24		(24a)
b) If balance	d mecha	anical ve	ntilation	without	heat rec	covery (N	и ЛV) (24b	m = (22)	1 2b)m + (2	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 of	or positiv	ve input v	ventilatio	n from c	outside		1			
if (22b)m	า < 0.5 ×	(23b), t	hen (240	c) = (23b	o); otherv	wise (24	c) = (22k	o) m + 0.	5 × (23b)	-		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft	0.51				
If (22b)m	n = 1, the n = 1	en (24d)	m = (22)	$\frac{1}{2}$ $\frac{1}{2}$	erwise (2	(4a)m = 0	0.5 + [(2	2b)m² x	0.5	0	0	l	(24d)
	ohongo		0) or (2.4k)	$\int_{-\infty}^{0} (24)$	$rac{0}{24}$		(25)	0	0	0		(244)
(25)m = 0.25	0 24		0.23	0 23				0.22	0.23	0.23	0.24		(25)
(20)11- 0.20	0.21	0.21	0.20	0.20	0.21	0.21	0.21	0.22	0.20	0.20	0.21		()
Heat losses	s and he	eat loss p	paramete	er:									
	_												
ELEMENT	Gros area	ss (m²)	Openin m	gs I ²	Net Ar A ,r	rea m²	U-valı W/m2	ue !K	A X U (W/I	K)	k-value kJ/m²∙I		A X k kJ/K
ELEMENT Doors	Gros area	ss (m²)	Openin m	gs I²	Net Ar A ,r 2.15	rea m² x	U-valı W/m2	ue 2K =	A X U (W/I 2.15	K)	k-value kJ/m²·I		A X k kJ/K (26)
ELEMENT Doors Windows Type	Gros area	88 (m²)	Openin m	gs 1 ²	Net Ar A ,r 2.15	ea m² x x ^{1/}	U-valı W/m2 1 /[1/(1.2)+	ue 2K = [.0.04] = [A X U (W/I 2.15 2.27	K)	k-value kJ/m²-I	> <	A X k kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area	SS (m²)	Openin m	gs ²	Net Arr A ,r 2.15 1.98 1.98	ea n ² x x x ¹ / x x ¹ /	U-valı W/m2 [ue K 0.04] = [0.04] = [A X U (W/I 2.15 2.27 2.27	K)	k-value kJ/m²·I	9 <	A X k kJ/K (26) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type	Gros area 1 2 3	5S (m²)	Openin m	gs ²	Net Ar A ,r 2.15 1.98 1.98 1.98	ea n ² x x ^{1/} x ^{1/} x ^{1/}	U-vali W/m2 [ue K 0.04] = [0.04] = [0.04] = [A X U (W/I 2.15 2.27 2.27 2.27	K)	k-value kJ/m²·I	9 K	A X k kJ/K (26) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4	ss (m²)	Openin m	gs ²	Net Ar A ,r 2.15 1.98 1.98 1.98	ea n ² x x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/}	U-vali W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	ue K = [0.04] = [0.04] = [0.04] = [A X U (W/I 2.15 2.27 2.27 2.27 2.27 2.27	<>	k-value kJ/m²·I	9 K	A X k kJ/K (26) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5	ss (m²)	Openin m	gs ²	Net Ar A ,r 2.15 1.98 1.98 1.98 3.26	ea n ² x x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/}	U-vali W/m2 (1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73	<>	k-value kJ/m²·I	9 {	A X k kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6	ss (m²)	Openin m	gs 2	Net Ar A ,r 2.15 1.98 1.98 1.98 3.26 1.98	ea n ² x x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/}	U-valu W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} \text{ue} \\ \text{K} \\ \hline 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27	<>	k-value kJ/m²·I	≥ ≺	A X k kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7	ss (m²)	Openin m	gs 2	Net Ar A ,r 2.15 1.98 1.98 1.98 1.98 3.26 3.26	ea n ² x x ¹ /	U-vali W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73	<>	k-value kJ/m²·I	9 K	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7 8	ss (m²)	Openin m	gs ²	Net Ar A ,r 2.15 1.98 1.98 1.98 3.26 1.98 3.26 1.76	ea 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/}	U-valu W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.27	\diamond	k-value kJ/m²·I	≥ ≺	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 3 4 5 6 7 8 59.8	5S (m ²) 38	Openin m	gs ² 3	Net Ar A ,r 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.76 41.7	ea n ² x x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/} x ^{1/}	U-vali W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} \text{ue}\\ \text{K}\\ \hline 0.04] = \begin{bmatrix} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \hline 0.04] = \\ \hline \end{array} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.27 3.73		k-value kJ/m²·I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type1 Walls Type2	Gros area 1 2 3 4 5 6 7 8 59.8 59.8	5S (m ²) 88 8	Openin m 18.18	gs ² B	Net Ar A ,r 2.15 1.98 1.98 1.98 3.26 1.98 3.26 1.76 41.7 5.48	ea 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/}	U-value W/m2 1 (1/(1.2)+) (1/(1.2)+ (1/(1.2)+) (1/(1.2)+ (1/(1.2)+) (1/(1.2)	$ \begin{array}{c} \text{ue}\\ \text{K}\\ = & \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ \end{array} $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.02 7.51 1.08		k-value kJ/m²+l		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type3	Gros area 1 2 3 4 5 6 7 8 59.8 5.44 16.3	38 8 37	Openin m 18.18 0 2.15	gs 2 8	Net Ar A ,r 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.76 41.7 5.48	ea n ² x x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾	U-value W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ 0.18 0.2	$\begin{array}{c} \text{ue} \\ \text{S} \\ 0.04 \\ \text{o} \\ 0.04 \\ \text{o} \\ 0.04 \\ \text{o} \\ \text{o} \\ 0.04 \\ \text{o} \\ \text$	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09		k-value kJ/m²-I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Total area of e	Gros area 1 2 3 4 5 6 7 8 5 9.8 5.44 16.3 lements	38 (m ²) 38 8 37 , m ²	Openin m 18.10 0 2.15	gs ² 3	Net Ar A ,r 2.15 1.98 1.98 1.98 3.26 1.98 3.26 1.98 3.26 1.76 41.7 5.48 14.22 81.73	ea n ² x x ¹ / x ² / x ² / x ³ /	U-value W/m2 $\begin{bmatrix} 1\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ (1/(1.2)+\\ 0.18\\ 0.2\\ 0.22\\ 0.$	$ \begin{array}{c} = \\ 0.04] = \\ 0.04 = \\ $	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09		k-value kJ/m²-I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Total area of e Party wall	Gros area 1 2 3 4 5 6 7 8 59.8 59.8 5.44 16.3	38 (m ²) 38 38 37 37 , m ²	Openin m 18.18 0 2.15	gs 2 ² 8	Net Ar A ,r 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.76 41.7 5.48 14.22 81.73 24.18	ea n ² x x ^{1/} x ² x ² x ³ x ³ x ³ x ³ x ³	U-value W/m2 1 (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) (1/(1.2)+) 0.18 0.2 0.22 0	$\begin{array}{c} \text{ue} \\ \text{K} \\ = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ = \\ \end{bmatrix}$	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09 0		k-value kJ/m²-I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Total area of e Party wall * for windows and ** include the area	Gross area 1 2 3 4 5 6 7 8 59.8 59.8 59.8 59.8 59.8 16.3 lements roof windows on both	38 (m ²) 38 38 37 , m ² ows, use e sides of ir	Openin m 18.18 0 2.15	gs ² B ndow U-va	Net Ar A ,r 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.98 3.26 1.76 41.7 5.48 14.22 81.73 24.18 alue calculations	ea m ² x x x x x x x x x x x x x x x x x x x	U-value W/m2 $\begin{bmatrix} 1\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ /[1/(1.2)+\\ (1/(1.2)+\\ 0.18\\ 0.2\\ 0.22\\ 0.22\\ 0.22\\ 0.22\\ 0.18\\ 0.2\\ 0.22\\ 0$	$\begin{array}{c} \text{ue} \\ \text{SK} \\ = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ = \\ 0.04] = \\ = \\ 0.04] = \\ 0$	A X U (W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09 0 ue)+0.04] a	K)	k-value kJ/m²-I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

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

Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K

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

(34)

(35)

7043.88

250

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

Indicative Value: Medium



can be u	ised instea	ad of a det	tailed calc	ulation.										
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						11.59	(36)
if details	of therma	l bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			46.24	(37)
Ventila	tion hea	t loss ca	alculated	I monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.49	12.36	12.23	11.56	11.43	10.77	10.77	10.64	11.03	11.43	11.7	11.96		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	58.73	58.6	58.47	57.8	57.67	57.01	57.01	56.87	57.27	57.67	57.94	58.2		
									/	Average =	Sum(39)1.	12 /12=	57.77	(39)
Heat Ic	oss para	meter (H	ILP), W/	′m²K					(40)m	= (39)m ÷	(4)		I	
(40)m=	0.96	0.96	0.95	0.94	0.94	0.93	0.93	0.93	0.93	0.94	0.95	0.95		_
Numbe	er of dav	rs in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁ .	12 /12=	0.94	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
	-	_	-		-		-	_		-		_		
4) 0 / -	1	•												
4. VVa	iter neat	ing ener	gy requ	rement:								KVVN/Ye	ear:	
Assum	ed occu	ipancy, I	N								2.	02		(42)
if TF	A > 13.9	9, N = 1 N = 1	+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9))2)] + 0.0)013 x (TFA -13.	9)			
Annual	l averad	e hot wa	ater usad	ae in litre	s per da	ıv Vd.av	erade =	(25 x N)	+ 36		82	12		(43)
Reduce	the annua	average	hot water	usage by	5% if the d	welling is	designed t	o achieve	a water us	se target o	f02	.12		()
not more	e that 125	litres per p	person per	day (all w	ater use, h	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	90.33	87.04	83.76	80.48	77.19	73.91	73.91	77.19	80.48	83.76	87.04	90.33		
									-	Total = Su	m(44) ₁₁₂ =	-	985.41	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4.$	190 x Vd,r	n x nm x D)Tm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	133.96	117.16	120.9	105.4	101.13	87.27	80.87	92.8	93.91	109.44	119.46	129.73		
									-	Total = Su	m(45) ₁₁₂ =	=	1292.03	(45)
If instant	aneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,) to (61)		-		L	
(46)m=	20.09	17.57	18.13	15.81	15.17	13.09	12.13	13.92	14.09	16.42	17.92	19.46		(46)
Storeg	storage	IOSS:	includir		lor or M		otorogo	within or	mayaa			-		(47)
Sillay				iy any su				(47)		561		0		(47)
Otherw	nunity n visa if no	eating a	na no la hot wate	nk in aw ar (this in	elling, e cludes i	nter 110 nstantar		(47) mbi boili	are) ente	ər '()' in (47)			
Water	storage	loss.	not wate			istantai					47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is knov	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b		,	2,					0		(49)
Energy	lost fro	m water	storage	kWh/ve	ar			(48) x (49)	_			0		(50)
b) If m	anufact	urer's de	eclared of	ylinder l	oss facto	or is not	known:	(40) x (40)				0		(50)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kWł	n/litre/da	ıy)					0		(51)
If comr	nunity h	eating s	ee secti	on 4.3										
Volume	e factor	from Tal	ble 2a									0	,	(52)
Tempe	rature fa	actor fro	m Table	2b								0		(53)



Energy Enter	y lost fro (50) or (m water (54) in (5	storage	, kWh/ye	ear			(47) x (51) x (52) x (53) =		0		(54)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m		0		(00)
(56)m-						0	0	0	0	0	0	0		(56)
lf cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (50	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	(00)
(57)~~		0	0	0,,,			,, (<i>,,</i> ,	, ,	, ,	,	0		(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	ry circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	ry circuit	loss cal	culated I		month (59)m = ((58) ÷ 36 or bootiu	55 × (41)	m Novlindo	r tharma	ctot)			
(110) (59)m=												0		(59)
(00)									Ů	•	Ŭ	•		()
Combi	i loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	55 × (41))m						(04)
(61)m=	32.17	29.01	32.03	30.9	31.87	30.76	31.73	31.82	30.84	31.96	31.04	32.15		(61)
Total h	neat requ	uired for	water he	eating ca	alculatec	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	166.13	146.17	152.93	136.31	133	118.03	112.6	124.62	124.75	141.4	150.51	161.88		(62)
Solar DI	HW input o	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WHRS	applies	, see Ap	pendix (ز از		-			(00)
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter		i	i	i							
(64)m=	166.13	146.17	152.93	136.31	133	118.03	112.6	124.62	124.75	141.4	150.51	161.88		
								Out	out from wa	ater heate	r (annual)₁	12	1668.32	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	ו] + 0.8 ×	(46)m	+ (57)m	+ (59)m]	
(65)m=	52.58	46.21	48.21	42.77	41.59	36.71	34.82	38.81	38.93	44.38	47.48	51.17		(65)
inclu	ude (57)	m in calo	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gain	s (Table	e 5), Wat	ts	-	-			-					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88		(66)
Lightin	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.71	13.95	11.34	8.59	6.42	5.42	5.86	7.61	10.22	12.97	15.14	16.14		(67)
Applia	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	176.16	177.99	173.38	163.58	151.2	139.56	131.79	129.96	134.57	144.38	156.76	168.39		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09		(69)
Pumps														
	s anu iai	is uallis	(Table 5	5a)										
(70)m=		is gains	(Table 5	5a) 3	3	3	3	3	3	3	3	3		(70)
(70)m=		3	(Table 5 3 on (negat	5a) 3 tive valu	3 es) (Tab	3 le 5)	3	3	3	3	3	3		(70)
(70)m= Losses (71)m=	s and fai 3 s e.g. ev	3 aporatic	(Table 5 3 on (negat	5a) 3 tive valu -80.7	3 es) (Tab -80.7	3 le 5) -80.7	3	3	3	3	3	3		(70)
(70)m= Losses (71)m= Water	s e.g. ev	aporatic -80.7	(Table 5 3 on (negat -80.7	5a) 3 tive valu -80.7	3 es) (Tab -80.7	3 le 5) -80.7	3	3	3	3	3 -80.7	3 -80.7		(70) (71)
(70)m= Losses (71)m= Water (72)m=	s e.g. ev -80.7 heating 70.68	aporatic -80.7 gains (1	(Table 5) 3 -80.7 -80.7 -able 5) 64.79	5a) 3 tive valu -80.7	3 es) (Tab -80.7	3 le 5) -80.7	3 -80.7 46.8	3 -80.7 52.16	3 -80.7 54.07	3 -80.7 59.65	3 -80.7 65.95	3 -80.7 68.78		(70) (71) (72)
(70)m= Losses (71)m= Water (72)m=	3 s e.g. ev -80.7 heating 70.68	3 raporatic -80.7 gains (T 68.76	(Table 5 3 on (negat -80.7 able 5) 64.79	5a) 3 tive valu -80.7 59.41	3 es) (Tab -80.7 55.91	3 le 5) -80.7 50.98	3 -80.7 46.8 m + (67)m	3 -80.7 52.16	3 -80.7 54.07	3 -80.7 59.65 (70)m + (7	3 -80.7 65.95	3 -80.7 68.78		(70) (71) (72)
(70)m= Losses (71)m= Water (72)m= Total i	3 s e.g. ev -80.7 heating 70.68 internal	3 aporatic -80.7 gains (1 68.76 gains =	(1 able 5 3 on (negat -80.7 -80.7 -able 5) 64.79 	5a) 3 tive valu -80.7 59.41	3 es) (Tab -80.7 55.91	3 le 5) -80.7 50.98 (66)	3 -80.7 46.8 m + (67)m 240.72	3 -80.7 52.16 + (68)m -	3 -80.7 54.07 + (69)m + (255.13	3 -80.7 59.65 (70)m + (7 273.26	3 -80.7 65.95 1)m + (72) 294 11	3 -80.7 68.78 m		 (70) (71) (72) (73)

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	1.76	x	11.28	×	0.4	x	0.7] =	3.85	(75)
Northeast 0.9x	0.77	x	1.76	x	22.97	×	0.4	x	0.7	i =	7.84	(75)
Northeast 0.9x	0.77	x	1.76	x	41.38	×	0.4	x	0.7	i =	14.13	(75)
Northeast 0.9x	0.77	x	1.76	x	67.96	×	0.4	x	0.7	=	23.21	(75)
Northeast 0.9x	0.77	x	1.76	x	91.35	×	0.4	x	0.7	=	31.2	(75)
Northeast 0.9x	0.77	x	1.76	x	97.38	×	0.4	x	0.7] =	33.26	(75)
Northeast 0.9x	0.77	x	1.76	x	91.1	x	0.4	x	0.7] =	31.11	(75)
Northeast 0.9x	0.77	x	1.76	x	72.63	x	0.4	x	0.7] =	24.8	(75)
Northeast 0.9x	0.77	x	1.76	x	50.42	×	0.4	x	0.7	=	17.22	(75)
Northeast 0.9x	0.77	x	1.76	x	28.07	×	0.4	x	0.7	=	9.59	(75)
Northeast 0.9x	0.77	x	1.76	x	14.2	x	0.4	x	0.7] =	4.85	(75)
Northeast 0.9x	0.77	x	1.76	x	9.21	×	0.4	x	0.7	=	3.15	(75)
Southeast 0.9x	0.77	x	1.98	x	36.79	×	0.4	x	0.7	=	14.14	(77)
Southeast 0.9x	0.77	x	3.26	x	36.79	x	0.4	x	0.7	=	23.27	(77)
Southeast 0.9x	0.77	x	1.98	x	36.79	×	0.4	x	0.7	=	14.14	– (77)
Southeast 0.9x	0.77	x	3.26	x	36.79	×	0.4	x	0.7	=	23.27	(77)
Southeast 0.9x	0.77	x	1.98	x	62.67	×	0.4	x	0.7	=	24.08	(77)
Southeast 0.9x	0.77	x	3.26	x	62.67	×	0.4	x	0.7	=	39.65	(77)
Southeast 0.9x	0.77	x	1.98	x	62.67	×	0.4	x	0.7	=	24.08	(77)
Southeast 0.9x	0.77	x	3.26	x	62.67	x	0.4	x	0.7	=	39.65	(77)
Southeast 0.9x	0.77	x	1.98	x	85.75	×	0.4	x	0.7	=	32.95	– (77)
Southeast 0.9x	0.77	x	3.26	x	85.75	×	0.4	x	0.7] =	54.24	(77)
Southeast 0.9x	0.77	x	1.98	x	85.75	×	0.4	x	0.7] =	32.95	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7] =	54.24	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7] =	40.82	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	×	0.4	x	0.7] =	67.21	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	×	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7] =	45.39	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	×	0.4	x	0.7] =	74.74	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	×	0.4	x	0.7] =	43.76	(77)
Southeast 0.9x	0.77	x	3.26	x	113.91	x	0.4	x	0.7	=	72.06	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	×	0.4	x	0.7	=	43.76	(77)



Southeast 0.9x	0.77	x	3.26	x	113.91	x	0.4	x	0.7] =	72.06	(77)
Southeast 0.9x	0.77	x	1.98	x	104.39	×	0.4	x	0.7	j =	40.11	(77)
Southeast 0.9x	0.77	x	3.26	x	104.39	×	0.4	x	0.7	=	66.03	(77)
Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7] =	40.11	(77)
Southeast 0.9x	0.77	x	3.26	x	104.39	x	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	×	0.4	x	0.7] =	35.67	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7	=	35.67	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7] =	58.74	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	3.26	x	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	3.26	x	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7] =	12.1	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7] =	12.1	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southwest0.9x	0.77	x	1.98	x	36.79]	0.4	x	0.7	=	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	36.79		0.4	x	0.7	=	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	36.79]	0.4	x	0.7	=	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest0.9x	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest0.9x	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest0.9x	0.77	x	1.98	x	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest0.9x	0.77	x	1.98	x	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest0.9x	0.77	x	1.98	x	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest0.9x	0.77	x	1.98	x	106.25		0.4	x	0.7	=	40.82	(79)
Southwest0.9x	0.77	x	1.98	x	106.25]	0.4	x	0.7	=	40.82	(79)
Southwest0.9x	0.77	x	1.98	x	106.25]	0.4	x	0.7	=	40.82	(79)
Southwest0.9x	0.77	x	1.98	x	119.01]	0.4	x	0.7	=	45.72	(79)
Southwest0.9x	0.77	x	1.98	x	119.01]	0.4	x	0.7	=	45.72	(79)
Southwest0.9x	0.77	x	1.98	x	119.01]	0.4	x	0.7] =	45.72	(79)
Southwest _{0.9x}	0.77	x	1.98	×	118.15]	0.4	×	0.7] =	45.39	(79)
Southwest0.9x	0.77	x	1.98	x	118.15]	0.4	x	0.7] =	45.39	(79)
Southwest _{0.9x}	0.77	x	1.98	x	118.15]	0.4	x	0.7	=	45.39	(79)
Southwest _{0.9x}	0.77	x	1.98	x	113.91]	0.4	x	0.7	=	43.76	(79)
Southwest _{0.9x}	0.77	x	1.98	x	113.91]	0.4	x	0.7	=	43.76	(79)



Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	1	13.91	Ι Γ	0.4	x	0.7	=	43	.76	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	1	04.39	ΪĒ	0.4	x	0.7	=	40	.11	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	1	04.39	ΪĒ	0.4	x	0.7	=	40	.11	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	1	04.39	ίĒ	0.4	x	0.7	=	40	.11	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	g	2.85	ίĒ	0.4	×	0.7	=	35	.67	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	g	2.85	ίĒ	0.4	x	0.7	=	35	.67	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	9	2.85	ίĒ	0.4	×	0.7	= =	35	.67	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.9	98	x	6	9.27	ίĒ	0.4	x	0.7	=	26	.61	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.9	98	x	6	9.27	ίĒ	0.4	×	0.7	= =	26	.61	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	6	9.27	ίĒ	0.4	×	0.7	= =	26	.61	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.9	98	x	4	4.07	ίĒ	0.4	x	0.7	=	16	.93	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.9	98	x	4	4.07	ίĒ	0.4	×	0.7	= =	16	.93	(79)
Southw	est <mark>0.9x</mark>	0.77	x	1.9	98	x	4	4.07	ίĒ	0.4	×	0.7	=	16	.93	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	3	31.49	ίĒ	0.4	×	0.7	=	12	2.1	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	3	31.49	ίĒ	0.4	×	0.7	=	12	2.1	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	1.9	98	x	3	31.49	ίĒ	0.4	×	0.7	= =	12	2.1	(79)
Solar ((83)m= Total g	gains in 121.08 gains – in	watts, ca 207.53 nternal ar	lculated 287.35 nd solar	for eac 361.74 (84)m =	h mont 410.38 = (73)m	:h 3 4 1 + (409.7 (83)m	394.04 , watts	<mark>(83)m</mark> : 357.4	= Sum(74)m . 1 313.06	(<mark>82)m</mark> 230.28	3 145.26	103.47			(83)
(84)m=	439.89	524.49	593.14	649.58	680.17	7 6	61.93	634.76	603.4	1 568.18	503.54	4 439.37	413.05	7		(84)
7. Me	ean inter	nal temp	erature	(heating	seaso	n)										
7. Me Temp	ean inter perature	nal tempo during he	erature eating p	(heating eriods ir	i seaso n the liv	on) ving	area	from Tat	ole 9, [°]	Th1 (°C)				2	:1	(85)
7. Me Temp Utilisa	ean inter perature ation fac	nal tempo during he ctor for ga	erature (eating p ains for l	(heating eriods ir iving are	seaso n the live a, h1,i	ving m (s	area f see Ta	from Tat ble 9a)	ole 9, [°]	Th1 (°C)				2	:1	(85)
7. Me Temp Utilisa	ean inter perature ation fac Jan	nal tempo during he ctor for ga Feb	erature eating p lins for I Mar	(heating eriods ir iving are Apr	seaso n the liv ea, h1,i May	on) /ing m (s /	area t see Ta Jun	from Tat ble 9a) Jul	ole 9, ⁻ Au	Th1 (°C) g Sep	Oct	Nov	Dec	 	1	(85)
7. Me Temp Utilisa (86)m=	ean inter perature ation fac Jan 0.99	nal tempo during he ctor for ga Feb 0.99	erature eating p lins for I Mar 0.96	(heating eriods ir iving are Apr 0.88	seaso n the liv ea, h1,i May 0.74	on) /ing m (s /	area f see Ta Jun 0.54	from Tab ble 9a) Jul 0.39	ole 9, Au 0.43	Th1 (°C) g Sep 0.67	Oct 0.92	Nov 0.99	Dec 1	2	1	(85)
7. Me Temp Utilisa (86)m= Mean	ean inter perature ation fac Jan 0.99	nal tempo during he ctor for ga Feb 0.99	erature eating p lins for I Mar 0.96	(heating eriods ir iving are Apr 0.88 iving are	seaso n the liv ea, h1,i May 0.74 ea T1 (n) ving m (s /	area f see Ta Jun 0.54	from Tab ble 9a) Jul 0.39 ps 3 to 7	ole 9, Au 0.43 7 in Ta	Th1 (°C) g Sep 0.67 ble 9c)	Oct 0.92	Nov 0.99	Dec 1	2	1	(85)
7. Me Temp Utilisa (86)m= Mean (87)m=	ean inter perature ation fac Jan 0.99 interna 20.14	nal temperative during he	erature eating p tins for I Mar 0.96 ature in I 20.56	(heating eriods ir iving are Apr 0.88 iving are 20.8	seaso n the liv ea, h1,i May 0.74 ea T1 (20.95	on) ving m (s / (follo	area f see Ta Jun 0.54 ow ste 20.99	from Tab ble 9a) Jul 0.39 ps 3 to 7 21	Die 9, Au 0.43 7 in Ta 21	Th1 (°C) g Sep 0.67 ble 9c) 20.98	Oct 0.92 20.78	Nov 0.99 20.41	Dec 1 20.1	[2]]	1	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp	ean inter perature ation fac Jan 0.99 interna 20.14	during he during he ctor for ga Feb 0.99 I tempera 20.32 during he	erature eating p ins for I Mar 0.96 ature in I 20.56	(heating eriods ir iving are Apr 0.88 iving are 20.8 eriods ir	seaso n the liv ea, h1,i May 0.74 ea T1 (20.95	on) ving m (s / (follo 2 of dw	area f see Ta Jun 0.54 ow ste 20.99 velling	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta	ole 9, Au 0.43 7 in Ta 21 able 9.	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C)	Oct 0.92 20.78	Nov 0.99 20.41	Dec 1 20.1	2]]	1	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	ean inter perature ation fac Jan 0.99 interna 20.14 perature 20.12	nal tempo during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12	erature eating p tins for I Mar 0.96 ature in I 20.56 eating p 20.12	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13	seaso n the liv ea, h1, May 0.74 ea T1 (20.95 n rest c 20.13	on) ving m (s / (follo	area f see Ta Jun 0.54 ow ste 20.99 velling 20.14	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14	Au 0.43 7 in Ta 21 able 9, 20.1	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14	Oct 0.92 20.78 20.13	Nov 0.99 20.41 20.13	Dec 1 20.1 20.13	[2]]]	1	(85) (86) (87) (88)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	ean inter perature ation fac Jan 0.99 interna 20.14 perature 20.12	nal tempor during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12	erature eating p lins for I Mar 0.96 ature in I 20.56 eating p 20.12	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13	seaso n the live ea, h1,i May 0.74 ea T1 (20.95 n rest c 20.13	n) ving m (s / (follo (follo 2 (follo 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	area 1 see Ta Jun 0.54 ow ste 20.99 velling 20.14	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14	Au 0.43 7 in Ta 21 able 9, 20.14	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14	Oct 0.92 20.78 20.13	Nov 0.99 20.41 20.13	Dec 1 20.1 20.13	[2]]]	1	(85) (86) (87) (88)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99	nal temper during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dr 0.85	seaso n the live ea, h1,i May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68	n) wing m (s / (follc (follc (follc) , h2	area 1 see Ta Jun 0.54 ow ste 20.99 velling 20.14 ,m (se 0.47	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32	Au 0.43 7 in Ta 21 able 9, 20.1 9a) 0.35	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14	Oct 0.92 20.78 20.13	Nov 0.99 20.41 20.13	Dec 1 20.1 20.13]]]	1	(85) (86) (87) (88) (88)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Moon	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99	nal tempo during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga	erature eating p nins for I Mar 0.96 ature in I 20.56 eating p 20.12 nins for r 0.95	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dr 0.85	seaso n the live ea, h1, i May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68	n) ving m (s / (follo (follo) f dw 1, h2	area 1 see Ta Jun 0.54 20.99 velling 20.14 ,m (se 0.47	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32	Au 0.43 7 in Ta 21 able 9, 20.11 9a) 0.35	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0.6	Oct 0.92 20.78 20.13 0.89	Nov 0.99 20.41 20.13 0.98	Dec 1 20.1 20.13]]]	1	(85) (86) (87) (88) (89)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna	nal tempor during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in 1 19.75	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 est of dr 0.85 the rest	seaso n the live ea, h1, i May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68 of dwe 20.1	n) ving m (s / (follo (follo (follo), h2) h2) h2),	area 1 see Ta Jun 0.54 20.99 velling 20.14 ,m (se 0.47 172 (fe 20.14	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14	Au 0.43 0.43 7 in Ta 21 able 9, 20.14 9a) 0.35 eps 3 f 20.14	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13	Oct 0.92 20.78 20.13 0.89 e 9c)	Nov 0.99 20.41 20.13 0.98	Dec 1 20.1 20.13 1 19.3]]]]	1	(85) (86) (87) (88) (89) (90)
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7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	an internation factor Jan 0.99 interna 20.14 oerature 20.12 ation factor 0.99 interna 19.34	nal temp during he ctor for ga 0.99 I temperation 20.32 during he 20.12 ctor for ga 0.98 I temperation 19.52 I temperation 10.98	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in 1 19.75	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dv 0.85 the rest 19.98	seaso n the live ea, h1, I May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68 of dwe 20.1	n) ving m (s / (follc (follc (follc 1, h2 1, h2 1, h2 1, h2 1, h2 1, h2 1, h2	area f see Ta Jun 0.54 0.5	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14	Au 0.43 0.43 7 in Ta 21 able 9, 20.11 9a) 0.35 eps 3 1 20.11 + (1 - 20.5	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 20.14 0.6 0 7 in Tabl 20.13 fLA) x T2 20.51	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4	Dec 1 20.1 20.13 1 19.3 4) =		45	(85) (86) (87) (88) (89) (90) (91)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m=	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34 interna	nal tempor during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52 I tempera 19.88	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in 1 19.75 ature (fo 20.11	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dr 0.85 the rest 19.98 r the wh 20.35	seaso n the live ea, h1, i May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68 of dwe 20.1 ole dw 20.48	n) ving m (s / / (follc (follc (follc 2 velling velling velling	area f see Ta Jun 0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.99 0.14 0.47 0.47 0.47 0.47 0.47 0.47 0.47 0.47 0.52 100 (fr 0.52 100 (fr 0.52 100 (fr 0.52 100 (fr 0.52 100 (fr 0.52 100 (fr 0.52 100 (fr 0.52)	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14 LA × T1 20.52 m Table	Au 0.43 7 in Ta 21 able 9, 20.1 9a) 0.35 eps 3 t 20.1 + (1 - 20.5 46 yr	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) ↓ 20.14 0.6 0 7 in Tabl ↓ 20.13 fLA) × T2 2 20.51 bere approx	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv 20.33	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4) 19.97	Dec 1 20.1 20.13 1 19.3 4) = 19.66		45	(85) (86) (87) (88) (89) (90) (91) (92)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m=	an interna perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34 interna 19.69 r adjustn 19.69	nal tempor during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52 I tempera 19.88 nent to th	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in 1 19.75 ature (fo 20.11 ie mean 20.11	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 est of dr 0.85 the rest 19.98 r the wh 20.35 internal 20.35	seaso a the live aa, h1, May 0.74 ea T1 (20.95 a rest of 20.13 welling 0.68 of dwe 20.1 oole dwe 20.1 oole dwe 20.48 1 tempe 20.48	n) ving m (s / (follc (fo	area 1 see Ta Jun 0.54 20.99 velling 20.14 ,m (se 0.47 0.47 0.47 20.14 mg) = fl 20.52 ure fro 20.52	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14 LA × T1 20.52 m Table 20.52	 Au 0.43 7 in Ta 21 able 9, 20.17 able 9, 20.17 9a) 0.35 eps 3 f 20.17 4e, w 20.5 	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13 f fLA) × T2 2 20.51 here approx 2 20.51	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv 20.33 opriate 20.33	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4 19.97	Dec 1 20.1 20.13 1 19.3 4) = 19.66		45	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)
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7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Sp Set T	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34 interna 19.69 r adjustn 19.69 r adjustn 19.69 r adjustn	nal temp during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52 I tempera 19.88 nent to th 19.88 nent to th 19.88 nent to th 19.88 nent to th	erature eating p ins for I Mar 0.96 ature in I 20.56 eating p 20.12 ins for r 0.95 ature in I 19.75 ature (fo 20.11 ie mean 20.11 irement ernal ten	(heating eriods ir iving are 0.88 iving are 20.8 eriods ir 20.13 rest of dr 0.85 the rest 19.98 r the wh 20.35 internal 20.35	seaso n the live ea, h1, I May 0.74 ea T1 (20.95 n rest c 20.13 welling 0.68 of dwe 20.1 nole dw 20.48 tempe 20.48 re obta	n) ving m (s / / (follc (follc 2 (follc 2 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	area f see Ta Jun 0.54 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14 LA × T1 20.52 m Table 20.52	Au 0.43 7 in Ta 21 able 9, 20.1 9a) 0.35 eps 3 1 20.1 + (1 - 20.5 4e, w 20.5 4e, w 20.5 Table	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13 fLA) × T2 2 20.51 here appro 2 20.51 9b, so tha	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv 20.33 opriate 20.33 t Ti,m=	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4 19.97 19.97 =(76)m an	Dec 1 20.1 20.13 1 19.3 4) = 19.66 19.66 d re-ca	2]]]]]]]]]]]]]]]]]]]	45	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)
7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Sp Set T the ut	an inter perature ation fac Jan 0.99 interna 20.14 perature 20.12 ation fac 0.99 interna 19.34 interna 19.69 adjustra 19.69 ace hea i to the n tillisation	nal temp during he ctor for ga Feb 0.99 I tempera 20.32 during he 20.12 ctor for ga 0.98 I tempera 19.52 I tempera 19.88 nent to th 19.88 nent to th 19.88 ting requ mean inte factor for	erature in l mar 0.96 ature in l 20.56 eating p 20.12 ature in l 20.12 ature in l 20.12 ature in l 19.75 ature (fo 20.11 ie mean 20.11 irement ernal ten r gains u	(heating eriods ir iving are Apr 0.88 iving are 20.8 eriods ir 20.13 est of dr 0.85 the rest 19.98 r the wh 20.35 internal 20.35	seaso a the live ea, h1, i May 0.74 ea T1 (20.95 a rest of 20.13 welling 0.68 of dwe 20.1 ole dw 20.48 I tempe 20.48 re obta able 9a	n) ving m (s / (follc (follc (follc i, h2 i, h2 velling velling velling inec	area 1 see Ta Jun 0.54 20.99 velling 20.14 ,m (se 0.47 0 T2 (fa 20.14 20.52 ure fro 20.52 Jure fro 20.52	from Tab ble 9a) Jul 0.39 ps 3 to 7 21 from Ta 20.14 ee Table 0.32 ollow ste 20.14 LA × T1 20.52 m Table 20.52 m Table	Au 0.43 0.43 7 in Ta 21 able 9, 20.11 able 9, 20.11 9a) 0.35 eps 3 f 20.11 + (1 - 20.51 44e, w 20.51 Table	Th1 (°C) g Sep 0.67 ble 9c) 20.98 Th2 (°C) 4 20.14 0.6 0 7 in Tabl 4 20.13 f fLA) × T2 2 20.51 here appro 2 20.51 so that	Oct 0.92 20.78 20.13 0.89 e 9c) 19.97 LA = Liv 20.33 ppriate 20.33 t Ti,m=	Nov 0.99 20.41 20.13 0.98 19.61 ring area ÷ (4 19.97 19.97 (76)m an	Dec 1 20.1 20.13 1 19.3 4) = 19.66 19.66 d re-ca	2]]]]]]]]]]]]]]]]]]]	45	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)



Utilisa	ation fac	tor for a	ains. hm	:										
(94)m=	0.99	0.98	0.95	0.86	0.71	0.51	0.35	0.39	0.63	0.9	0.98	0.99		(94)
Usefu	ul gains,	hmGm ,	, W = (94	4)m x (84	ـــــــــــــــــــــــــــــــــــــ			1						
(95)m=	436.48	513.75	561.91	560.6	480.28	334.48	223.42	234.09	356.77	451.97	431.18	410.73		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	904.12	877.72	795.71	661.7	506.15	337.46	223.71	234.59	366.86	561.29	745.56	899.76		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	h = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	347.92	244.59	173.95	72.79	19.25	0	0	0	0	81.34	226.36	363.84		-
								Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	1530.03	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year							[24.97	(99)
9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:										-		_
Fracti	ion of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	– (201) =				1	(202)
Fracti	ion of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		Ī	1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1							Ī	89.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec	kWh/vea	⊐ ar
Space	e heatin	g require	ement (c	alculate	d above)								
•	347.92	244.59	173.95	72.79	19.25	0	0	0	0	81.34	226.36	363.84		
(211)m	ר 1 = {[(98)m x (20	4)] } x 1	00 ÷ (20)6)									(211)
()	388.74	273.28	194.35	81.33	21.5	0	0	0	0	90.88	252.92	406.52		
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	1709.53	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							L		
= {[(98)m x (20)1)]}x1	00 ÷ (20	8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	ll (kWh/yea	ar) =Sum(2	215) _{15,1012}	-	0	(215)
Water	heating	J										•		-
Output	from w	ater hea	ter (calc	ulated a	bove)									
	166.13	146.17	152.93	136.31	133	118.03	112.6	124.62	124.75	141.4	150.51	161.88		-
Efficier	ncy of w	ater hea	iter								i		86.7	(216)
(217)m=	88.58	88.43	88.17	87.65	87.04	86.7	86.7	86.7	86.7	87.7	88.36	88.62		(217)
Fuel fo	or water	heating,	kWh/m	onth										
(219)m	1 = (64)	M X 100	$\frac{1}{17345}$	m 155.5	152.8	136 14	129.88	143 74	143 88	161 23	170.33	182 67		
()							0.00	Tota	I = Sum(2 ⁻	19a), =			1902 46	7(210)
Δnnua	al totale								```	r112	Wh/vear	. l	kWh/voar	
Space	heating	fuel use	ed, main	system	1					ň	year	[1709.53	٦
Wator	haating	fuel แระ	ď	-								L T	1002.46	
vvaler	nearing	iuei use	u										1902.46	1

Electricity for pumps, fans and electric keep-hot



mechanical ventilation - balanced, extract or pos	itive input from outside	e	98.12		(230a)
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum	of (230a)(230g) =		173.12	(231)
Electricity for lighting				277.36	(232)
Electricity generated by PVs				-519.53	(233)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b)	=		3542.94	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	369.26	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	410.93	(264)
Space and water heating	(261) + (262) + (263) + (264) =		780.19	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	89.85	(267)
Electricity for lighting	(232) x	0.519	=	143.95	(268)
Energy saving/generation technologies Item 1		0.519	=	-269.64	(269)
Total CO2, kg/year		sum of (265)(271) =		744.35	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		12.15	(273)
EI rating (section 14)				91	(274)



			User D	etails:						
Assessor Name:	Panagiotis	Dalapas		Stroma	a Num	ber:		STRO	030082	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.41	
		P	roperty a	Address:	Be Gre	en-Top I	Floor Fla	at		
Address :	238 KILBUR	RN HIGH ROAD	, LONDO	ON, NWE	6 2BS					
1. Overall dwelling dimen	sions:									
Ground floor				a(m²) 02.92	(1a) x	Av. He i	ight(m) .45	(2a) =	252.15	(3a)
Total floor area TFA = (1a)	+(1b)+(1c)+	(1d)+(1e)+(1	ר) (1	02.92	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	252.15	(5)
2. Ventilation rate:	main		n /	athan		total				
Number of chimneys	heating	heating	+	0] = [0	×4	40 =	0	(6a)
Number of open flues	0	+ 0	+	0	=	0	X 2	20 =	0	(6b)
Number of intermittent fan	S					0	x ′	10 =	0	(7a)
Number of passive vents						0	x ′	10 =	0	(7b)
Number of flueless gas fire	es					0	x 4	40 =	0	(7c)
								Air ch	nanges per ho	ur
Infiltration due to chimneys	s, flues and fa	ans = (6a) + (6b) + (7)	7a)+(7b)+(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has be	en carried out or dwelling (ne	r is intended, procee	d to (17), o	otherwise o	continue fro	om (9) to ((16)			
Additional infiltration	e uwening (na	<i>)</i>					[(9)-	-11x0.1 =	0	(10)
Structural infiltration: 0.2	5 for steel or	r timber frame o	[.] 0.35 foi	r masonr	y constr	uction	L(-7	1	0	(11)
if both types of wall are pre deducting areas of opening	sent, use the va s); if equal user	lue corresponding to 0.35	o the great	er wall area	a (after					
If suspended wooden flo	oor, enter 0.2	(unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else e	enter 0							0	(13)
Percentage of windows	and doors dr	aught stripped		0 25 - [0 2	$x(14) \pm 1$	001 -			0	(14)
				(8) + (10)	× (14) ÷ 1 + (11) + (1	2) + (13) +	+ (15) =		0	(15)
Air permeability value	50 expresse	ed in cubic metre	es per ho	our per so	ouare m	etre of e	nvelope	area	0	(10)
If based on air permeabilit	v value, then	(18) = [(17) ÷ 20]+(8), otherwi	ise (18) = (16)		intelepe	area	0.15	(18)
Air permeability value applies	if a pressurisatio	on test has been doi	ne or a deg	gree air pei	rmeability	is being us	sed			
Number of sides sheltered									2	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporatir	ng shelter fac	tor		(21) = (18)) x (20) =				0.13	(21)
Infiltration rate modified fo	r monthly wir	nd speed							1	
Jan Feb N	lar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Tabl	e7				4.0			1	
(22)m= 5.1 5 4	.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	J	
Wind Factor $(22a)m = (22)$	m÷4		1			[]			1	
(22a)m= 1.27 1.25 1.	23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	J	



Adjusted infilt	ration rat	e (allow	ing for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe	ective air	change	rate for t	he appli	cable ca	se						0.5	(232)
If exhaust air h	neat pump	usina App	endix N. (2	3b) = (23a) × Fmv (e	auation (N	15)) . othe	rwise (23b) = (23a)			0.5	(23a)
If balanced wit	th heat reco	overy: effic	ciency in %	allowing for	or in-use fa	actor (from	n Table 4h) =	, (,			76.5	(23c)
a) If balanc	ed mech	, anical ve	entilation	with hea	at recove	erv (MVH	HR) (24a) m = (22	2b)m + (2	23b) x [′	l – (23c)	+ 1001	(200)
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(24a)
b) If balanc	ed mech	anical ve	entilation	without	heat rec	overy (N	I /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 I	house ex m < 0.5 x	tract ver	ntilation of then (24)	or positiv	e input v	ventilatio	on from c	butside m + 0	5 x (23h)	1		
(24c)m= 0	0	0		0	0	0	0	0	0	0	0		(24c)
d) If natural	ventilati	on or wh	nole hous	se positiv	re input y	ventilatio	on from l	oft					
if (22b)	m = 1, th	en (24d))m = (22l	o)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	r change	rate - ei	nter (24a) or (24b) or (24o	c) or (24	d) in boy	k (25)			-		
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros	SS	Openin	gs	Net Are	ea	U-valu	ue	ΑXU		k-value	9	AXk
	area	(m²)	rr	1 ²	A ,n	∩²	W/m2	2K	(W/ł	<)	kJ/m²·l	K	KJ/K
Doors	area	(m²)	ſſ	1 ²	A ,n 2.15	∩² ×	W/m2	:к = [(W/ł 2.15	<)	kJ/m²₊I	ζ.	KJ/K (26)
Doors Windows Typ	area e 1	(m²)	ſſ	J ²	A ,n 2.15 1.98	∩² x x1/	W/m2 1 /[1/(1.2)+	2K = [0.04] = [(W/ł 2.15 2.27	<) 	kJ/m²∙I	ζ.	KJ/K (26) (27)
Doors Windows Typ Windows Typ	area e 1 e 2	(m²)	rr	J ²	A ,n 2.15 1.98 1.98	n ² x x ^{1/} x ^{1/}	W/m2 1 /[1/(1.2)+ /[1/(1.2)+	K 0.04] = [0.04] = [(W/ł 2.15 2.27 2.27	<) 	kJ/m²•I	ζ.	KJ/K (26) (27) (27)
Doors Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3	(m²)	rr	12	A ,n 2.15 1.98 1.98 1.98	n ² x x ^{1/} x ^{1/} x ^{1/}	W/m2 1 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ $	(W/ł 2.15 2.27 2.27 2.27		kJ/m²∙I	<	KJ/K (26) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4	(m²)	rr	12	A ,n 2.15 1.98 1.98 1.98 1.98	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 [1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$K = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04$	(W/ł 2.15 2.27 2.27 2.27 2.27	\diamond	kJ/m²·I	<.	KJ/K (26) (27) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 [1/(1.2)+ [1/(1.2)+ [1/(1.2)+ [1/(1.2)+ [1/(1.2)+ [1/(1.2)+	$K = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27	\diamond	kJ/m²·I	< c	KJ/K (26) (27) (27) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27	\diamond	kJ/m²·I	<.	KJ/K (26) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \end{bmatrix} $	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²·I	<.	KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98	n ² x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²·I	<.	KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98	n ² x x x x x x x x x x x x x x x x x x x	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²-I	<.	KJ/K (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	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26	n ² x x x x x x x x x x x x x x x x x x x	W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \\ = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²-I	<.	KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
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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	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12	(m²)	ſſ	12	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 3.26 1.87 1.2	$\begin{array}{c c} n^{2} & x \\ x^{1/} \\ $	W/m2 1 $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$ $(1/(1.2)+)$	$\begin{array}{c} \mathbf{K} \\ \hline 0.04 \\ = \\ \begin{bmatrix} \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ 0.04 \\ \end{bmatrix} = \\ \begin{bmatrix} \\ \\ \end{bmatrix}$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	\diamond	kJ/m²-I	ς	KJ/K (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 Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 [128	.(m ²)	m 26.7	1	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 $(1/(1.2)+)$	$\begin{array}{c} \mathbf{K} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \\ 0.04] &= \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= $	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	<pre>> </pre>	kJ/m²-I	< <	 KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29)
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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 Windows Typ Windows Typ Windows Typ Windows Typ	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>22.8</u> <u>19.2</u>	.4 33 21	m 26.7 0 2.15	1	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 3.26 1.87 1.2 101.69 22.83 17.06	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 $(1/(1.2)+)$ $(1/(1$	$\begin{array}{c} \mathbf{K} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04]$	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	<pre>> </pre>	kJ/m²-I		 KJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)
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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 Windows Typ Windows Typ Windows Typ Walls Type1 Walls Type2 Walls Type3 Roof Total area of o	area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 11 e 12 <u>128</u> <u>19.2</u> elements	.4 33 21 92 5, m ²	m 26.7 0 2.15 0	1 	A ,n 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	W/m2 1 $(1/(1.2)+)$ $(1/(1$	$\begin{array}{c} \mathbf{K} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ 0.04] &= \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ 0.04] &= \\ \end{bmatrix} \\ 0.04] &= \begin{bmatrix} \\ \\ \\ \\ 0.04] &= \\ \end{bmatrix} \\ 0.04] &= \\ 0.04] &= \begin{bmatrix} \\ \\ \\ 0.04] &= \\ 0.04] $	(W/ł 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2		kJ/m²-I		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) =

72.64 (33)



Heat o	capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	16692.33	(34)
Therm	al mass	parame	ter (TMF	- Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35)
For des can be	ign assess used inste	ments wh ad of a dei	ere the de tailed calci	tails of the ulation.	construct	ion are noi	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						39.78	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								_
Total f	abric he	at loss							(33) +	(36) =			112.41	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y I	i			(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	23.3	23.04	22.77	21.45	21.18	19.86	19.86	19.59	20.39	21.18	21.71	22.24		(38)
Heat t	ransfer o	coefficier	nt, W/K			-			(39)m	= (37) + (3	38)m			
(39)m=	135.72	135.45	135.19	133.86	133.6	132.27	132.27	132	132.8	133.6	134.13	134.66		_
Heat l	oss para	meter (H	HLP), W/	/m²K			-		(40)m	Average = = (39)m ÷	Sum(39) _{1.} (4)	12 /12=	133.79	(39)
(40)m=	1.32	1.32	1.31	1.3	1.3	1.29	1.29	1.28	1.29	1.3	1.3	1.31		
Numb	er of day	rs in mor	nth (Tab	le 1a)	-	-			,	Average =	Sum(40) _{1.}	12 /12=	1.3	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
Assun if TF if TF Annua <i>Reduce</i>	ned occu FA > 13.9 FA £ 13.9 al average the annua	ipancy, I 9, N = 1 9, N = 1 e hot wa al average	N + 1.76 x ater usag <i>hot water</i>	[1 - exp ge in litre usage by	(-0.0003 es per da 5% if the o	849 x (TF ay Vd,av Iwelling is	FA -13.9) erage = designed t)2)] + 0.((25 x N) to achieve)013 x (⁻ + 36 a water us	TFA -13. se target o	2. 9)	.87]	(42) (43)
not mor	e that 125	litres per p	person per	r day (all w	ater use, l	hot 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=	109.85	105.86	101.87	97.87	93.88	89.88	89.88	93.88	97.87	101.87	105.86	109.85		_
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D)Tm / 3600	kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1198.41	(44)
(45)m=	162.91	142.48	147.03	128.18	123	106.14	98.35	112.86	114.21	133.1	145.29	157.77		_
lf instar	ntaneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46,) to (61)	Total = Su	m(45) ₁₁₂ =	:	1571.31	(45)
(46)m=	24.44	21.37	22.05	19.23	18.45	15.92	14.75	16.93	17.13	19.96	21.79	23.67		(46)
Water	storage	loss:	includin		alar or M		storado	within ea	me ves	sol		0	1	(47)
Sillaç				iy ariy su		ntor 110		(47)		501		0		(47)
Others Water	wise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	(47) ombi boil	ers) ente	er '0' in (47)			
a) If n	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temp	erature f	actor fro	m Table	2b		`	• /					0		(49)
Energ	y lost fro	m water urer's de	storage	, kWh/ye cvlinder l	ear loss fact	or is not	known:	(48) x (49)	=			0		(50)
D) II II	lanalaot													



Hot wa If comr Volume Tempe	ater stora munity h e factor erature f	age loss leating s from Ta actor fro	factor fr ee secti ble 2a m Table	rom Tabl on 4.3 2b	e 2 (kW	h/litre/da	y)					0		(51) (52) (53)
Energy	/ lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter	(50) or ((54) in (5	55)									0		(55)
Water	storage	loss cal	culated	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	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (50	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 Primar (moo	y circuit y circuit dified by	loss (ar loss cal factor fi	nual) fro culated rom Tab	om Table for each le H5 if t	e 3 month (here is s	59)m = (solar wat	(58) ÷ 36 er heatir	65 × (41) ng and a	m cylinde	r thermo	stat)	0		(58)
(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=	32.48	29.3	32.36	31.2	32.13	30.98	31.94	32.07	31.1	32.26	31.34	32.44		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.39	171.78	179.39	159.38	155.13	137.12	130.29	144.93	145.31	165.36	176.63	190.21		(62)
Solar DH	HW input of	calculated	using App	endix G o	Appendix	H (negativ	ve quantity	/) (enter '0	if no sola	r contributi	ion to wate	er heating)		
(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	-										
(64)m=	195.39	171.78	179.39	159.38	155.13	137.12	130.29	144.93	145.31	165.36	176.63	190.21		
								Outp	out from wa	ater heate	r (annual)₁	12	1950.91	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m]	
(65)m=	62.29		-							r in the second s	1			
inclu		54.7	56.98	50.42	48.93	43.04	40.69	45.54	45.75	52.32	56.14	60.57		(65)
	ıde (57)	54.7 m in calo	56.98	50.42 of (65)m	48.93 only if c	43.04 Sylinder is	40.69 s in the c	45.54 dwelling	45.75 or hot w	52.32 ater is fr	56.14 rom com	60.57 munity h	eating	(65)
5. Int	ide (57)i ternal ga	54.7 m in calo ains (see	56.98 culation	50.42 of (65)m 5 and 5a	48.93 only if c):	43.04 Sylinder is	40.69 s in the c	45.54 dwelling	45.75 or hot w	52.32 ater is fr	56.14 om com	60.57 munity h	eating	(65)
5. Int Metabo	ide (57)i ternal ga olic gain	54.7 m in calo ains (see as (Table	56.98 culation Table 5 e 5), Wat	50.42 of (65)m 5 and 5a ts	48.93 only if c):	43.04 ylinder is	40.69 s in the c	45.54 dwelling	45.75 or hot w	52.32 ater is fr	56.14 rom com	60.57 munity h	eating	(65)
5. Int Metabo	ide (57)i ernal ga olic gain Jan	54.7 m in calo ains (see s (Table Feb	56.98 culation Table 5 5), Wat Mar	50.42 of (65)m 5 and 5a ts Apr	48.93 only if c): May	43.04 ylinder is Jun	40.69 s in the c Jul	45.54 dwelling Aug	45.75 or hot w Sep	52.32 ater is fr Oct	56.14 Form corm	60.57 munity h Dec	eating	(65)
5. Int Metabo (66)m=	ide (57)i ternal ga olic gain Jan 138.25	54.7 m in calo ains (see s (Table Feb 138.25	56.98 culation (Table 5 5), Wat Mar 138.25	50.42 of (65)m 5 and 5a ts Apr 138.25	48.93 only if c): May 138.25	43.04 ylinder is Jun 138.25	40.69 s in the c Jul 138.25	45.54 dwelling Aug 138.25	45.75 or hot w Sep 138.25	52.32 ater is fr Oct 138.25	56.14 rom com Nov 138.25	60.57 munity h Dec 138.25	eating	(65)
5. Int Metabo (66)m= Lightin	ide (57) ernal ga olic gain Jan 138.25 g gains	54.7 m in calo ains (see s (Table Feb 138.25 (calcula	56.98 culation (Table 5 e 5), Wat Mar 138.25 ted in Ap	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix	48.93 only if c): May 138.25 L, equati	43.04 ylinder is Jun 138.25 ion L9 of	40.69 s in the c Jul 138.25 r L9a), a	45.54 dwelling Aug 138.25 lso see	45.75 or hot w Sep 138.25 Table 5	52.32 ater is fr Oct 138.25	56.14 rom com Nov 138.25	60.57 munity h Dec 138.25	eating	(65)
5. Int Metabo (66)m= Lightin (67)m=	ide (57) iernal ga olic gain Jan 138.25 g gains 23.27	54.7 m in calo s (Table Feb 138.25 (calcula 20.66	56.98 culation (5), Wat (138.25 ted in Ap (16.8	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72	48.93 only if c): May 138.25 L, equati 9.51	43.04 ylinder is Jun 138.25 ion L9 of 8.03	40.69 s in the c Jul 138.25 r L9a), a 8.68	45.54 dwelling Aug 138.25 Iso see 11.28	45.75 or hot w Sep 138.25 Table 5 15.14	52.32 ater is fr Oct 138.25 19.22	56.14 rom com Nov 138.25 22.43	60.57 munity h Dec 138.25 23.91	eating	(65) (66) (67)
5. Int Metabo (66)m= Lightin (67)m= Appliar	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga	54.7 m in calo ains (see Feb 138.25 (calcula 20.66 ins (calc	56.98 culation (Table 5 5), Wat Mar 138.25 ted in Ap 16.8 ulated ir	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 n Append	48.93 only if c): May 138.25 L, equati 9.51 dix L, eq	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13	45.54 dwelling 138.25 lso see 11.28 3a), also	45.75 or hot w Sep 138.25 Table 5 15.14 o see Ta	52.32 ater is fr Oct 138.25 19.22 ble 5	56.14 rom com Nov 138.25 22.43	60.57 munity h Dec 138.25 23.91	eating	(65) (66) (67)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m=	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96	54.7 m in calo ains (see s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67	56.98 culation (Table 5 5), Wat Mar 138.25 ted in Ap 16.8 ulated in 256.85	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 Append 242.32	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L ² 206.75	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52	45.75 or hot w Sep 138.25 Table 5 15.14 see Ta 199.35	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88	56.14 om com Nov 138.25 22.43 232.21	60.57 munity h Dec 138.25 23.91 249.45	eating	 (65) (66) (67) (68)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin	ide (57) iernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains	54.7 m in calo s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula	56.98 culation (5), Wat 138.25 ted in Ap 16.8 ulated in 256.85 tted in A	50.42 of (65)m and 5a ts Apr 138.25 opendix 12.72 Appendix 242.32 ppendix	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a)	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52 , also se	45.75 or hot w Sep 138.25 Table 5 15.14 o see Ta 199.35 ee Table	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5	56.14 rom com Nov 138.25 22.43 232.21	60.57 munity h Dec 138.25 23.91 249.45	eating	(65) (66) (67) (68)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m=	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82	54.7 m in calo s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82	56.98 culation (Table 5 5), Wat 038.25 ted in Ap 16.8 culated in 256.85 ted in A 36.82	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 n Appendix 242.32 ppendix 36.82	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52 , also se 36.82	45.75 or hot w Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82	56.14 om com Nov 138.25 22.43 232.21 36.82	60.57 munity h Dec 138.25 23.91 249.45 36.82	eating	 (65) (66) (67) (68) (69)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai	54.7 m in calo ains (see s (Table Teb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains	56.98 culation (Table 5 5), Wat 4 Mar 138.25 ted in Ap 16.8 ulated in 256.85 ted in A 36.82 (Table 5	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 a Append 242.32 ppendix 36.82 5a)	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52), also se 36.82	45.75 or hot w Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82	56.14 om com Nov 138.25 22.43 232.21 36.82	60.57 munity h Dec 138.25 23.91 249.45 36.82	eating	 (65) (66) (67) (68) (69)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	ide (57) iernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai	54.7 m in calo ains (see s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3	56.98 culation (56.98 culation (5), Wat 138.25 ted in Ap 16.8 ulated in 256.85 ted in A 36.82 (Table \$ 3	50.42 of (65)m and 5a ts Apr 138.25 opendix 12.72 Appendix 242.32 ppendix 36.82 5a) 3	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52 , also se 36.82	45.75 or hot w Sep 138.25 Table 5 15.14 o see Ta 199.35 ee Table 36.82	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82 3	56.14 om com Nov 138.25 22.43 232.21 36.82 3	60.57 munity h Dec 138.25 23.91 249.45 36.82	eating	 (65) (66) (67) (68) (69) (70)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai 3 s e.g. ev	54.7 m in calo ains (see s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 vaporatic	56.98 culation (Table 5 5), Wat 138.25 ted in Ap 16.8 ulated in 256.85 ited in A 36.82 (Table 5 3 on (nega	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 n Appendix 242.32 ppendix 36.82 5a) 3 tive valu	48.93 only if c): 138.25 L, equati 9.51 dix L, equati 223.98 L, equat 36.82 3 es) (Tab	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82 3 le 5)	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52), also se 36.82	45.75 or hot w Sep 138.25 Table 5 15.14 0 see Ta 199.35 ee Table 36.82	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82 3	56.14 om com Nov 138.25 22.43 232.21 36.82 3	60.57 munity h Dec 138.25 23.91 249.45 36.82 3	eating	 (65) (66) (67) (68) (69) (70)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai 3 s e.g. ev -110.6	54.7 m in calo ains (see s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 raporatic -110.6	56.98 culation (Table 5 e 5), Wat Mar 138.25 ted in Ap 16.8 culated in 256.85 ted in A 36.82 (Table 5 3 on (nega -110.6	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 n Appendix 242.32 ppendix 36.82 5a) 3 tive valu -110.6	48.93 only if c): 138.25 L, equati 9.51 dix L, equati 223.98 L, equati 36.82 3 es) (Tab -110.6	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82 3 	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82 3 -110.6	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52), also se 36.82 3 3	45.75 or hot w Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82 3 3	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82 3 3 -110.6	56.14 om com Nov 138.25 22.43 232.21 36.82 3 -110.6	60.57 munity h Dec 138.25 23.91 249.45 36.82 3 -110.6	eating	 (65) (66) (67) (68) (69) (70) (71)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	ide (57) iernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai 3 s e.g. ev -110.6 heating	54.7 m in calc ains (see is (Table Is (Table 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 raporatic -110.6 gains (T	56.98 culation (Table 5 5), Wat 138.25 ted in Ap 16.8 ulated in 256.85 ted in A 36.82 (Table 5 3 on (nega -110.6 Table 5)	50.42 of (65)m and 5a ts Apr 138.25 opendix 12.72 Appendix 242.32 opendix 36.82 5a) 3 tive valu -110.6	48.93 only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82 3 es) (Tab -110.6	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L9 206.75 ion L15 36.82 3 le 5) -110.6	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82 3 -110.6	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52 36.82 36.82 3 3	45.75 or hot w Sep 138.25 Table 5 15.14 o see Ta 199.35 ee Table 36.82 3 -110.6	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82 3 3 -110.6	56.14 om com Nov 138.25 22.43 232.21 36.82 3 -110.6	60.57 munity h Dec 138.25 23.91 249.45 36.82 3 3 -110.6	eating	 (65) (66) (67) (68) (69) (70) (71)
5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ide (57) ernal ga olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai 3 s e.g. ev -110.6 heating 83.72	54.7 m in calo ains (see s (Table Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 3 aporatic -110.6 gains (T 81.4	56.98 culation (Table 5 5), Wat Mar 138.25 ted in Ap 16.8 ulated in A 36.82 (Table 5 able 5) 76.58	50.42 of (65)m 5 and 5a ts Apr 138.25 opendix 12.72 n Appendix 242.32 ppendix 36.82 5a) 3 tive valu -110.6	48.93 only if c): 138.25 L, equati 9.51 dix L, equati 223.98 L, equat 36.82 3 es) (Tab -110.6	43.04 ylinder is Jun 138.25 ion L9 of 8.03 uation L9 206.75 ion L15 36.82 3 le 5) -110.6	40.69 s in the c Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82 3 -110.6	45.54 dwelling 138.25 lso see 11.28 3a), also 192.52), also se 36.82 3 -110.6	45.75 or hot w Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82 3 -110.6	52.32 ater is fr Oct 138.25 19.22 ble 5 213.88 5 36.82 3 -110.6	56.14 om com 138.25 22.43 232.21 36.82 3 -110.6 77.98	60.57 munity h Dec 138.25 23.91 249.45 36.82 3 3 -110.6 81.41	eating	 (65) (66) (67) (68) (69) (70) (71) (72)



Total	interna	l gains =						(66))m + (67)m	n + (68	3)m + (69)	m + (7	0)m +	(71)m + (72)	m			
(73)m=	435.42	433.21	417	.71	392.55	366.73	3	42.02	326.07	332	.49 345	5.5	370.89	9 400.09	422.24	4		(73)
6. Sc	lar gain	s:																
Solar	gains are	calculated	using	solar	flux from	Table 6a	a and	lassoc	iated equa	ations	to convert	to the	applic	able orientat	ion.			
Orient	ation:	Access F Table 6d	acto	r	Area m²			Flu Tal	x ble 6a		g_ Table	6b		FF Table 6c			Gains (W)	
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	1	1.28	x	0.4	ļ	x	0.7	=	- [4.09	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	1	1.28	x	0.4	ļ	x	0.7	=	= [2.63	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	2	2.97	x	0.4	ļ	x	0.7		• [8.33	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	2	2.97	x	0.4		x	0.7	=	• [5.35	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	4	1.38	x	0.4	-	x	0.7	=	• [15.01	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	4	1.38	x	0.4		x	0.7	=	- [9.63	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	6	37.96	x	0.4		x	0.7	=	- [24.66	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	6	37.96	x	0.4		x	0.7	=	- [15.82	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	g	91.35	x	0.4		x	0.7	=	- [33.15	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	9	91.35	x	0.4		x	0.7	=	- [21.27	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	9	97.38	x	0.4		x	0.7	=	- [35.34	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	9	97.38	x	0.4		x	0.7	=	- [22.68	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x		91.1	x	0.4		x	0.7	=	- [33.06	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x		91.1	x	0.4	ļ	x	0.7	=	- [21.21	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	7	'2.63	x	0.4		x	0.7	=	- [26.35	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	7	'2.63	x	0.4		x	0.7	=	- [16.91	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	5	50.42	x	0.4		x	0.7	=	- [18.3	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	5	50.42	x	0.4		x	0.7	=	- [11.74	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x	2	28.07	x	0.4		x	0.7	=	- [10.18	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x	2	28.07	x	0.4		x	0.7	=	- [6.54	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x		14.2	x	0.4		x	0.7	=	- [5.15	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x		14.2	x	0.4		x	0.7	=	- [3.31	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.8	7	x		9.21	x	0.4	ļ	x	0.7	=	- [3.34	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	1.2	2	x		9.21	x	0.4		x	0.7	=	- [2.15	(75)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	3	36.79	x	0.4	-	x	0.7	=	- [14.14	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	3	36.79	x	0.4		x	0.7	=	- [14.14	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	3	36.79	x	0.4		x	0.7	=	- [14.14	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	3	36.79	x	0.4		x	0.7	=	- [14.14	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	36.79	x	0.4		x	0.7	=	• [23.27	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	36.79	x	0.4		x	0.7	=	• [23.27	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	36.79	x	0.4		x	0.7		• [23.27	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	6	67	x	0.4		x	0.7	=	- [24.08	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	6	32.67	x	0.4		x	0.7	=	- [24.08	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	1.9	8	x	6	67 62.67	x	0.4		×	0.7		٠Ē	24.08	(77)



Southeast 0.9x	0.77	x	1.98	x	62.67	x	0.4	x	0.7] =	24.08	(77)
Southeast 0.9x	0.77	x	3.26	×	62.67	×	0.4	x	0.7	j =	39.65	– (77)
Southeast 0.9x	0.77	x	3.26	×	62.67	×	0.4	x	0.7	i =	39.65	(77)
Southeast 0.9x	0.77	x	3.26	×	62.67	×	0.4	x	0.7] =	39.65	(77)
Southeast 0.9x	0.77	×	1.98	×	85.75	×	0.4	x	0.7	=	32.95	(77)
Southeast 0.9x	0.77	x	1.98	×	85.75	×	0.4	x	0.7] =	32.95	(77)
Southeast 0.9x	0.77	x	1.98	×	85.75	×	0.4	x	0.7] =	32.95	(77)
Southeast 0.9x	0.77	x	1.98	x	85.75	×	0.4	x	0.7] =	32.95	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	3.26	×	106.25	×	0.4	x	0.7] =	67.21	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7] =	45.72	(77)
Southeast 0.9x	0.77	x	1.98	×	119.01	x	0.4	x	0.7] =	45.72	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7] =	75.28	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	3.26	×	119.01	×	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	3.26	×	118.15	x	0.4	x	0.7] =	74.74	(77)
Southeast 0.9x	0.77	x	1.98	×	113.91	×	0.4	x	0.7] =	43.76	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	x	0.4	x	0.7	=	43.76	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	×	0.4	x	0.7	=	43.76	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	x	0.4	x	0.7	=	43.76	(77)
Southeast 0.9x	0.77	x	3.26	x	113.91	×	0.4	x	0.7	=	72.06	(77)
Southeast 0.9x	0.77	×	3.26	×	113.91	×	0.4	×	0.7	=	72.06	(77)
Southeast 0.9x	0.77	x	3.26	×	113.91	×	0.4	x	0.7] =	72.06	(77)
Southeast 0.9x	0.77	×	1.98	×	104.39	×	0.4	×	0.7	=	40.11	(77)
Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7	=	40.11	(77)



Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7] =	40.11	(77)
Southeast 0.9x	0.77	x	1.98	×	104.39	×	0.4	x	0.7	j =	40.11	(77)
Southeast 0.9x	0.77	x	3.26	×	104.39	×	0.4	x	0.7	=	66.03	(77)
Southeast 0.9x	0.77	x	3.26	×	104.39	x	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	x	3.26	×	104.39	×	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	×	0.4	x	0.7] =	35.67	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7	=	35.67	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7	=	35.67	(77)
Southeast 0.9x	0.77	x	1.98	×	92.85	x	0.4	x	0.7] =	35.67	(77)
Southeast 0.9x	0.77	x	3.26	×	92.85	×	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	3.26	×	92.85	x	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	1.98	×	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	3.26	×	69.27	x	0.4	x	0.7] =	43.82	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	3.26	×	44.07	×	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	3.26	×	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	3.26	x	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7	=	12.1	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7	=	12.1	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7	=	12.1	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7	=	12.1	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southwest0.9x	0.77	x	1.98	x	36.79]	0.4	x	0.7] =	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	36.79]	0.4	x	0.7] =	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	36.79]	0.4	x	0.7] =	14.14	(79)
Southwest _{0.9x}	0.77	x	1.98	×	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest0.9x	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest _{0.9x}	0.77	x	1.98	×	62.67]	0.4	x	0.7] =	24.08	(79)
Southwest _{0.9x}	0.77	x	1.98	×	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest _{0.9x}	0.77	x	1.98	×	85.75]	0.4	x	0.7	=	32.95	(79)



Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	8	5.75		0.4	>		0.7		=	32.95	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	06.25]	0.4	>	[0.7		=	40.82	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	06.25]	0.4	>		0.7		=	40.82	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	06.25]	0.4	>	Ē	0.7		=	40.82	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	19.01	Ī	0.4	>	Ē	0.7		=	45.72	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	19.01	Ī	0.4	>	Ē	0.7		=	45.72	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	19.01	Ī	0.4	,	Ē	0.7		=	45.72	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	18.15	İ	0.4	,	Ē	0.7		=	45.39	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	18.15	Ī	0.4	>	Ē	0.7		=	45.39	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	18.15]	0.4	>	Ē	0.7		=	45.39	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	13.91	Ī	0.4	,	Ē	0.7		=	43.76	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	13.91	j	0.4	>	Ē	0.7		=	43.76	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	1	13.91	j	0.4	>	Ē	0.7		=	43.76	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	04.39	İ	0.4	,	Ē	0.7		=	40.11	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	04.39	İ	0.4	,	Ī	0.7		=	40.11	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	1	04.39	Ī	0.4	,	Ē	0.7		=	40.11	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	9	2.85	İ	0.4	,	Ē	0.7		=	35.67	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	9	2.85	Ī	0.4	,	Ē	0.7		=	35.67	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	9	2.85	İ	0.4	,	Ī	0.7		=	35.67	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	6	9.27	İ	0.4	,	Ē	0.7		=	26.61	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	6	9.27	İ	0.4	,	Ē	0.7		=	26.61	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	6	9.27	İ	0.4	,	Ī	0.7		=	26.61	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	4	4.07	İ	0.4	,	Ē	0.7		=	16.93	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	4	4.07	İ	0.4	,	Ē	0.7		=	16.93	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	x	4	4.07	İ	0.4	,	Ē	0.7		=	16.93	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	3	31.49	İ	0.4	,	Ē	0.7		=	12.1	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	3	31.49	Ī	0.4	,	Ē	0.7		=	12.1	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	1.	98	×	3	31.49	İ	0.4	,	Ē	0.7		=	12.1	(79)
	•					•			•					•			-
Solar g	ains in	watts, cal	culated	for eac	h mon	th			(83)m	i = Sum(74)m	(82)	m	_	-			
(83)m=	175.5	301.17	418.01	527.87	600.3	3 5	99.98	576.78	522	.11 455.96	334	.46	210.61	149	.93		(83)
Total g	ains – i	internal ar	nd solai	r (84)m	= (73)n	1 + (83)m	, watts					-	-		I	
(84)m=	610.92	734.38	835.72	920.41	967.00	6	942	902.85	854	.6 801.45	705	.35	610.71	572	.17		(84)
7. Mea	an inte	rnal tempe	erature	(heating	g seaso	on)											
Temp	erature	e during he	eating p	eriods	n the li	ving	area	from Tab	ole 9	Th1 (°C)						21	(85)
Utilisa	tion fac	ctor for ga	ins for	living ar	ea, h1,	m (s	ee Ta	ble 9a)									_
	Jan	Feb	Mar	Apr	Ma	y	Jun	Jul	A	ug Sep	0	ct	Nov	D	ec		
(86)m=	1	1	0.99	0.97	0.91		0.78	0.61	0.6	6 0.87	0.9	8	1	1			(86)
Mean	interna	al tempera	ture in	living a	ea T1	(follo	<u>w ste</u>	ps <u>3</u> to 7	7 in T	able 9c)							
(87)m=	19.53	19.72	19.99	20.35	20.67		20.9	20.97	20.	96 20.81	20.	38	19.88	19	.5		(87)
Temp	erature	during he	eating p	eriods	n rest o	of dw	velling	from Ta	able 9	9, Th2 (°C)							
(88)m=	19.83	19.83	19.83	19.84	19.84		19.85	19.85	19.	85 19.85	19.	84	19.84	19.	83		(88)
-												_					


Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.98	0.95	0.87	0.68	0.47	0.52	0.8	0.97	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	le 9c)				
(90)m=	18.5	18.68	18.96	19.32	19.62	19.8	19.85	19.84	19.74	19.35	18.86	18.47		(90)
									f	fLA = Livin	g area ÷ (4	4) =	0.33	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = fl	A 🗙 T1	+ (1 – fl	A) x T2			I		_
(92)m=	18.84	19.03	19.3	19.66	19.97	20.17	20.22	20.22	20.09	19.69	19.2	18.81		(92)
Apply	v adjustn	nent to t	he mear	n internal	temper	i ature fro	n Table	4e, whe	ere appro	n Spriate				
(93)m=	18.84	19.03	19.3	19.66	19.97	20.17	20.22	20.22	20.09	19.69	19.2	18.81		(93)
8. Sp	ace hea	ting requ	uirement	t										
Set T	i to the i	mean int	ernal te	mperatui	re obtain	ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm		0.07	0.74	0.50	0.57	0.00	0.00	0.00			(04)
(94)m=		0.99	0.98	0.95	0.87	0.71	0.52	0.57	0.82	0.96	0.99	1		(94)
Usefu	Il gains,	hmGm	, W = (9)	4)m x (84	4)m	00740	400.07	404.50	055 70	070.07	000.04	570.00		(05)
(95)m=	608.79	/28.3/	819.4	873.4	841.68	667.18	466.37	484.58	655.79	679.37	606.24	570.68		(95)
IVIONTI	niy avera	age exte	ernal tem				10.0	16.4	1 4 4	10.6	7.4	4.2		(96)
	4.3	4.9				14.0	10.0	10.4	14.1 (06)m	10.0	7.1	4.2		(30)
	1055 1216	1012 47				LIII , VV =	=[(39)m	x [(93)///	- (96)III	1214 61	1622.05	1067.07		(97)
(97)III=	- 1973.0		$\frac{1731.04}{2}$	r oach n	$r_{104.02}$	//b/mon	470.07	303.04	m (05)	$\frac{1214.01}{1201}$	1)m	1907.97		(37)
(98)m-	1015 57	796 38	678.26	408 29	195 77		11 = 0.02		0	398.22	732.1	1039 59		
(00)11-	1010.07	100.00	070.20	400.20	100.11	Ŭ	Ŭ	Tota		(k\\/b/yea	$r_{02.1}$	8)	5264 19	(98)
•								TOTA	i per year	(KVVII/yeai) – Sum(3	0)15,912 -	5204.19	
Space	e heatin	g require	ement in	i kvvh/m²	/year								51.15	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:			, .									٦
Fracti	ion of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from n	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								89.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ו, %					ĺ	0	(208)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec	kWh/vea	⊐ ar
Space	e heatin	g require	ement (c	alculate	d above)							·····,	
•	1015.57	796.38	678.26	408.29	195.77	0	0	0	0	398.22	732.1	1039.59		
(211)m	ר 1 = {[(98)m x (20	1 4)] } x 1	$100 \div (20)$)6)									(211)
(=)	1134.71	889.81	757.83	456.19	218.74	0	0	0	0	444.94	817.99	1161.55		· · ·
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15.10} 12	=	5881.77	(211)
Snac	e heatin	a fuel (s	econdar	·v) k\//h/	month							l		
= {[(98)m x (20)1)]}x1	00 ÷ (20)8)	monu									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
				•				Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
												1		_



Water heating

Output	from wa	ater hea	ter (calc	ulated a	oove)									
	195.39	171.78	179.39	159.38	155.13	137.12	130.29	144.93	145.31	165.36	176.63	190.21		
Efficier	icy of w	ater hea	ter										86.7	(216)
(217)m=	89.04	88.99	88.9	88.7	88.24	86.7	86.7	86.7	86.7	88.66	88.94	89.06		(217)
Fuel fo (219)m	r water = (64)	heating, m x 100	kWh/mo) ÷ (217)	onth m							-			
(219)m=	219.45	193.04	201.79	179.69	175.81	158.15	150.28	167.16	167.6	186.51	198.59	213.59		
								Tota	l = Sum(21	19a) ₁₁₂ =		-	2211.64	(219)
Annua	I totals									k\	Wh/yea	r	kWh/year	-
Space	heating	fuel use	ed, main	system	1								5881.77	
Water I	neating	fuel use	d										2211.64]
Electric	ity for p	oumps, fa	ans and	electric	keep-ho	t								
mech	anical v	entilatior	n - balan	iced, ext	ract or p	ositive ir	nput fron	n outside	Э			199.96		(230a)
centra	I heatin	g pump:										30		(230c)
boiler	with a f	an-assis	ted flue									45		(230e)
Total e	lectricity	/ for the	above, ł	⟨Wh/yea	r			sum	of (230a).	(230g) =			274.96	(231)
Electric	ity for li	ghting											410.87	(232)
Electric	ity gene	erated by	y PVs										-871.93	(233)
Total d	eliverec	l energy	for all us	ses (211)(221)	+ (231)	+ (232).	(237b)	=				7907.31	(338)
12a. (CO2 em	issions -	- Individ	ual heati	ng syste	ems inclu	uding mi	cro-CHP)					

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	1270.46 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	477.71 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1748.18 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	142.7 (267)
Electricity for lighting	(232) x	0.519 =	213.24 (268)
Energy saving/generation technologies Item 1		0.519 =	-452.53 (269)
Total CO2, kg/year	sum	of (265)(271) =	1651.59 (272)
Dwelling CO2 Emission Rate	(272	?) ÷ (4) =	16.05 (273)
El rating (section 14)			85 (274)



APPENDIX F. DFEE WORKSHEETS



			User D	etails:						
Assessor Name:	Panagiotis	Dalapas		Strom	a Num	ber:		STRO	030082	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.41	
		P	roperty .	Address	: Be Lea	n-First F	loor Flat	t		
Address :	238 KILBUR	RN HIGH ROAD	, LONDO	ON, NWE	6 2BS					
1. Overall dwelling dime	nsions:									
Ground floor			Area 5	a(m²) 50.18	(1a) x	Av. He i	ight(m) 2.5	(2a) =	Volume(m ³) 125.45	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+	(1d)+(1e)+(1r	ר) 5	0.18	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	125.45	(5)
2. Ventilation rate:	•			- 41						
	main heating	secondai	у	other	_	total			m ³ per hour	r
Number of chimneys	0	+ 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	+	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns					2	x ´	10 =	20	(7a)
Number of passive vents					Γ	0	× ′	10 =	0	(7b)
Number of flueless gas fi	res				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	ys, flues and fa	ans = (6a) + (6b) + (7)	'a)+(7b)+(7c) =		20		÷ (5) =	0.16	(8)
Number of storeys in th	een carried out of ne dwelling (ns	r is intenaea, procee s)	a to (17), c	otherwise (continue tr	om (9) to (16)		0	– (9)
Additional infiltration		-)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	r timber frame or	0.35 fo	r masonr	ry constr	uction			0	(11)
if both types of wall are pr	resent, use the va	lue corresponding to	o the great	er wall are	a (after					_
If suspended wooden f	loor, enter 0.2	(unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else e	enter 0	(,,					0	(13)
Percentage of windows	s and doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value,	q50, expresse	ed in cubic metre	es per ho	our per s	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabil	ity value, then	$(18) = [(17) \div 20] + (10)$	8), otherwi	ise (18) = ((16)				0.31	(18)
Air permeability value applie	s if a pressurisation	on test has been dor	ne or a deg	gree air pei	rmeability	is being us	sed		4	
Shelter factor	u			(20) = 1 -	[0.075 x (1	9)] =			0.7	(13)
Infiltration rate incorporat	ing shelter fac	tor		(21) = (18)) x (20) =				0.22	(21)
Infiltration rate modified for	or monthly wir	nd speed								
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	eed from Tabl	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (22	2)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	



Adjust	ed infiltra	tion rate	e (allowir	ng for sh	elter an	d wind s	peed) =	= (21a) x	(22a)m					
	0.28	0.27	0.27	0.24	0.23	0.21	0.21	0.2	0.22	0.23	0.24	0.25		
Calcul	ate effect	ive air c	hange h	ate for t	he appli	cable ca	se		-	-		-		(00-)
	eust air he		IUII. sina Anne	ndiv N (2	3h) - (23:	a) v Emv (e	auation (N5)) othe	rwise (23h) - (23a)			0	(238)
If bal	anced with	heat recov	verv: effici	ency in %	allowing f	for in-use f	actor (fro	m Table 4h) –) – (20a)			0	(23D)
a) If				ntilation	with ho	of rocov) = (2)	2b) m i (1	226) v [/	1 (22a)	0	(23C)
a) II (24a)m-									$\frac{1}{1} = \frac{2}{1}$	$\frac{2}{1}$		1 - (230)	- 100j	(24a)
(2-10)11-				ntilation	without	boot rec		 M\/) (24F	$\int \frac{1}{\sqrt{2}}$	2b)m + ('	23h)	Ů	l	()
(24b)m=				0	0			0			0	0	1	(24b)
c) If			ract vent	tilation o	or nositiv		ventilati	on from (<u> </u>	Ů	ů	ů	l	
0) 11	if (22b)m	< 0.5 ×	(23b), th	nen (240	c) = (23k	b); otherv	vise (24	lc) = (22	o) m + 0.	.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural v	entilatio	n or who	ole hous	e positi	ve input v	ventilati	on from I	oft			!		
i	if (22b)m	= 1, the	n (24d)r	m = (22k	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]	-	ı —	1	
(24d)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.53	0.53	0.53		(24d)
Effe	ctive air c	hange r	ate - en	ter (24a) or (24l	o) or (240	c) or (24	1d) in bo	k (25)	1	r	i	1	
(25)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.53	0.53	0.53		(25)
3. He	at losses	and hea	at loss p	aramete	er:									
ELEN	IENT	Gross area (s (m²)	Openin m	gs ²	Net Ar A ,r	ea n²	U-val W/m2	ue ?K	A X U (W/I	<)	k-valu∉ kJ/m²₊l	e K	A X k kJ/K
Doors						2.15	x	1	=	2.15				(26)
Windo	ws Type	1				3.26	x1	I/[1/(1.2)+	0.04] =	3.73				(27)
Windo	ws Type	2				3.26	x1	I/[1/(1.2)+	0.04] =	3.73				(27)
Windo	ws Type	3				2	x1	I/[1/(1.2)+	0.04] =	2.29				(27)
Windo	ws Type	4				1.7	x1	I/[1/(1.2)+	0.04] =	1.95	=			(27)
Windo	ws Type	5				2	x1	I/[1/(1.2)+	0.04] =	2.29	=			(27)
Floor						50.18	5 X	0.15	=	7.527				(28)
Walls	Type1	53.68	3	12.22	2	41.46	5 X	0.18	=	7.46	ה ה		\dashv	(29)
Walls	Туре2	14.73	3	0		14.73	5 X	0.2	=	2.91	i T		\dashv	(29)
Walls	ТуреЗ	3.34		2.15		1.19	×	0.22	=	0.26			\dashv	(29)
Total a	rea of ele	ements,	m²			121.9	3							(31)
Party v	vall					22.09) x	0	=	0				(32)
* for win ** inclua	dows and r le the areas	oof windo s on both s	ws, use ef sides of int	fective wi ternal wali	ndow U-va Is and par	alue calcula titions	ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	n 3.2	
Fabric	heat loss	s, W/K =	S (A x I	U)				(26)(30)) + (32) =				34.3	(33)
Heat c	apacity C	cm = S(A	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	10578.2	29 (34)
Therm	al mass p	paramet	er (TMP	' = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35)
For desi can be เ	ign assessri Ised instea	nents whe d of a deta	ere the det ailed calcu	ails of the Iation.	construct	ion are not	t known p	recisely the	e indicative	e values of	TMP in Ta	able 1f	L	
Therm	al bridge	s : S (L :	x Y) calo	culated u	using Ap	pendix ł	<						16.37	(36)
if dotails	of thermal	bridging a	are not kno	own (36) =	= 0.05 x (3	:1)								



Total fa	abric hea	at loss							(33) +	(36) =			50.67	(37)
Ventila	tion hea	t 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=	22.28	22.22	22.16	21.87	21.82	21.58	21.58	21.53	21.67	21.82	21.93	22.04		(38)
Heat tr	ansfer c	oefficier	nt, W/K		-	-	-		(39)m	= (37) + (38)m	-		
(39)m=	72.95	72.89	72.83	72.54	72.49	72.24	72.24	72.2	72.34	72.49	72.6	72.71		
Heat lo	oss para	meter (H	HLP), W/	′m²K					(40)m	Average = = (39)m ÷	Sum(39)₁. · (4)	12 /12=	72.54	(39)
(40)m=	1.45	1.45	1.45	1.45	1.44	1.44	1.44	1.44	1.44	1.44	1.45	1.45		
Numbe	er of day	rs in mor	nth (Tabl	le 1a)					,	Average =	Sum(40)1.	12 /12=	1.45	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
							-			-	-			
4. Wa	iter heat	ing enei	gy requi	rement:								kWh/ye	ear:	
Assum	ed occu	ipancy, I	N								1	.7		(42)
if TF	A > 13.9	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	A -13.9)2)] + 0.0	0013 x (TFA -13	.9)			
	A £ 13.9 Laverad	9, N = 1 e hot wa	ater usar	ne in litre	s ner da	w Vd av	erade -	(25 x N)	+ 36		74	47		(13)
Reduce	the annua	l average	hot water	usage by	5% if the a	lwelling is	designed t	to achieve	a water us	se target o	f 74	.47		(43)
not more	e that 125	litres per p	person per	ˈday (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 in	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)		1	1			
(44)m=	81.91	78.93	75.96	72.98	70	67.02	67.02	70	72.98	75.96	78.93	81.91		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D)Tm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	893.59	(44)
(45)m=	121.47	106.24	109.63	95.58	91.71	79.14	73.33	84.15	85.16	99.24	108.33	117.64		
lf instant	aneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46,) to (61)	Total = Su	m(45) ₁₁₂ =	-	1171.64	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:												
Storag	e volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr Otherw	nunity h /ise if no	eating a stored	nd no ta hot wate	nk in dw er (this ir	velling, e icludes i	nter 110 nstantar) litres in neous co	(47) ombi boil	ers) ente	er '0' in (47)			
vvater	storage	loss: urer's de	aclarad l	nee factu	or is kno	wn (k\//	n/dav).					0		(49)
Tompo	anulaci	actor fro	m Table	25 1201			i/uay).					0		(40)
Energy	lost fro	m water	storade	zu kWb/w	aar			(48) v (49)	_			0		(49)
b) If m	anufact	urer's de	eclared c	ylinder l	oss fact	or is not	known:	(40) × (43)	_			0		(50)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If comr	nunity h	eating s	ee sectio	on 4.3										
Volume	e factor	trom Tal	ble 2a m Tabla	2h								0		(52)
гепре				ZU LAN/- /						50)		U		(53)
Energy Enter	10st tro (50) or (111 water 54) in <i>(5</i>	storage	, KVVN/Y6	ar			(47) X (51)	x (52) X (əð) =		0		(54)
LING		<u>, , , , , , , , , , , , , , , , , , , </u>	,									v		(33)



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	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (ar	nual) fro	om Table								0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				1	
(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=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	103.25	90.31	93.19	81.24	77.95	67.27	62.33	71.53	72.38	84.36	92.08	99.99		(62)
Solar DH	-IW input o	calculated	using App	endix G o	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 \	WWHRS	applies	, see Ap	pendix (<u>3)</u>		-	-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter				-	-						
(64)m=	103.25	90.31	93.19	81.24	77.95	67.27	62.33	71.53	72.38	84.36	92.08	99.99		-
								Outp	out from w	ater heate	r (annual)₁	12	995.89	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	25.81	22.58	23.3	20.31	19.49	16.82	15.58	17.88	18.1	21.09	23.02	25		(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	e Table 5	and 5a	۱.									
Metab				and Ja).									
	<u>olic gain</u>	is (Table	e 5), Wat	ts).					i				
	olic gain Jan	s (Table Feb	5), Wat Mar	ts Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	olic gain Jan 84.77	s (Table Feb 84.77	5), Wat Mar 84.77	ts Apr 84.77	May 84.77	Jun 84.77	Jul 84.77	Aug 84.77	Sep 84.77	Oct 84.77	Nov 84.77	Dec 84.77		(66)
(66)m= Lightin	olic gain Jan 84.77 g gains	s (Table Feb 84.77 (calcula	5), Wat Mar 84.77 ted in Ap	ts Apr 84.77 opendix	May 84.77 L, equati	Jun 84.77 ion L9 o	Jul 84.77 r L9a), a	Aug 84.77 Iso see	Sep 84.77 Table 5	Oct 84.77	Nov 84.77	Dec 84.77		(66)
(66)m= Lightin (67)m=	olic gain Jan 84.77 g gains 13.17	s (Table Feb 84.77 (calcula 11.7	e 5), Wat Mar 84.77 ted in Ap 9.51	ts Apr 84.77 opendix 7.2	May 84.77 L, equati 5.38	Jun 84.77 ion L9 o 4.54	Jul 84.77 r L9a), a 4.91	Aug 84.77 Iso see 6.38	Sep 84.77 Table 5 8.57	Oct 84.77 10.88	Nov 84.77 12.7	Dec 84.77 13.53		(66)
(66)m= Lightin (67)m= Appliar	olic gain Jan 84.77 g gains 13.17 nces ga	s (Table Feb 84.77 (calcula 11.7 ins (calc	5), Wat Mar 84.77 ted in Ap 9.51 ulated ir	ts Apr 84.77 ppendix 7.2 Append	May 84.77 L, equati 5.38 dix L, eq	Jun 84.77 ion L9 of 4.54 uation L	Jul 84.77 r L9a), a 4.91 13 or L1	Aug 84.77 Iso see 6.38 3a), also	Sep 84.77 Table 5 8.57 see Ta	Oct 84.77 10.88 ble 5	Nov 84.77 12.7	Dec 84.77 13.53		(66) (67)
(66)m= Lightin (67)m= Applian (68)m=	olic gain Jan 84.77 g gains 13.17 nces ga 147.7	s (Table Feb 84.77 (calcula 11.7 ins (calc 149.23	e 5), Wat Mar 84.77 ted in Ap 9.51 ulated ir 145.37	ts Apr 84.77 ppendix 7.2 Append 137.15	May 84.77 L, equati 5.38 dix L, eq 126.77	Jun 84.77 ion L9 o 4.54 uation L 117.02	Jul 84.77 r L9a), a 4.91 13 or L1 110.5	Aug 84.77 Iso see 6.38 3a), also 108.97	Sep 84.77 Table 5 8.57 9 see Ta 112.83	Oct 84.77 10.88 ble 5 121.05	Nov 84.77 12.7 131.43	Dec 84.77 13.53 141.18		(66) (67) (68)
(66)m= Lightin (67)m= Applian (68)m= Cookir	Jan 84.77 g gains 13.17 nces ga 147.7 ng gains	s (Table Feb 84.77 (calcula 11.7 ins (calc 149.23 (calcula	e 5), Wat Mar 84.77 ted in Ap 9.51 ulated ir 145.37	ts Apr 84.77 ppendix 7.2 Append 137.15 ppendix	May 84.77 L, equati 5.38 dix L, eq 126.77 L, equat	Jun 84.77 ion L9 o 4.54 uation L 117.02 ion L15	Jul 84.77 r L9a), a 4.91 13 or L1 110.5 or L15a)	Aug 84.77 Iso see 6.38 3a), also 108.97), also se	Sep 84.77 Table 5 8.57 see Ta 112.83 ee Table	Oct 84.77 10.88 ble 5 121.05 5	Nov 84.77 12.7 131.43	Dec 84.77 13.53 141.18		(66) (67) (68)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m=	Jan 84.77 g gains 13.17 nces ga 147.7 ng gains 31.48	s (Table Feb 84.77 (calcula 11.7 ins (calc 149.23 (calcula 31.48	5), Wat Mar 84.77 ted in Ap 9.51 ulated in 145.37 tted in A 31.48	ts Apr 84.77 ppendix 7.2 Append 137.15 ppendix 31.48	May 84.77 L, equati 5.38 dix L, eq 126.77 L, equat 31.48	Jun 84.77 ion L9 of 4.54 uation L 117.02 ion L15 31.48	Jul 84.77 r L9a), a 4.91 13 or L1 110.5 or L15a) 31.48	Aug 84.77 Iso see 6.38 3a), also 108.97), also se 31.48	Sep 84.77 Table 5 8.57 9 see Ta 112.83 9 e Table 31.48	Oct 84.77 10.88 ble 5 121.05 5 31.48	Nov 84.77 12.7 131.43 31.48	Dec 84.77 13.53 141.18 31.48		(66) (67) (68) (69)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps	Jan Jan 84.77 g gains 13.17 nces ga 147.7 ng gains 31.48 s and fan	s (Table Feb 84.77 (calcula 11.7 ins (calc 149.23 (calcula 31.48 ns gains	 5), Wat Mar 84.77 ted in Ar 9.51 ulated ir 145.37 tted in A 31.48 (Table \$ 	ts Apr 84.77 ppendix 7.2 Appendix 137.15 ppendix 31.48 5a)	May 84.77 L, equati 5.38 dix L, eq 126.77 L, equat 31.48	Jun 84.77 ion L9 of 4.54 uation L 117.02 ion L15 31.48	Jul 84.77 r L9a), a 4.91 13 or L1 110.5 or L15a) 31.48	Aug 84.77 Iso see 6.38 3a), also 108.97), also se 31.48	Sep 84.77 Table 5 8.57 9 see Ta 112.83 ee Table 31.48	Oct 84.77 10.88 ble 5 121.05 5 31.48	Nov 84.77 12.7 131.43 31.48	Dec 84.77 13.53 141.18 31.48		(66) (67) (68) (69)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m=	olic gain Jan 84.77 og gains 13.17 nces ga 147.7 ng gains 31.48 s and far 0	IS (Table Feb 84.77 (calcula 11.7 ins (calc 149.23 (calcula 31.48 ns gains 0	5), Wat Mar 84.77 ted in Ap 9.51 ulated in 145.37 ted in A 31.48 (Table 5 0	ts Apr 84.77 ppendix 7.2 Append 137.15 ppendix 31.48 5a) 0	May 84.77 L, equati 5.38 dix L, eq 126.77 L, equat 31.48	Jun 84.77 ion L9 o 4.54 uation L 117.02 ion L15 31.48	Jul 84.77 r L9a), a 4.91 13 or L1 110.5 or L15a) 31.48	Aug 84.77 Iso see 6.38 3a), also 108.97), also se 31.48	Sep 84.77 Table 5 8.57 9 see Ta 112.83 9 e Table 31.48	Oct 84.77 10.88 ble 5 121.05 5 31.48 0	Nov 84.77 12.7 131.43 31.48	Dec 84.77 13.53 141.18 31.48		(66) (67) (68) (69) (70)
(66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses	olic gain Jan 84.77 g gains 13.17 nces ga 147.7 ng gains 31.48 s and fai 0 s e.g. ev	IS (Table Feb 84.77 (calcula 11.7 ins (calc 149.23 (calcula 31.48 ns gains 0 vaporatic	 5), Wat Mar 84.77 ted in Ap 9.51 ulated in A 145.37 uted in A 31.48 (Table \$ 0 on (negation 1000) 	ts Apr 84.77 opendix 7.2 Appendix 137.15 ppendix 31.48 5a) 0 tive valu	May 84.77 L, equati 5.38 dix L, eq 126.77 L, equat 31.48 0 es) (Tab	Jun 84.77 ion L9 of 4.54 uation L 117.02 ion L15 31.48 0 le 5)	Jul 84.77 r L9a), a 4.91 13 or L1 110.5 or L15a) 31.48	Aug 84.77 Iso see 6.38 3a), also 108.97), also se 31.48	Sep 84.77 Table 5 8.57 9 see Ta 112.83 9 e Table 31.48	Oct 84.77 10.88 ble 5 121.05 5 31.48 0	Nov 84.77 12.7 131.43 31.48 0	Dec 84.77 13.53 141.18 31.48 0		(66) (67) (68) (69) (70)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	olic gain Jan 84.77 g gains 13.17 nces ga 147.7 ng gains 31.48 s and fan 0 s e.g. ev -67.82	s (Table Feb 84.77 (calcula 11.7 ins (calc 149.23 (calcula 31.48 ns gains 0 vaporatic -67.82	 5), Wat Mar 84.77 ted in Ar 9.51 ulated in A 145.37 tted in A 31.48 (Table \$ 0 on (nega -67.82 	ts Apr 84.77 ppendix 7.2 Appendix 137.15 ppendix 31.48 5a) 0 tive valu -67.82	May 84.77 L, equati 5.38 dix L, eq 126.77 L, equat 31.48 0 es) (Tab	Jun 84.77 ion L9 ol 4.54 uation L 117.02 ion L15 31.48 0 le 5) -67.82	Jul 84.77 r L9a), a 4.91 13 or L1 110.5 or L15a) 31.48 0	Aug 84.77 Iso see 6.38 3a), also 108.97), also se 31.48 0	Sep 84.77 Table 5 8.57 9 see Ta 112.83 ee Table 31.48 0	Oct 84.77 10.88 ble 5 121.05 5 31.48 0 -67.82	Nov 84.77 12.7 131.43 31.48 0	Dec 84.77 13.53 141.18 31.48 0		(66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water	olic gain Jan 84.77 ng gains 13.17 nces ga 147.7 ng gains 31.48 s and fan 0 s e.g. ev -67.82 heating	IS (Table Feb 84.77 (calcula 11.7 ins (calcula 149.23 (calcula 31.48 ns gains 0 raporatic -67.82 gains (T	e 5), Wat Mar 84.77 ted in Ap 9.51 ulated in 145.37 ated in A 31.48 (Table 5 0 on (nega -67.82 Table 5)	ts Apr 84.77 ppendix 7.2 Append 137.15 ppendix 31.48 5a) 0 tive valu -67.82	May 84.77 L, equati 5.38 dix L, eq 126.77 L, equat 31.48 0 es) (Tab -67.82	Jun 84.77 ion L9 o 4.54 uation L 117.02 ion L15 31.48 0 le 5) -67.82	Jul 84.77 r L9a), a 4.91 13 or L1 110.5 or L15a) 31.48 0 -67.82	Aug 84.77 Iso see 6.38 3a), also 108.97 0, also se 31.48 0	Sep 84.77 Table 5 8.57 • see Ta 112.83 • Table 31.48 0 -67.82	Oct 84.77 10.88 ble 5 121.05 5 31.48 0 -67.82	Nov 84.77 12.7 131.43 31.48 0 -67.82	Dec 84.77 13.53 141.18 31.48 0 -67.82		(66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	olic gain Jan 84.77 g gains 13.17 nces ga 147.7 ng gains 31.48 s and fai 0 s e.g. ev -67.82 heating 34.7	s (Table Feb 84.77 (calcula 11.7 ins (calc 149.23 (calcula 31.48 ns gains 0 raporatic -67.82 gains (T 33.6	 5), Wat Mar 84.77 ted in Ap 9.51 ulated in Ap 145.37 uted in A 31.48 (Table 5) 31.31 	ts Apr 84.77 ppendix 7.2 Appendix 137.15 ppendix 31.48 5a) 0 tive valu -67.82 28.21	May 84.77 L, equati 5.38 dix L, eq 126.77 L, equat 31.48 0 es) (Tab -67.82 26.19	Jun 84.77 ion L9 of 4.54 uation L 117.02 ion L15 31.48 0 le 5) -67.82 23.36	Jul 84.77 r L9a), a 4.91 13 or L1 110.5 or L15a) 31.48 0 -67.82 20.95	Aug 84.77 Iso see 6.38 3a), also 108.97), also se 31.48 0 -67.82 24.04	Sep 84.77 Table 5 8.57 9 see Ta 112.83 9e Table 31.48 0 -67.82 25.13	Oct 84.77 10.88 ble 5 121.05 5 31.48 0 -67.82 28.35	Nov 84.77 12.7 131.43 31.48 0 -67.82 31.97	Dec 84.77 13.53 141.18 31.48 0 -67.82 33.6		(66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	olic gain Jan 84.77 g gains 13.17 nces ga 147.7 ng gains 31.48 s and fan 0 s e.g. ev -67.82 heating 34.7	IS (Table Feb 84.77 (calcula 11.7 ins (calc 149.23 (calcula 31.48 ns gains 0 /aporatic -67.82 gains (T 33.6 gains =	e 5), Wat Mar 84.77 ted in Ap 9.51 ulated in 145.37 ted in A 31.48 (Table 5 0 on (nega -67.82 able 5) 31.31	ts Apr 84.77 ppendix 7.2 Appendix 137.15 ppendix 31.48 5a) 0 tive valu -67.82 28.21	May 84.77 L, equati 5.38 dix L, eq 126.77 L, equat 31.48 0 es) (Tab -67.82 26.19	Jun 84.77 ion L9 oi 4.54 uation L 117.02 ion L15 31.48 0 le 5) -67.82 23.36 (66)	Jul 84.77 r L9a), a 4.91 13 or L1 110.5 or L15a) 31.48 0 -67.82 20.95 m + (67)m	Aug 84.77 Iso see 6.38 3a), also 108.97), also se 31.48 0 -67.82 24.04	Sep 84.77 Table 5 8.57 • see Ta 112.83 • e Table 31.48 0 -67.82 25.13 + (69)m +	Oct 84.77 10.88 ble 5 121.05 5 31.48 0 -67.82 28.35 (70)m + (7	Nov 84.77 12.7 131.43 31.48 0 -67.82 31.97 1)m + (72)	Dec 84.77 13.53 141.18 31.48 0 -67.82 33.6		 (66) (67) (68) (69) (70) (71) (72)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	olic gain Jan 84.77 ng gains 13.17 nces ga 147.7 ng gains 31.48 s and fan 0 s e.g. ev -67.82 heating 34.7 internal 244	IS (Table Feb 84.77 (calcula 11.7 ins (calcula 149.23 (calcula 31.48 ns gains 0 raporatic -67.82 gains (T 33.6 gains = 242.96	 5), Wat Mar 84.77 ted in Ag 9.51 ulated in A 145.37 ited in A 31.48 (Table 5) able 5) 31.31 234.63 	ts Apr 84.77 ppendix 7.2 Appendix 137.15 ppendix 31.48 5a) 0 tive valu -67.82 28.21	May 84.77 L, equati 5.38 dix L, eq 126.77 L, equat 31.48 0 es) (Tab -67.82 26.19	Jun 84.77 ion L9 o 4.54 uation L 117.02 ion L15 31.48 0 le 5) -67.82 23.36 (66) 193.35	Jul 84.77 r L9a), a 4.91 13 or L1 110.5 or L15a) 31.48 0 -67.82 20.95 m + (67)m 184.79	Aug 84.77 Iso see 6.38 3a), also 108.97 0, also se 31.48 0 -67.82 24.04 1+ (68)m - 187.81	Sep 84.77 Table 5 8.57 • see Ta 112.83 • Table 31.48 0 -67.82 25.13 • (69)m + 194.96	Oct 84.77 10.88 ble 5 121.05 5 31.48 0 -67.82 28.35 (70)m + (7 208.7	Nov 84.77 12.7 131.43 31.48 0 -67.82 31.97 1)m + (72) 224.53	Dec 84.77 13.53 141.18 31.48 0 -67.82 33.6 m 236.75		 (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.



Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.7	x	11.28	x	0.4	×	0.7	=	3.72	(75)
Northeast 0.9x	0.77	x	1.7	×	22.97	x	0.4	×	0.7	i =	7.58	(75)
Northeast 0.9x	0.77	x	1.7	×	41.38	x	0.4	×	0.7	j =	13.65	(75)
Northeast 0.9x	0.77	x	1.7	×	67.96	x	0.4	×	0.7	i =	22.42	(75)
Northeast 0.9x	0.77	x	1.7	×	91.35	×	0.4	x	0.7	=	30.13	(75)
Northeast 0.9x	0.77	x	1.7	x	97.38	x	0.4	x	0.7	=	32.12	(75)
Northeast 0.9x	0.77	x	1.7	×	91.1	x	0.4	×	0.7	=	30.05	(75)
Northeast 0.9x	0.77	x	1.7	x	72.63	x	0.4	x	0.7	=	23.96	(75)
Northeast 0.9x	0.77	x	1.7	×	50.42	x	0.4	×	0.7	i =	16.63	(75)
Northeast 0.9x	0.77	x	1.7	×	28.07	x	0.4	×	0.7	=	9.26	(75)
Northeast 0.9x	0.77	x	1.7	x	14.2	x	0.4	x	0.7	=	4.68	(75)
Northeast 0.9x	0.77	x	1.7	×	9.21	x	0.4	×	0.7	=	3.04	(75)
Southeast 0.9x	0.77	x	3.26	×	36.79	×	0.4	×	0.7	=	23.27	(77)
Southeast 0.9x	0.77	x	3.26	x	36.79	x	0.4	x	0.7	=	23.27	(77)
Southeast 0.9x	0.77	x	2	×	36.79	x	0.4	×	0.7	i =	14.28	(77)
Southeast 0.9x	0.77	x	2	×	36.79	×	0.4	×	0.7	=	14.28	(77)
Southeast 0.9x	0.77	x	3.26	x	62.67	x	0.4	×	0.7	=	39.65	(77)
Southeast 0.9x	0.77	x	3.26	x	62.67	x	0.4	×	0.7	i =	39.65	(77)
Southeast 0.9x	0.77	x	2	×	62.67	x	0.4	x	0.7	=	24.32	(77)
Southeast 0.9x	0.77	x	2	×	62.67	x	0.4	×	0.7	=	24.32	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	×	0.7	i =	54.24	(77)
Southeast 0.9x	0.77	x	3.26	×	85.75	x	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	2	×	85.75	x	0.4	×	0.7] =	33.28	(77)
Southeast 0.9x	0.77	x	2	×	85.75	x	0.4	x	0.7	=	33.28	(77)
Southeast 0.9x	0.77	x	3.26	×	106.25	x	0.4	×	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	3.26	×	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	2	×	106.25	x	0.4	x	0.7	=	41.23	(77)
Southeast 0.9x	0.77	x	2	×	106.25	x	0.4	×	0.7	=	41.23	(77)
Southeast 0.9x	0.77	x	3.26	×	119.01	×	0.4	×	0.7] =	75.28	(77)
Southeast 0.9x	0.77	x	3.26	×	119.01	x	0.4	×	0.7] =	75.28	(77)
Southeast 0.9x	0.77	x	2	x	119.01	x	0.4	x	0.7] =	46.19	(77)
Southeast 0.9x	0.77	x	2	×	119.01	×	0.4	×	0.7] =	46.19	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7] =	74.74	(77)
Southeast 0.9x	0.77	x	3.26	×	118.15	x	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	2	×	118.15	x	0.4	×	0.7	=	45.85	(77)
Southeast 0.9x	0.77	x	2	x	118.15	x	0.4	x	0.7] =	45.85	(77)
Southeast 0.9x	0.77	x	3.26	×	113.91	x	0.4	×	0.7] =	72.06	(77)
Southeast 0.9x	0.77	x	3.26	x	113.91	x	0.4	×	0.7] =	72.06	(77)
Southeast 0.9x	0.77	x	2	x	113.91	x	0.4	x	0.7	=	44.21	(77)



Southea	ast <mark>0.9x</mark>	0.77		x	2		x	1	13.91	1 x		0.4	x	0.7		=	44.21	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x		04.39	」 】 x		0.4	ا_ x	0.7		=	66.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x		04.39	」 】 ×		0.4	- T x	0.7	=	=	66.03	(77)
Southea	ast <mark>0.9x</mark> [0.77		x	2		x		04.39] x		0.4	ا_ ×	0.7	_	=	40.51	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x		04.39	」 】 x		0.4	ا_ x	0.7		=	40.51	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x)2.85	x		0.4	۲ × ۲	0.7		=	58.74	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x)2.85	x		0.4	ا_ ×	0.7		=	58.74	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	9	92.85	x		0.4	۲ × ۲	0.7		=	36.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	g	92.85	x		0.4	×	0.7		=	36.03	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	6	39.27	×		0.4	- ×	0.7		=	43.82	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	6	39.27	×		0.4	×	0.7		=	43.82	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	6	39.27	×		0.4	×	0.7		=	26.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	6	39.27	×		0.4	- ×	0.7		=	26.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	4	14.07	×		0.4	×	0.7		=	27.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	4	14.07	x		0.4	×	0.7		=	27.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	4	14.07	x		0.4	×	0.7		=	17.1	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	4	14.07	x		0.4	×	0.7		=	17.1	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	31.49	x		0.4	×	0.7		=	19.92	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.2	6	x	3	31.49	x		0.4	×	0.7		=	19.92	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	3	31.49	x		0.4	×	0.7		=	12.22	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	2		x	3	31.49	x		0.4	x	0.7		=	12.22	(77)
Solar g	ains in	watts, ca	alcula	ated	for eacl	n mont	h		. 	(83)m	n = Sur	m(74)m	.(82)m	1	1		1	
(83)m= [78.83	135.51	188	6.7 alar	239.31	273.07		273.3	262.57	237	.05	206.17	150.6	5 94.64	67	.32		(83)
rotar g	$\frac{1}{2}$				(84)m =	= (73)II	1 + (83)m		404	00	404 42	250.20	210.17	20/	1.07	1	(84)
(64)///=	322.62	378.47	423.	.32	460.3	479.83	9 4	co.oo	447.30	424	.00	401.13	359.30	5 319.17	304	4.07		(04)
7. Me	an inter	nal temp	perati	ure (heating	seaso	n)					(1.0)						
lemp	erature	during h	eatir	ng pe	eriods ir	the liv	/ing	area	from Tat	ole 9	, 1h1	(°C)					21	(85)
Utilisa	ition fac	tor for ga	ains	for li	ving are	ea, h1,	m (s .		ible 9a)			0	0.1	Neur			1	
(86)m-	Jan			ar	Apr	May	/	Jun	JUI		ug 7	Sep						(86)
(00)11-		0.33	0.5	3	0.37	0.92		0.0	0.00	0.	<u>′</u>	0.00	0.30	0.99		I		(00)
Mean	interna	l temper	ature	e in li	iving are	ea T1 (follo	ow ste	ps 3 to 7	7 in T	able	9c)		10.77		07	1	(07)
(87)m=	19.41	19.59	19.8	87	20.23	20.58		20.85	20.95	20.	94	20.74	20.28	19.77	19	.37		(87)
Temp	erature	during h	eatir	ng pe	eriods ir	n rest c	of dv	velling	from Ta	able 9	9, Th	2 (°C)					1	
(88)m=	19.72	19.72	19.7	72	19.73	19.73		19.73	19.73	19.	73	19.73	19.73	19.73	19	.73		(88)
Utilisa	tion fac	tor for g	ains	for r	est of d	velling	, h2	,m (se	e Table	9a)								
(89)m=	1	0.99	0.9	8	0.95	0.88		0.71	0.49	0.5	54	0.81	0.96	0.99		1		(89)
Mean	interna	l temper	ature	e in t	he rest	of dwe	lling	1 T2 (f	ollow ste	eps 3	to 7	in Table	e 9c)					
(90)m=	18.3	18.47	18.	75	19.11	19.44		19.66	19.72	19.	72	19.59	19.17	18.66	18	.26		(90)
												fL	_A = Liv	ving area ÷ (4	4) =		0.48	(91)

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$



(92)m=	18.83	19.01	19.29	19.65	19.99	20.23	20.31	20.3	20.14	19.71	19.2	18.8		(92)
Apply	adjustr	nent to t	he mear	n internal	tempera	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.83	19.01	19.29	19.65	19.99	20.23	20.31	20.3	20.14	19.71	19.2	18.8		(93)
8. Sp	ace hea	ting req	uirement	t										
Set T the ut	i to the i ilisation	mean int factor fo	ternal tei or gains	mperatui using Ta	re obtain Ible 9a	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	i ains, hm	1 <u>'</u> 1:	,			5						
(94)m=	1	0.99	0.98	0.95	0.89	0.75	0.57	0.62	0.84	0.96	0.99	1		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	321.27	374.81	414.7	438.32	425.49	349.58	254.99	262.82	337.46	346.1	316.26	302.92		(95)
Month	nly aver	age exte	ernal terr	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an interr	al tempe	erature,	Lm,W =	=[(39)m :	x [(93)m	– (96)m					
(97)m=	1060.18	1028.33	931.43	779.97	601.13	406.79	268.38	281.87	437.27	660.09	878.19	1061.19		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	h = 0.02	4 x [(97))m – (95)m] x (4	1)m			
(98)m=	549.75	439.17	384.45	245.99	130.68	0	0	0	0	233.61	404.59	564.16		
		-	-					Tota	l per year	(kWh/yeai	·) = Sum(9	8)15,912 =	2952.38	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								58.84	(99)
80 S	nace co	olina rea	nuiremer	ht.	-									
Calcu	lated fo	r luno	July and	August	See Tak	ale 10b								
Calco	Jan	Feb	Mar	August.	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rate	e Lm (ca	lculated	using 2	5°C inter	nal tem	perature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	679.1	534.61	548.71	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	bss hm											
(101)m=	0	0	0	0	0	0.76	0.84	0.82	0	0	0	0		(101)
Usefu	l loss, r	ı mLm (V	Vatts) = ((100)m x	(101)m									
(102)m=	0	0	0	0	0	517.68	450.85	448.2	0	0	0	0		(102)
Gains	s (solar g	gains ca	lculated	for appli	cable we	eather re	gion, se	e Table	10)					
(103)m=	0	0	0	0	0	609.59	585.82	560.47	0	0	0	0		(103)
Spac	e coolin	g require	ement fo	r month,	whole c	lwelling,	continue	ous (kW	h) = 0.02	24 x [(10)3)m – (*	102)m]:	x (41)m	
set (1	04)m to	zero if ((104)m <	: 3 × (98)m									
(104)m=	0	0	0	0	0	66.18	100.42	83.53	0	0	0	0		_
. .									Total	= Sum(104)	=	250.13	(104)
Coolec	d fraction	n 		`					fC=	cooled	area ÷ (4	1) =	1	(105)
Interm		actor (1)			0	0.05	0.05	0.05		0		0		
(106)m=	0	0	0	0	0	0.25	0.25	0.25		0		0		
Snooo	ocolina	roquiro	mont for	month -	(104)m	v (10E)	v (106)r	~	Total	= Sum(104)	=	0	(106)
(107)m-					(104)11	X (105)	X (100)1	20.88	0	0	0	0		
(107)11=					U	10.04	20.1	20.00	Total		107)	=	62 53	(107)
Space	cooling	require	ment in L	⟨₩h/m²/\	/ear				(107)	∴ (4) _	-o x o* /		1 25	
Of Cok	vio Eno		ioney (a			doropo		itiona		$\cdot (-) -$			1.20	
				arculateo	roniy un	der spec		mons, s						
Fabrie	Energ	y Etticiei	ncy						(99) -	+ (108) =	=		60.08	(109)



			User D	etails:						
Assessor Name:	Panagiotis	Dalapas		Strom	a Num	ber:		STRO	030082	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.41	
		F	Property A	Address:	: Be Lea	n-Secon	nd Floor	Flat		
Address :	238 KILBUF	RN HIGH ROAD	, LONDO	ON, NWE	6 2BS					
1. Overall dwelling dimen	sions:									
Ground floor			Area 6	a(m²) 1.28	(1a) x	Av. He i	ight(m) 2.5	(2a) =	Volume(m ³) 153.2	(3a)
Total floor area TFA = (1a)	+(1b)+(1c)+	(1d)+(1e)+(1	n) 6	1.28	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	153.2	(5)
2. Ventilation rate:				a th a n		total				
	heating	seconda	r y	otner	_	total			m ³ per nou	
Number of chimneys	0	+ 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	+ [0	=	0	x 2	20 =	0	(6b)
Number of intermittent fan	S				- Ē	2	x ′	10 =	20	(7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fire	s					0	x 4	40 =	0	(7c)
0										
								Air ch	hanges per ho	ur
Infiltration due to chimneys	s, flues and fa	ans = (6a)+(6b)+(7a)+(7b)+(7c) =	Γ	20	· ·	÷ (5) =	0.13	(8)
If a pressurisation test has bee	en carried out or	r is intended, procee	ed to (17), o	otherwise d	continue fr	om (9) to ((16)			
Number of storeys in the	e dwelling (ne	5)					[(0)	11 0 1	0	(9)
Additional inilitration	5 for stool or	r timbor frama a	r 0 25 foi	macan	a constr	uction	[(9)-	-1]x0.1 =	0	(10)
if both types of wall are pre deducting areas of opening	sent, use the va s); if equal user	lue corresponding to 0.35	the great	er wall are	a (after	uction			0	
If suspended wooden flo	or, enter 0.2	(unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	r 0.05, else e	enter 0							0	(13)
Percentage of windows	and doors dr	aught stripped		0.05 10.0		001			0	(14)
Window infiltration				(8) (10)	$X(14) \div 1$	(10) = (12)	. (15) -		0	(15)
	50 02010555	d in cubic metr	e nor ha	(0) + (10)		2) + (13) +	- (15) =	area	0	(16)
If based on air permeability	value then	(18) = [(17) ÷ 20]+(8), otherwi	ise (18) = (16)		invelope	alea	3 0.28	(17)
Air permeability value applies	if a pressurisatio	on test has been do	ne or a deg	gree air pei	rmeability	is being us	sed		0.20	
Number of sides sheltered									4	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporatir	ig shelter fac	tor		(21) = (18)) x (20) =				0.2	(21)
Infiltration rate modified for	monthly wir	nd speed	i	1			1	1	1	
Jan Feb N	lar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind spe	ed from Tabl	e 7		1			1		1	
(22)m= 5.1 5 4	.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	J	
Wind Factor $(22a)m = (22)$	m÷4		1	1		· · · · · · · · · · · · · · · · · · ·	1	1	1	
(22a)m= 1.27 1.25 1.	23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	J	



Adjuste	ed infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.25	0.25	0.24	0.22	0.21	0.19	0.19	0.18	0.2	0.21	0.22	0.23		
Calcula If me	ate effec echanica	ctive air	change	rate for t	he appli	cable ca	se						0	(23a)
lf exh	aust air he	eat pump	using App	endix N, (2	3b) = (23a) × Fmv (e	equation (1	N5)), othe	wise (23b) = (23a)			0	(23b)
lf bala	anced with	heat reco	overy: effic	iency in %	allowing for	or in-use fa	actor (fron	n Table 4h) =	, , ,			0	(23c)
a) If	balance	d mech	anical ve	entilation	with hea	at recove	erv (MVI	HR) (24a	ı)m = (22	2b)m + (i	23b) × [⁻	1 – (23c)	÷ 100]	()
, (24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mech	anical ve	entilation	without	heat rec	overy (N	MV) (24b)m = (22	2b)m + (2	23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	tract ver	ntilation of	or positiv	e input v	ventilatio	on from c	outside	-		-		
i	if (22b)n	n < 0.5 ×	(23b), t	hen (240	c) = (23b); otherv	vise (24	c) = (22t) m + 0.	5 × (23b)		L	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf	natural	ventilatio	on or wh	ole hous $m = (22)$	e positiv	e input v	ventilatio	on from I	oft 2b)m² v	0.51				
(24d)m=	0.53	0.53	0.53	111 = (221)	0.52	0.52	40/11 = 0.52	0.5 + [(2)]	20)III- X	0.5]	0.52	0.53		(24d)
Effe	ctive air	change	rate - er) or (24b	(24)	c) or (24		(25)	0.02	0.02	0.00		(-)
(25)m=	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.53		(25)
(- /														. ,
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN	IENI	Gros	SS	Openin	gs	Net Ar	ea	U-vaii	Je	AXU		k-value	•	АХК
		area	(m²)	m	2 ²	A,n	n²	W/m2	K	(W/I	K)	kJ/m²·ł	<	kJ/K
Doors		area	(m²)	m	12	A ,n 2.15	n²	W/m2	K =	(W/I 2.15	K)	kJ/m²∙ł	<	kJ/K (26)
Doors Windov	ws Type	area e 1	(m²)	m	12	A ,n 2.15 1.98	m ² x	W/m2 1 /[1/(1.2)+	K = 0.04] =	(W/I 2.15 2.27	K)	kJ/m²-ł	<	kJ/K (26) (27)
Doors Windov Windov	ws Type ws Type	area e 1 e 2	(m²)	rr	J2	A ,n 2.15 1.98 1.98	n ² x x x ¹ x ¹	W/m2 1 /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] =	(W/I 2.15 2.27 2.27	K)	kJ/m²∙ł	K	kJ/K (26) (27) (27)
Doors Windov Windov Windov	ws Type ws Type ws Type	area 9 1 9 2 9 3	(m²)	m	J ²	A ,n 2.15 1.98 1.98	n ² x x x ¹ x ¹ x ¹	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] = 0.04] =	(W/I 2.15 2.27 2.27 2.27	K)	kJ/m²-ŀ	K	kJ/K (26) (27) (27) (27)
Doors Window Window Window Window	ws Type ws Type ws Type ws Type	area 9 1 9 2 9 3 9 4	(m²)	rr	2	A ,n 2.15 1.98 1.98 1.98 1.98	n ² x x1 x1 x1 x1 x1 x1 x1	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.15 2.27 2.27 2.27 2.27 2.27	K)	kJ/m²-ŀ	<	kJ/K (26) (27) (27) (27) (27) (27)
Doors Window Window Window Window	ws Type ws Type ws Type ws Type ws Type	area 2 1 2 3 2 4 2 5	(m²)	rr	2	A ,n 2.15 1.98 1.98 1.98 1.98 3.26	n ² x x1 x1 x1 x1 x1 x1 x1 x1	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.15 2.27 2.27 2.27 2.27 2.27 3.73	K)	kJ/m²-ŀ	<	kJ/K (26) (27) (27) (27) (27) (27) (27)
Doors Window Window Window Window Window	ws Type ws Type ws Type ws Type ws Type ws Type	area 2 3 4 5 6	(m²)	m	2	A ,n 2.15 1.98 1.98 1.98 1.98 3.26 1.98	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.15 2.27 2.27 2.27 2.27 2.27 3.73 2.27	K)	kJ/m²-ŀ	K	kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
Doors Window Window Window Window Window Window	ws Type ws Type ws Type ws Type ws Type ws Type ws Type	area 2 3 4 5 6 7	(m²)	ſſ	2	A ,n 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26	n ² x x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73	<pre>k)</pre>	kJ/m²-ŀ	<	kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Window Window Window Window Window Window	ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type	area 2 3 4 5 6 7 8	(m²)	ſſ	2	A ,n 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.98	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.15 2.27 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.227	\sim	kJ/m²-ŀ	<	kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Window Window Window Window Window Window Window Window	ws Type ws Type ws Type ws Type ws Type ws Type ws Type ype1	area 2 3 4 5 6 7 8 59.8	(m²) 38	m 18.1	3	A ,n 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.76 41.7	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.18	K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.15 2.27 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51	<pre></pre>	kJ/m²-ŀ	<	kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Window Window Window Window Window Window Window Window Walls T	ws Type ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2	area 2 3 4 5 6 7 8 59.8 5.4	(m²) 38 8	m 18.13	8	A ,n 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.98 3.26 1.76 41.7	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	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.18 0.2	K 0.04] = 0.0	(W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08	×)	kJ/m²-ŀ		kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Window Window Window Window Window Window Window Window Walls T Walls T	ws Type ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3	area 2 = 1 2 = 3 4 = 5 4 = 5 6 = 7 8 = 59.8 59.8 5.44 16.3	(m²) 38 8 37	m 18.11 0 2.15	B	A ,n 2.15 1.98 1.98 1.98 3.26 1.98 3.26 1.98 3.26 1.76 41.7 5.48	n ² X X X X X X X X X X X X X X X X X X X	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.18 0.2 0.22	K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 1 = 0.04] = 1 =	(W/I 2.15 2.27 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09	×	kJ/m²-ŀ		kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Window Window Window Window Window Window Walls T Walls T Total a	ws Type ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3 urea of e	area 2 = 1 2 = 3 2 = 3 2 = 4 2 = 5 2 = 6 2 = 7 2 = 8 59.8 59.8 59.8 59.4 16.3 emperts	(m²) 38 8 37 37	m 18.11 0 2.15	B	A ,n 2.15 1.98 1.98 1.98 3.26 1.98 3.26 1.98 3.26 1.98 3.26 1.76 41.7 5.48 14.22 81.73	n ² x x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.18 0.2 0.22	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] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.15 2.27 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09	<pre>k)</pre>	kJ/m²-ŀ		kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Window Window Window Window Window Window Walls T Walls T Walls T Total a Party w	ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3 irea of e vall	area a = 1 $a = 2$ $a = 3$ $a = 4$ $a = 5$ $a = 6$ $a = 7$ $a = 8$ 59.6 59.6 59.4 16.3 elements	(m²) 38 8 37 5, m²	m 18.11 0 2.15	3 5	A ,n 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.76 41.7 5.48 14.22 81.73 24.18	n ² x x ¹ x ² x ¹ x ²	W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.18 0.2 0.22 0		(W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09	<pre></pre>	kJ/m²-ł		kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Window Window Window Window Window Window Window Walls Walls Walls Total a Party w	ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3 urea of e vall dows and	area a re	(m ²) 38 8 8 37 3, m ² ows, use 6	m 18.13 0 2.15 effective wi	2 B Indow U-va	A ,n 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.98 3.26 1.76 41.7 5.48 14.22 81.73 24.18	n ² x x ¹ x ² x ² x ² x ³ x ³ x ⁴	W/m2 1 $/[1/(1.2)+$ $/[1/(1.2)+$ $/[1/(1.2)+$ $/[1/(1.2)+$ $/[1/(1.2)+$ $/[1/(1.2)+$ $/[1/(1.2)+$ $(1/(1.2)+$ 0.18 0.2 0.22 0 0 0 0 0 0 0 0 0 0	K 0.04] = 0	(W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09 0 1e)+0.04] a	K)	kJ/m²-ł		kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Window Window Window Window Window Window Walls Walls Walls Total a Party w * for window	ws Type ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3 urea of e vall dows and te the area	area a rea a 1 a 2 a 3 a 4 a 5 a 6 a 7 a 8 59.8 59.8 59.8 16.3 16.3 1700 f windhas on both	(m ²) 38 8 37 37 37 37 37 37 37 37 37 37 37 37 37	m 18.13 0 2.15 effective wind nternal walk	2 3 5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A ,n 2.15 1.98 1.98 1.98 1.98 3.26 1.98 3.26 1.98 3.26 1.98 3.26 1.76 41.7 5.48 14.22 81.73 24.18 alue calcula itions	n ² x x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x ¹ x	W/m2 1 $/[1/(1.2)+$ $/[1/(1.2)+$ $/[1/(1.2)+$ $/[1/(1.2)+$ $/[1/(1.2)+$ $/[1/(1.2)+$ $/[1/(1.2)+$ $[1/(1.2)+$ 0.18 0.2 0.22 0.22 0 0 1 formula 1	$K = [] \\ 0.04] = [] \\ 0.04] = [] \\ 0.04] = [] \\ 0.04] = [] \\ 0.04] = [] \\ 0.04] = [] \\ 0.04] = [] \\ 0.04] = [] \\ = [] \\ 0.04] = [] \\ $	(W/I 2.15 2.27 2.27 2.27 2.27 3.73 2.27 3.73 2.27 3.73 2.02 7.51 1.08 3.09 0 1e)+0.04] a	K)	kJ/m²-ł		kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

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

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

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

(34)

(35)

7043.88

250

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

Indicative Value: Medium



can be ι	ised instea	ad of a det	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						11.59	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			46.24	(37)
Ventila	tion 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=	26.86	26.8	26.74	26.46	26.4	26.16	26.16	26.11	26.25	26.4	26.51	26.62		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	73.1	73.04	72.98	72.7	72.64	72.4	72.4	72.35	72.49	72.64	72.75	72.86		
									/	Average =	Sum(39)1	12 /12=	72.7	(39)
Heat Ic	oss para	meter (H	ILP), W/	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.19	1.19	1.19	1.19	1.19	1.18	1.18	1.18	1.18	1.19	1.19	1.19		_
Numbe	er of dav	vs in mor	nth (Tab	le 1a)					/	Average =	Sum(40)1.	12 /12=	1.19	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
											ļ			
1 \//2	tor hoat	ing onor	av roqui	iromont.								k\Mb/w	oor:	
4. 000		ing ener	gy requ	nement.								KVVII/yt	-ai.	
		ipancy, I	N 1 76 y	[1 0)/0	(0 0000	ио у (тг	- 42 0	<u>))], 0</u> (012 x /7	TEA 40	2.	02		(42)
if TF	A > 13.9 A £ 13.9	9, N = 1 9. N = 1	+ 1.70 X	[i - exp	(-0.0003	949 X (11	-A - 13.9)2)] + 0.(JU 13 X (1	IFA - 13.	.9)			
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	iy Vd,av	erage =	(25 x N)	+ 36		82	.12		(43)
Reduce	the annua	al average	hot water	usage by	5% if the d	lwelling is	designed t เส	o achieve	a water us	se target o	f			
notmore		nites per p					ia) I				1		I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	day for ea	ach month	Vd,m = fa	ctor from	l able 1c x	(43)						
(44)m=	90.33	87.04	83.76	80.48	77.19	73.91	73.91	77.19	80.48	83.76	87.04	90.33		_
Enormy	contont of	hot wator	used col	culated m	opthly - 1	100 v Vd r	n v nm v F	Tm / 2600	kW/b/mon	Total = Su	m(44) ₁₁₂ =	= 0.1d)	985.41	(44)
					<i>nuny</i> = 4.	190 X VU,I						(, 10)		
(45) m =	133.96	117.16	120.9	105.4	101.13	87.27	80.87	92.8	93.91	109.44	119.46	129.73	4000.00	
lf instant	taneous w	ater heatir	ng at point	of use (no	hot water	· storage),	enter 0 in	boxes (46,) to (61)	1 otal = Su	m(45) ₁₁₂ =	-	1292.03	(43)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:	-	-	-		-	-	-			-		
Storag	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	nd no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherw	ise if no	o stored	hot wate	er (this ir	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:												
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=			0		(50)
b) If m Hot wa	anufact	urer's de	eclared (cylinder l com Tabl	oss facto	or is not h/litro/da	known:					0	l	(51)
If com	nunitv h	eating s	ee secti	on 4.3	5 2 (r\v)	., int 6/ Ud	•y)					U		(01)
Volum	e factor	from Tal	ble 2a	-								0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)



Energy Enter	y lost fro (50) or (om water (54) in (5	⁻ storage 55)	e, kWh/y€	ear			(47) x (51)) x (52) x (53) =		0		(54) (55)
Water	storage	loss cal	culated t	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)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	i lix 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	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	solar wa	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=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	: 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	113.86	99.58	102.76	89.59	85.96	74.18	68.74	78.88	79.82	93.02	101.54	110.27		(62)
Solar DI	-IW input	calculated	using App	endix G oı	r Appendix	KH (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	t from w	ater hea	ter	-	-			-		-	-	-		
(64)m=	113.86	99.58	102.76	89.59	85.96	74.18	68.74	78.88	79.82	93.02	101.54	110.27		-
								Outp	out from wa	ater heate	r (annual)₁	12	1098.23	(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=	28.47	24.9	25.69	22.4	21.49	18.55	17.18	19.72	19.96	23.26	25.39	27.57		(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	e Table 5	5 and 5a):									
Metab	olic gair	is (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88	100.88		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see [·]	Table 5					
(67)m=	15.71	13.95	11.34	8.59	6.42	5.42	5.86	7.61	10.22	12.97	15.14	16.14		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	176.16	177.99	173.38	163.58	151.2	139.56	131.79	129.96	134.57	144.38	156.76	168.39		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)), also se	ee Table	5				
(69)m=	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09		(69)
Pumps	s and fai	ns gains	(Table (5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	, aporatic	n (nega	tive valu	es) (Tab	le 5)						•		
(71)m=	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7		(71)
Water	heating	gains (T	Table 5)			•							I	
(72)m=	38.26	37.05	, 34.53	31.11	28.89	25.76	23.1	26.51	27.72	31.26	35.26	37.05		(72)
Total i	internal	gains =	:			(66)	•)m + (67)m	• 1 + (68)m -	+ (69)m + ((70)m + (7	1)m + (72))m	I	
(73)m=	283.39	282.25	272.52	256.54	239.77	224	214.01	217.34	225.77	241.87	260.42	274.85		(73)
6. So	lar gains	5:											• •	

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	1.76	x	11.28	x	0.4	x	0.7	=	3.85	(75)
Northeast 0.9x	0.77	x	1.76	×	22.97	x	0.4	x	0.7	i =	7.84	(75)
Northeast 0.9x	0.77	x	1.76	×	41.38	×	0.4	x	0.7	=	14.13	(75)
Northeast 0.9x	0.77	x	1.76	×	67.96	×	0.4	x	0.7	=	23.21	(75)
Northeast 0.9x	0.77	x	1.76	×	91.35	x	0.4	x	0.7	=	31.2	(75)
Northeast 0.9x	0.77	x	1.76	×	97.38	x	0.4	x	0.7	=	33.26	(75)
Northeast 0.9x	0.77	x	1.76	×	91.1	×	0.4	x	0.7	=	31.11	(75)
Northeast 0.9x	0.77	x	1.76	x	72.63	x	0.4	x	0.7	=	24.8	(75)
Northeast 0.9x	0.77	x	1.76	×	50.42	×	0.4	x	0.7	i =	17.22	(75)
Northeast 0.9x	0.77	x	1.76	×	28.07	x	0.4	x	0.7	=	9.59	(75)
Northeast 0.9x	0.77	x	1.76	x	14.2	x	0.4	x	0.7	=	4.85	(75)
Northeast 0.9x	0.77	x	1.76	×	9.21	×	0.4	x	0.7	=	3.15	(75)
Southeast 0.9x	0.77	x	1.98	×	36.79	×	0.4	x	0.7	İ =	14.14	(77)
Southeast 0.9x	0.77	x	3.26	x	36.79	×	0.4	x	0.7	 =	23.27	(77)
Southeast 0.9x	0.77	x	1.98	×	36.79	×	0.4	x	0.7	=	14.14	(77)
Southeast 0.9x	0.77	x	3.26	×	36.79	×	0.4	x	0.7	İ =	23.27	(77)
Southeast 0.9x	0.77	x	1.98	×	62.67	x	0.4	x	0.7	=	24.08	(77)
Southeast 0.9x	0.77	x	3.26	×	62.67	×	0.4	x	0.7	=	39.65	(77)
Southeast 0.9x	0.77	x	1.98	×	62.67	×	0.4	x	0.7	İ =	24.08	(77)
Southeast 0.9x	0.77	x	3.26	×	62.67	x	0.4	x	0.7	=	39.65	(77)
Southeast 0.9x	0.77	x	1.98	×	85.75	×	0.4	x	0.7	=	32.95	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	1.98	×	85.75	×	0.4	x	0.7	=	32.95	(77)
Southeast 0.9x	0.77	x	3.26	x	85.75	x	0.4	x	0.7	=	54.24	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	3.26	×	106.25	×	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	×	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	3.26	x	119.01	x	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	×	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	3.26	×	119.01	×	0.4	x	0.7	=	75.28	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	3.26	×	118.15	x	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	1.98	×	118.15	×	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	3.26	×	118.15	×	0.4	x	0.7	=	74.74	(77)
Southeast 0.9x	0.77	x	1.98	×	113.91	×	0.4	x	0.7	=	43.76	(77)
Southeast 0.9x	0.77	x	3.26	×	113.91	×	0.4	×	0.7	=	72.06	(77)
Southeast 0.9x	0.77	x	1.98	×	113.91	×	0.4	x	0.7	i =	43.76	(77)



Southeast 0.9x	0.77	x	3.26	x	113.91	x	0.4	x	0.7	=	72.06	(77)
Southeast 0.9x	0.77	x	1.98	×	104.39	x	0.4	x	0.7	1 =	40.11	(77)
Southeast 0.9x	0.77	x	3.26	×	104.39	×	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7] =	40.11	(77)
Southeast 0.9x	0.77	×	3.26	×	104.39	x	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7] =	35.67	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7	=	35.67	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	1.98	×	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	3.26	×	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	3.26	×	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	3.26	×	44.07	x	0.4	x	0.7] =	27.88	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	3.26	x	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7] =	12.1	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7	=	12.1	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southwest _{0.9x}	0.77	x	1.98	x	36.79]	0.4	x	0.7] =	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	36.79		0.4	x	0.7	=	14.14	(79)
Southwest _{0.9x}	0.77	x	1.98	x	36.79]	0.4	x	0.7	=	14.14	(79)
Southwest0.9x	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest _{0.9x}	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest _{0.9x}	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest0.9x	0.77	x	1.98	×	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest _{0.9x}	0.77	x	1.98	x	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest0.9x	0.77	x	1.98	x	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest0.9x	0.77	x	1.98	x	106.25		0.4	x	0.7	=	40.82	(79)
Southwest0.9x	0.77	x	1.98	x	106.25]	0.4	x	0.7	=	40.82	(79)
Southwest0.9x	0.77	x	1.98	x	106.25]	0.4	x	0.7] =	40.82	(79)
Southwest _{0.9x}	0.77	x	1.98	x	119.01]	0.4	x	0.7] =	45.72	(79)
Southwest _{0.9x}	0.77	x	1.98	x	119.01]	0.4	x	0.7	=	45.72	(79)
Southwest _{0.9x}	0.77	x	1.98	x	119.01]	0.4	x	0.7	=	45.72	(79)
Southwest _{0.9x}	0.77	x	1.98	×	118.15]	0.4	x	0.7	=	45.39	(79)
Southwest _{0.9x}	0.77	x	1.98	x	118.15]	0.4	x	0.7	=	45.39	(79)
Southwest _{0.9x}	0.77	x	1.98	×	118.15]	0.4	x	0.7] =	45.39	(79)
Southwest _{0.9x}	0.77	x	1.98	×	113.91]	0.4	x	0.7] =	43.76	(79)
Southwest _{0.9x}	0.77	×	1.98	x	113.91]	0.4	x	0.7	=	43.76	(79)



Southw	vest <mark>0.9x</mark>	0.77)	< [1.98	3	x	1	13.91		0.4	x	0.7	-	- [43.76	(79)
Southw	vest <mark>0.9x</mark>	0.77)	· [1.98	3	x	10	04.39		0.4	×	0.7		- Ī	40.11	(79)
Southw	vest <mark>0.9x</mark>	0.77)	· [1.98	3	x	10	04.39		0.4	×	0.7	-	- Ī	40.11	(79)
Southw	vest <mark>0.9x</mark>	0.77)		1.98	3	x	10	04.39		0.4	×	0.7	-	- Ī	40.11	(79)
Southw	vest <mark>0.9x</mark>	0.77	,		1.98	3	x	9	2.85		0.4	×	0.7		- Ī	35.67	(79)
Southw	vest <mark>0.9x</mark>	0.77	,	,	1.98	3	x	9	2.85		0.4	×	0.7		- Ī	35.67	(79)
Southw	vest <mark>0.9x</mark>	0.77	,	- آ	1.98	3	x	9	2.85		0.4	×	0.7	-	- Ī	35.67	(79)
Southw	vest <mark>0.9x</mark>	0.77)		1.98	3	x	6	9.27		0.4	×	0.7		- [26.61	(79)
Southw	vest <mark>0.9x</mark>	0.77	,		1.98	3	x	6	9.27		0.4	×	0.7	-	= [26.61	(79)
Southw	vest <mark>0.9x</mark>	0.77)		1.98	3	x	6	9.27		0.4	×	0.7	-	= [26.61	(79)
Southw	vest <mark>0.9x</mark>	0.77)	· [1.98	3	x	4	4.07		0.4	×	0.7		- Ī	16.93	(79)
Southw	vest <mark>0.9x</mark>	0.77)		1.98	3	x	4	4.07		0.4	×	0.7	-	= [16.93	(79)
Southw	vest <mark>0.9x</mark>	0.77	,	· [1.98	3	x	4	4.07		0.4	×	0.7		- [16.93	(79)
Southw	vest <mark>0.9x</mark>	0.77	,		1.98	3	x	3	1.49		0.4	×	0.7	·	= [12.1	(79)
Southw	vest <mark>0.9x</mark>	0.77)		1.98	3	x	3	31.49		0.4	×	0.7		= [12.1	(79)
Southw	vest <mark>0.9x</mark>	0.77)	Ċ	1.98	3	x	3	31.49		0.4	×	0.7		= [12.1	(79)
Solar g	gains in	watts, ca	lculate	d fo	or each	mont	h			(83)m = 8	Sum(74)m .	.(82)m	-				
(83)m=	121.08	207.53	287.35	36	61.74	410.38	3 4	409.7	394.04	357.41	313.06	230.28	3 145.26	103.4	7		(83)
l otal g	jains – II	nternal al		r(8)	$\frac{34}{10.00}$ m =	(73)m) + (. T	83)m	, watts	57475	500.00	470.44	- 405.00	070.0			(0.4)
(84)m=	404.48	489.78	559.87	61	18.28	650.15		533.7	608.05	574.75	538.82	472.1	405.68	378.3	2		(04)
7. Me	ean inter	nal temp	erature	e (he	eating s	seaso	n)		·		1 (100)				г		
7. Me	ean inter perature	nal temp during h	erature eating	e (he peri	eating s iods in	seaso the liv	n) /ing	area	from Tab	ole 9, Th	n1 (°C)					21	(85)
7. Me Temp Utilisa	ean inter perature ation fac	nal temp during he tor for ga	erature eating ains for	e (he perie livir	eating s iods in ng area	seaso the liv a, h1,i	n) /ing m (s	area f ee Ta	from Tab ble 9a)	ble 9, Th	n1 (°C)	Oct	Nov]	21	(85)
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7. Me Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Mear (90)m= Mear (90)m= Mear (92)m= Apply (93)m= 8. Sp Set T the utilisa	an inter perature ation fac Jan 1 interna 19.76 perature 19.93 ation fac 1 interna 18.8 interna 19.23 <i>r</i> adjustn 19.23 <i>r</i> adjustn 19.23 <i>r</i> adjustn 19.23 <i>r</i> to the r tilisation	nal temp during here ctor for ga Feb 0.99 I temperation during here 19.95 during here 19.93 ctor for ga 0.99 I temperation 18.99 I temperation 19.42 nent to the 19.42 ting require factor fo Feb	erature eating ains for Mar 0.98 ature ir 20.22 eating 19.93 ains for 0.97 ature ir 19.26 ature (f 19.69 ne mea 19.69 ne mea 19.69 siremer ernal te r gains	<pre>> (he period livin livin 2 period 1 ress 0 t t empod usin 2 c t empod usin 2 c t</pre>	eating s iods in ng area Apr 0.94 ing area 20.55 iods in 19.93 st of dw 0.92 e rest o 19.57 be rest o 19.57 he who 20.01 ternal 1 20.01 st or dw 0.92 cont state 20.01	seaso the liv a, h1,i May 0.85 a T1 (20.81 rest c 19.93 velling 0.79 of dwe 19.81 velling 0.79 of dwe 19.81 velling 0.79 of dwe 20.25 tempe 20.25	n) ring m (s / follc follc f dw f dw f dw f dw f dw f dw f dw f dw f dw f dw f dw f dw f dw f dw f ollc f	area f eee Ta Jun 0.68 0.68 0.68 0.59 19.93 (m (se) 0.59 172 (fo) 19.91 172 (fo) 19.91 19.91 10.38	from Tab ble 9a) Jul 0.51 ps 3 to 7 20.99 from Ta 19.93 ee Table 0.39 ollow ste 19.93 collow ste 19.93	Aug 0.56 ' in Tab 20.98 able 9, T 19.94 9a) 0.44 ops 3 to 19.93 + (1 - fl 20.4 20.4 20.4 Table 9 Aug Aug 0.44 0.44 19.93 + (1 - fl 20.4 Table 9 Aug	n1 (°C) Sep 0.8 le 9c) 20.89 h2 (°C) 19.93 0.72 7 in Table 19.88 fl 20.33 ere appro 20.33 b, so that Sep	Oct 0.96 20.54 19.93 0.94 e 9c) 19.58 A = Liv 20.01 20.01 criate 20.01	Nov 0.99 20.07 19.93 0.99 19.12 ving area ÷ (4 19.55 19.55 =(76)m and	Dec 1 19.71 19.93 1 18.76 4) = 19.18 19.18 d re-ca	[c 1 3 3 3 3 alc c	21 0.45	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)



Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	1	0.99	0.97	0.92	0.81	0.63	0.45	0.5	0.75	0.94	0.99	1		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m								I	
(95)m=	402.47	483.66	542.6	568.94	527.5	398.08	272.33	284.5	404.3	445.33	401.26	376.93		(95)
Month	nly aver	age exte	ernal tem	perature	e from Ta	able 8							I	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]			I	
(97)m=	1091.23	1060.59	962.75	807.49	621.41	418.22	275.43	289.51	451.71	683.3	905.47	1091.77		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m		-	
(98)m=	512.44	387.7	312.59	171.75	69.87	0	0	0	0	177.05	363.03	531.84		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2526.27	(98)
Space	e heatin	a reauire	ement in	kWh/m ²	2/vear								41.22](99)
					, j e a.									
		oling rec	luiremer		0 T.									
Calcu	lated to	r June, J	July and	August.	See Tai		Lul.	Δυσ	Son	Oct	Nov	Dec	1	
Heat	Jan oss rate				Iviay			and ext	ornal ton				l	
(100)m-	035 141					680 53	535 74	549 87					1	(100)
Litilies	tion fac	tor for lo		0	0	000.00	000.74	040.07	0	0	0	0	j	()
(101)m-				0	0	0.9	0.95	0.93	0	0	0	0	1	(101)
			$\sqrt{2tts} = 1$	(100)m y	(101)m	0.0	0.00	0.00	0	0	0	0	İ	()
(102)m-	0		$\int \frac{1}{\sqrt{2}}$			610.27	506.67	511 44	0	0	0	0	1	(102)
Gains	(solar	ins ca	l <u> </u>	for appli	l čable w	ather re	aion se	e Table	10)	Ŭ	Ů	Ŭ		()
(103)m=	0					815.96	784 49	746 73		0	0	0	1	(103)
Space	° a coolin		<u> </u>	r month	whole a	welling	continu	$\frac{1}{2} \frac{1}$	$\frac{1}{(h)} = 0.0$	21 x [(1)	$\frac{1}{2}$	$\frac{102}{ml}$	(<i>1</i> 1)m	()
set (1	04)m to	zero if ((104)m <	: 3 × (98)m	wenng,	continua	003 (11	(11) = 0.0	24 × [[/ C).),),), (102)111]2	(<i>+1)</i> ///	
(104)m=	0	0	0	0	0	148.09	206.7	175.06	0	0	0	0		
									Total	= Sum(104)	=	529.84	(104)
Cooled	I fractio	า							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)	-	_	-	_	-	-	_			
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
			-					-	Tota	l = Sum((104)	=	0	(106)
Space	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	37.02	51.67	43.76	0	0	0	0		
									Tota	= Sum(107)	=	132.46	(107)
Space	cooling	requirer	ment in k	(Wh/m²/y	/ear				(107)) ÷ (4) =			2.16	(108)
8f. <u>Fab</u>	ric Ene	rgy <u>Effic</u> i	iency (ca	alculated	l onl <u>y un</u>	der <u>spec</u>	cial cond	lition <u>s, s</u>	ee s <u>ectio</u>	on 1 <u>1) _</u>				
Fabric	: Enera	v Efficier	ncv						(99)	+ (108) =	=		43.39	(109)
		,	- ,						(00)	(100)				```



			User D	etails:						
Assessor Name: Software Name:	Panagiotis Stroma FS/	Dalapas AP 2012		Stroma Softwa	a Num are Ver	ber: sion:		STRO Versio	030082 n: 1.0.5.41	
		Р	roperty .	Address:	: Be Lea	n-Top F	loor Flat			
Address :	238 KILBUR	N HIGH ROAD,	LOND	DN, NWE	6 2BS					
1. Overall dwelling dimen	sions:									
Ground floor				a(m²) 02.92	(1a) x	Av. He	i ght(m) .45	(2a) =	Volume(m ³) 252.15	(3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1e)+(1r	n) 1	02.92	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	252.15	(5)
2. Ventilation rate:									<u> </u>	
	main heating	secondar heating	у	other		total			m ³ per hour	•
Number of chimneys	0	+ 0	+	0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	+ 0	- + -	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fan	s					4	x 1	0 =	40	(7a)
Number of passive vents						0	x 1	0 =	0	_](7b)
Number of flueless gas fire	es.					0	x 4	40 =	0	$\left \begin{array}{c} \\ \\ \\ \end{array} \right _{(7c)}$
						0			0	
								Air ch	anges per ho	ur
Infiltration due to chimneys	s, flues and fa	INS = (6a)+(6b)+(7	'a)+(7b)+(7c) =	Γ	40	<u> </u>	÷ (5) =	0.16	(8)
If a pressurisation test has be	en carried out or	is intended, procee	d to (17), d	otherwise o	continue fro	om (9) to ((16)			
Number of storeys in the	e dwelling (ns)							0	(9)
Additional infiltration							[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2	5 for steel or	timber frame or	0.35 for	r masonr	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening	sent, use the val s): if equal user (ue corresponding to 0.35	the great	er wall are	a (after					
If suspended wooden flo	oor, enter 0.2	(unsealed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else e	nter 0							0	(13)
Percentage of windows	and doors dra	aught 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, q	50, expresse	d in cubic metre	s per ho	our per so	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabilit	y value, then	$(18) = [(17) \div 20] + (8)$	3), otherwi	se (18) = (16)				0.31	(18)
Air permeability value applies	if a pressurisatio	n test has been dor	e or a deg	gree air pei	rmeability	is being us	sed			
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(19)
Infiltration rate incorporatir	ng shelter fact	or		(21) = (18)) x (20) =				0.26](==)](21)
Infiltration rate modified fo	r monthly win	d speed							0.20	
Jan Feb M	/lar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table	e 7								
(22)m= 5.1 5 4	.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a) ~ (22)									1	
(22a)m = 1.27 + 1.25 + 1	23 1 1	1.08 0.95	0.95	0.92	1	1.08	1 12	1 18		
		0.00	0.00	0.02	'		2		l	



Adjusted	l infiltra	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.33	0.33	0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.3	0.31		
Calculate	e effec hanica	<i>tive air</i> Il ventila	change	rate for t	he appli	cable ca	se						0	(23a)
lf exhau	ist air he	eat pump	using App	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If baland	ced with	heat reco	overy: effic	ciency in %	allowing f	or in-use fa	actor (from	n Table 4h) =				0	(23c)
a) If ba	alance	d mech	anical v	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (2	23b) × [1 – (23c)	÷ 100]	(/
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If ba	alance	d mech	anical v	entilation	without	heat rec	overy (N	и V) (24b)m = (22	2b)m + (2	23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If wh if (hole ho (22b)m	ouse ex n < 0.5 >	tract vei (23b),	ntilation of then (24)	or positiv c) = (23b	ve input v); otherv	ventilatio vise (24	on from o c) = (22t	outside b) m + 0.	.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf na if (atural \ (22b)m	ventilation = 1, th	on or wh en (24d)	nole hous)m = (221	e positiv o)m othe	/e input v erwise (2	ventilatio 4d)m = 0	on from l 0.5 + [(2	oft 2b)m² x	0.5]				
(24d)m=	0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(24d)
Effectiv	ve air	change	rate - e	nter (24a) or (24b	o) or (240	c) or (24	d) in box	x (25)				-	
(25)m=	0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(25)
3. Heat	losses	s and he	eat loss	paramete	er:									
ELEME	ENT	Gros	SS	Openin	gs	Net Ar	ea	U-valu	ue	AXU		k-value	e V	A X k
		aica	(111-)		1-	А,п	11 -	vv/m2	in in	(vv/r	γ	KJ/M ² ·I	n in the second se	NJ/IN
Doors		alea	(11-)		1-	A ,11 2.15	л ² х	VV/m2	:r. = [(VV/r 2.15		KJ/m-•i	∧	(26)
Doors Windows	з Туре	1	(11-)	11	F	A ,n 2.15	x x x ¹ /	1/[1/(1.2)+	= [0.04] = [2.15 2.27		KJ/M2+I	N.	(26) (27)
Doors Windows Windows	s Туре s Туре	1 2	(111-)		-	A , II 2.15 1.98	x x ^{1/} x ^{1/}	VV/M2 1 /[1/(1.2)+ /[1/(1.2)+	$\begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	2.15 2.27 2.27		KJ/M²•I	~	(26) (27) (27)
Doors Windows Windows Windows	s Type s Type s Type	1 2 3	(111-)		-	A , ff 2.15 1.98 1.98 1.98	x x ^{1,} x ^{1,} x ^{1,} x ^{1,}	/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04$	2.15 2.27 2.27 2.27		KJ/M²∙I	~	(26) (27) (27) (27)
Doors Windows Windows Windows Windows	s Type s Type s Type s Type s Type	1 2 3 4	(11-)		-	A , II 2.15 1.98 1.98 1.98 1.98	x x1, x1, x1, x1, x1, x1, x1,	VV/M2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{bmatrix} & & \\ &$	(WVA 2.15 2.27 2.27 2.27 2.27 2.27		KJ/M ² ·I	~	(26) (27) (27) (27) (27) (27)
Doors Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type	1 2 3 4 5	(11-)		-	A , II 2.15 1.98 1.98 1.98 1.98 1.98	x x x ^{1,} x ^{1,} x ^{1,} x ^{1,} x ^{1,}	/[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ $	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27		KJ/M ² ·I	~	(26) (27) (27) (27) (27) (27) (27)
Doors Windows Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type s Type	1 2 3 4 5 6	(11-)		-	A , II 2.15 1.98 1.98 1.98 1.98 1.98 1.98	x x x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾ x ¹⁾	VV/M2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 $	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27		KJ/M*+I	~	(26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windows Windows Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type s Type s Type	1 2 3 4 5 6 7	(11-)		-	A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98	x x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	VV/M2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{bmatrix} \mathbf{R} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2		KJ/M ² ·I	~	 (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Windows Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type s Type s Type s Type	1 2 3 4 5 6 7 8	(11-)		-	A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	VV/M2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{bmatrix} \mathbf{R} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2		KJ/M ² ·I	~	 (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Windows Windows Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type	1 2 3 4 5 6 7 8 9	(11-)		-	A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26	x x1,	VV/M2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ $	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	>	KJ/M ² ·I	~	 (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Windows Windows Windows Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type	1 2 3 4 5 6 7 8 9 10	(117-)			A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26	$ \begin{array}{c c} $	VV/M2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{bmatrix} \mathbf{R} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix}$	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2		KJ/M ² ·I	~	 (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Windows Windows Windows Windows Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type	1 2 3 4 5 6 7 8 9 10 11	(117-)		-	A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 1.87	$ \begin{array}{c c} $	VV/M2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{bmatrix} \mathbf{R} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix}$	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	>	KJ/M*+1	~	 (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Windows Windows Windows Windows Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type	1 2 3 4 5 6 7 8 9 10 11 12	(117-)			A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 1.87 1.2	$ \begin{array}{c} $	VV/M2 1 ([1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{bmatrix} \mathbf{R} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0 \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0 \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0 \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} $	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2	>	KJ/M*-1	~	 (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27)
Doors Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type	1 2 3 4 5 6 7 8 9 10 11 12 [128	.4	26.7	1	A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 1.87 1.2	$ \begin{array}{c} $	$\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$	$ \begin{bmatrix} \mathbf{R} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix}$	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2		KJ/M*•1		 (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29)
Doors Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type ype1 ype2	1 2 3 4 5 6 7 8 9 10 11 12 128 22.8	.433	26.7	1	A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 1.87 1.2 101.69 22.83	$ \begin{array}{c} x \\ x^{1} \\ x^$	$\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{1}{(1/(1.2)+}$ $\frac{0.18}{0.2}$	$\begin{array}{c} \mathbf{R} \\ 0.041 &=$	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2		KJ/M ² ··		 (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (29) (29)
Doors Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows	s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3	1 2 3 4 5 6 7 8 9 10 11 12 128 22.8 19.2	.43321	26.7 0 2.15	1	A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 3.26 1.87 1.2 101.69 22.83 17.06	$ \begin{array}{c} $	VV/M2 1 $([1/(1.2)+)$ $([$	$\begin{array}{c} \mathbf{R} \\ 0.04] = \\ 0.$	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2		KJ/M2+1		 (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (22) (29) (29) (29)
Doors Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Walls Ty Walls Ty Walls Ty Roof	s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3	1 2 3 4 5 6 7 8 9 10 11 12 128 22.8 19.2 102.	.4 33 21 92	26.7 0 2.15 0	1	A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 3.26 1.87 1.2 101.69 22.83 17.06 102.92	$ \begin{array}{c} $	VV/M2 $[1]$ $(1/(1.2)+$ $(1$	$\begin{array}{c} \mathbf{R} \\ 0.041 &=$	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2		KJ/M*•1		 (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (22) (29) (20) (30)
Doors Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Windows Walls Ty Walls Ty Walls Ty Roof Total are	s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3 a of el	1 2 3 4 5 6 7 8 9 10 11 12 128 22.8 19.2 102.	.4 33 21 92 5, m ²	26.7 0 2.15 0		A , fi 2.15 1.98 1.98 1.98 1.98 1.98 1.98 1.98 1.98 3.26 3.26 3.26 3.26 1.87 1.2 101.69 22.83 17.06 102.92 273.30	$ \begin{array}{c} 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^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{1} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{2} \\ x^{3} \\ x^{4} \\ x^$	VV/M2 1 /[1/(1.2)+ /[1/(1.2	$\begin{bmatrix} \mathbf{R} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(WW 2.15 2.27 2.27 2.27 2.27 2.27 2.27 2.27 2.2		KJ/M2-1		 K)/K (26) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (27) (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) =

72.64 (33)



	•.													(24)
rieat ca	apacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	16692.33	(34)
Therma	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35)
For desig can be u	gn assess sed instea	ments wh ad of a dei	ere the de tailed calci	tails of the ulation.	construct	ion are noi	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	<						39.78	(36)
if details	of therma	l bridging	are not kn	own (36) =	= 0.05 x (3	1)			(22)	(0.0)				
lotal fa	abric he	at loss							(33) +	(36) =	05) (5)		112.41	(37)
Ventila	tion hea	t loss ca	alculated	monthl	y 				(38)m	= 0.33 × (25)m x (5)	Dat	1	
(38)m-	Jan 46.26	Feb 46.08	Mar 45.9	Apr 45.07	May	Jun 44 19	JUI 44 10	Aug	Sep		NOV	15 56	1	(38)
(50)11-	40.20	40.00	40.0	43.07	44.31	44.13	44.13	44.00	44.47	44.31	43.23	40.00		(00)
Heat tr	ansfer c		nt, W/K	457.40	457.00	450.0	450.0	450.47	(39)m	= (37) + (38)m	457.07	1	
(39)m=	158.67	158.49	158.32	157.48	157.33	156.6	156.6	156.47	156.88	157.33	157.64 Sum(20)	157.97	157.49	(30)
Heat lo	oss para	meter (H	HLP), W/	′m²K	-	-			(40)m	= (39)m ÷	(4)	12 / 12-	137.40	
(40)m=	1.54	1.54	1.54	1.53	1.53	1.52	1.52	1.52	1.52	1.53	1.53	1.53		
Numbe	er of day	rs in mor	nth (Tab	le 1a)					/	Average =	Sum(40)1.	12 /12=	1.53	(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	1	(41)
4. Wa	ller neal	ing ener	gy requi	irement:								kWh/y	ear:	
4. Wa Assum if TF, if TF,	ed occu A > 13.9 A £ 13.9	ipancy, I 9, N = 1 9, N = 1	y requi N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	⁻ A -13.9)2)] + 0.0)013 x (⁻	TFA -13.	<u>2.</u> 9)	kWh/y 76	ear:	(42)
4. Wa Assum if TF if TF Annual Reduce not more	ed occu A > 13.9 A £ 13.9 averag the annua e that 125	pancy, I 9, N = 1 9, N = 1 e hot wa l average litres per l	y requi N + 1.76 x ater usag hot water person per	[1 - exp [2 - exp ge in litre usage by day (all w	(-0.0003 es per da 5% if the o rater use, I	349 x (TF ay Vd,av Iwelling is hot and co	FA -13.9 erage = designed i ld))2)] + 0.0 (25 x N) to achieve)013 x (⁻ + 36 a water us	TFA -13. se target o	2. 9) 99	kWh/y 76 .87	ear:]]	(42) (43)
4. Wa Assum if TF if TF Annual <i>Reduce</i> <i>not more</i>	ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan	pancy, I 9, N = 1 9, N = 1 e hot wa l average litres per p Feb	y requination of the second se	[1 - exp [2 - exp usage by 1 day (all w Apr	(-0.0003 es per da 5% if the a rater use, I May	349 x (TF ay Vd,av Iwelling is hot and co Jun	FA -13.9 erage = designed i ld) Jul)2)] + 0.0 (25 x N) to achieve Aug	0013 x (⁻ + 36 ^{a water us} Sep	TFA -13. se target o Oct	9) 2. 9) / 99	kWh/y 76 .87 Dec	ear:]]]	(42) (43)
4. Wa if TF if TF Annual Reduce not more	ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan Jan	pancy, I 9, N = 1 9, N = 1 e hot wa al average litres per p Feb	N + 1.76 x ater usag hot water person per Mar day for ea	[1 - exp ge in litre usage by day (all w Apr ach month	(-0.0003 es per da 5% if the a vater use, l May Vd,m = fa	349 x (TF ay Vd,av Iwelling is hot and co Jun ctor from T	FA -13.9 erage = designed i ld) Jul Table 1c x)2)] + 0.0 (25 x N) to achieve Aug (43)	0013 x (⁻ + 36 a water us Sep	TFA -13. se target o Oct	9) 9) Nov	kWh/y 76 .87 Dec	ear:]]	(42) (43)
4. Wa if TF. if TF. Annual Reduce not more Hot wate (44)m=	ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan ar usage in 109.85	Ipancy, I 9, N = 1 9, N = 1 e hot wa al average litres per p Feb n litres per 105.86	y requinations of the second s	Irement: [1 - exp ge in litre usage by day (all w Apr ach month 97.87	(-0.0003 es per da 5% if the o rater use, l May Vd,m = fa 93.88	349 x (TF ay Vd,av lwelling is hot and co Jun ctor from 1 89.88	FA -13.9 erage = designed i ld) Jul Table 1c x 89.88)2)] + 0.0 (25 x N) to achieve Aug (43) 93.88	0013 x (⁻ + 36 <i>a water us</i> Sep 97.87	TFA -13. se target o Oct 101.87	2. 9) 99 Nov	kWh/y 76 .87 Dec 109.85	ear:]]]	(42) (43)
4. Wa Assum if TF if TF Annual Reduce not more Hot wate (44)m=	ed occu A > 13.9 A \pounds 13.9 averag the annua that 125 Jan er usage in 109.85	pancy, I b, N = 1 b, N = 1 e hot wa l average litres per Feb n litres per 105.86 hot water	y requinations of the second s	[1 - exp ge in litre usage by a day (all w Apr ach month 97.87	(-0.0003 es per da 5% if the o vater use, l May Vd,m = fa 93.88	349 x (TF ay Vd,av Iwelling is hot and co Jun ctor from 1 89.88 190 x Vd,r	FA -13.9 erage = designed i Id) Jul Table 1c x 89.88 m x nm x E)2)] + 0.0 (25 x N) to achieve Aug (43) 93.88 07m / 3600	0013 x (" + 36 a water us Sep 97.87 	TFA -13. se target o Oct 101.87 Total = Su oth (see Ta	2. 9) Nov 105.86 m(44) ₁₁₂ =	kWh/y 76 .87 Dec 109.85 c, 1d)	ear:]]]	(42) (43)
4. Wa if Xessum if TF. Annual Reduce not more (44)m= Energy c (45)m=	ed occu A > 13.9 A \pounds 13.9 averag the annual the annual that 125 Jan 109.85 content of 162.91	pancy, I pancy, I p, N = 1 e hot way la verage litres per p Feb n litres per 105.86 hot water 142.48	y requinations of the second s	[1 - exp ge in litre usage by a day (all w Apr ach month 97.87 culated mo	(-0.0003 es per da 5% if the o vater use, l May Vd,m = fa 93.88 onthly = 4.	A9 x (TF ay Vd,av Iwelling is hot and co Jun ctor from 7 89.88 190 x Vd,r 106.14	FA -13.9 erage = designed i ld) Jul Table 1c x 89.88 m x nm x E 98.35)2)] + 0.0 (25 x N) to achieve Aug (43) 93.88 97m / 3600 112.86	0013 x (⁻ + 36 <i>a water us</i> Sep 97.87 	TFA -13. se target o Oct 101.87 Total = Su oth (see Ta 133.1	2. 9) Nov 105.86 m(44)112 tbles 1b, 1 145.29	kWh/y 76 .87 Dec 109.85 c, 1d) 157.77	ear:]]] 	(42) (43)
4. Wa if Xessum if TF. Annual Reduce not more (44)m= Energy c (45)m=	ed occu A > 13.9 A \pm 13.9 averag the annua that 125 Jan 109.85 content of 162.91	pancy, I pancy, I p, N = 1 p, N = 1 e hot wa laverage litres per p Feb n litres per 105.86 hot water 142.48 rater heating	y requinations of the second s	[1 - exp ge in litre usage by day (all w Apr ach month 97.87 culated mo 128.18	(-0.0003) es per da 5% if the o vater use, l May Vd,m = fa 93.88 onthly = 4. 123	349 x (TF ay Vd,av Iwelling is hot and co Jun ctor from 7 89.88 190 x Vd,r 106.14	A -13.9 erage = designed i ld) Jul Table 1c x 89.88 m x nm x E 98.35 enter 0 in)2)] + 0.0 (25 x N) to achieve Aug (43) 93.88 07m / 3600 112.86 boxes (46,	0013 x (+ 36 a water us Sep 97.87 	TFA -13. se target o Oct 101.87 Total = Su nth (see Ta 133.1 Total = Su	2. 9) Nov 105.86 m(44) ₁₁₂ = ables 1b, 1 145.29 m(45) ₁₁₂ =	kWh/y 76 .87 .87 .09.85	ear:]]] 1198.41 1571.31	(42) (43) (44) (45)
4. Wa Assum if TF. if TF. Annual <i>Reduce</i> not more (44)m= Energy c (45)m= If instant (46)m=	ed occu A > 13.9 A \pounds 13.9 average the annuation that 125 Jan ar usage in 109.85 content of 162.91 aneous w	pancy, I pancy, I p, N = 1 p, N = 1 e hot wa laverage litres per l Feb n litres per 105.86 hot water 142.48 patter heatin 0	y requinations of the second s	Irement: [1 - exp ge in litre usage by a day (all w Apr ach month 97.87 culated mo 128.18	(-0.0003) es per da 5% if the o vater use, l May Vd,m = fa 93.88 onthly = 4. 123 o hot water 0	349 x (TF ay Vd,av Iwelling is foot and co Jun ctor from 1 89.88 190 x Vd,r 106.14 storage), 0	FA -13.9 erage = designed i ld) Table 1c x 89.88 m x nm x D 98.35 enter 0 in 0)2)] + 0.0 (25 x N) to achieve (43) 93.88 07m / 3600 112.86 boxes (46, 0	0013 x (" + 36 a water us Sep 97.87 	TFA -13. se target o Oct 101.87 Total = Su nth (see Ta 133.1 Total = Su 0	2. 9) Nov 105.86 m(44) ₁₁₂ = ables 1b, 1 145.29 m(45) ₁₁₂ = 0	kWh/y 76 .87 .87 .09.85 ., 1d) 157.77	ear:]]] 1198.41 1571.31	(42) (43) (44) (45) (46)
4. Wa Assum if TF if TF. Annual <i>Reduce</i> not more (44)m= (44)m= (45)m= If instant (46)m= Water	ed occu A > 13.9 A \pounds 13.9 average the annual that 125 Jan ar usage in 109.85 content of 162.91 aneous w 0 storage	pancy, I pancy, I p, N = 1 p, N = 1 e hot wa laverage litres per l Feb n litres per 105.86 hot water 142.48 rater heatin 0 loss: e (litres)	y requinations of the second s	[1 - exp ge in litre usage by a day (all w Apr ach month 97.87 culated mo 128.18 f of use (no 0	(-0.0003) es per da 5% if the o vater use, l May Vd,m = fa 93.88 onthly = 4. 123 o hot water 0	349 x (TF ay Vd,av Iwelling is hot and co Jun ctor from 1 89.88 190 x Vd,r 106.14 storage), 0	FA -13.9 erage = designed i ld) Jul Table 1c x 89.88 m x nm x E 98.35 enter 0 in 0)2)] + 0.0 (25 x N) to achieve Aug (43) 93.88 97m / 3600 112.86 boxes (46, 0	0013 x (⁻ + 36 a water us Sep 97.87 - 0 kWh/mor 114.21 - 0 to (61) 0	TFA -13. se target o Oct 101.87 Total = Su 133.1 Total = Su 0 sel	2. 9) Nov 105.86 m(44) ₁₁₂ = ables 1b, 1 145.29 m(45) ₁₁₂ = 0	kWh/y 76 .87 Dec 109.85 c, 1d) 157.77	ear:]]] 1198.41 1571.31]	(42) (43) (43) (44) (45) (46)
4. Wa if TF if TF. Annual Reduce not more (44)m= Energy c (45)m= If instant (46)m= Water s Storage If comp	ed occu A > 13.9 A \pounds 13.9 A \pounds 13.9 averag the annual that 125 Jan ar usage in 109.85 content of 162.91 aneous w 0 storage e volum	ing energy, Ipancy, Ib, N = 1e hot wal averagelitres per pFebn litres per105.86hot water142.48ater heatin0loss:e (litres)	y requinations of the second s	[1 - exp ge in litre usage by a day (all w Apr ach month 97.87 culated mo 128.18 of use (no 0 ng any so	(-0.0003) es per da 5% if the o vater use, l May Vd,m = fa 93.88 onthly = 4. 123 o hot water 0 olar or W	349 x (TF ay Vd,av Iwelling is hot and co Jun ctor from 7 89.88 190 x Vd,r 106.14 r storage), 0 /WHRS	FA -13.9 erage = designed i ld) Jul Table 1c x 89.88 m x nm x L 98.35 enter 0 in 0 storage)2)] + 0.0 (25 x N) to achieve Aug (43) 93.88 97m / 3600 112.86 boxes (46) 0 within sa	0013 x (+ 36 a water us Sep 97.87 97.87 0 kWh/mor 114.21 0 to (61) 0 0 ame vess	TFA -13. se target o Oct 101.87 Total = Su 133.1 Total = Su 0 sel	2. 9) Nov 105.86 m(44) ₁₁₂ = bbles 1b, 1 145.29 m(45) ₁₁₂ = 0	kWh/y 76 .87 Dec 109.85 c, 1d) 157.77 a 0	ear:]]] 1198.41 1571.31]]	(42) (43) (44) (44) (45) (46) (47)
4. Wa 4.	ed occu A > 13.9 A \pm 13.9 averag the annua that 125 Jan 109.85 content of 162.91 aneous w 0 storage e volum nunity h vise if no	pancy, I pancy, I p, N = 1 p, N = 1 e hot was litres per p Feb n litres per 105.86 hot water 142.48 rater heatin 0 loss: e (litres) eating a o stored loss:	N + 1.76 x ater usag hot water person per Mar day for ea 101.87 used - call 147.03 ng at point 0 includin nd no ta hot wate	Irement: [1 - exp ge in litre usage by a day (all w Apr ach month 97.87 culated mode 128.18 of use (not 0 ng any so ank in dw er (this in	(-0.0003 es per da 5% if the of vater use, I May Vd,m = fa 93.88 onthly = 4. 123 o hot water 0 olar or W velling, e ocludes i	A9 x (TF ay Vd,av Iwelling is hot and co Jun ctor from 7 89.88 190 x Vd,r 106.14 - storage), 0 /WHRS nter 110 nstantar	FA -13.9 erage = designed inId) Jul Table 1c x 89.88 m x nm x D 98.35 enter 0 in 0 storage 0 litres in neous co)2)] + 0.0 (25 x N) to achieve Aug (43) 93.88 07m / 3600 112.86 boxes (46) 0 within sa (47) ombi boile	0013 x (+ 36 a water us Sep 97.87 - 0 kWh/mor 114.21 - 0 to (61) 0 ame vess ers) ente	TFA -13. se target o Oct 101.87 Total = Su 0 0 sel or '0' in (2. 9) Nov 105.86 m(44)112 nbles 1b, 1 145.29 m(45)112 0	kWh/y 76 .87 Dec 109.85 = c, 1d) 157.77 = 0	ear:]]]] [1198.41] [1571.31]]]	(42) (43) (44) (44) (45) (46) (47)
4. Wa Assum if TF if TF Annual <i>Reduce</i> not more (44)m= (44)m= (44)m= (45)m= (45)m= (46)m= (46)m= Storage If comr Otherw Water s a) If m	ed occu A > 13.9 A \pm 13.9 average the annuation that 125 Jan aneous w 109.85 content of 162.91 aneous w 0 storage e volum nunity h vise if no storage anufact	pancy, I pancy, I p, N = 1 p, N = 1 e hot wa litres per l Feb n litres per 105.86 hot water 142.48 ater heatil 0 loss: e (litres) eating a p stored loss: urer's de	N + 1.76 x ater usag hot water person per Mar 101.87 used - cal 147.03 includin ng at point 0 includin nd no ta hot wate	[1 - exp ge in litre usage by a day (all w Apr ach month 97.87 culated mo 128.18 f of use (no 0 ng any so onk in dw er (this in oss facto	(-0.0003 es per da 5% if the o vater use, I May Vd,m = fa 93.88 onthly = 4. 123 o hot water 0 olar or W velling, e ocludes i	349 x (TF ay Vd,av <i>Iwelling is</i> <i>hot and co</i> Jun <i>ctor from T</i> 89.88 190 x Vd,r 106.14 - storage), 0 /WHRS nter 110 nstantar wn (kWł	FA -13.9 erage = designed inId) Jul Table 1c x 89.88 m x nm x E 98.35 enter 0 in 0 storage 0 litres in neous co)2)] + 0.0 (25 x N) to achieve Aug (43) 93.88 97 <i>m</i> / 3600 112.86 boxes (46) 0 within sa (47) ombi boile	0013 x (+ 36 a water us Sep 97.87 	TFA -13. se target o Oct 101.87 Total = Su nth (see Talling) 133.1 Total = Su 0 sel er '0' in (2. 9) Nov 105.86 m(44) ₁₁₂ = ables 1b, 1 145.29 m(45) ₁₁₂ = 0	kWh/y 76 .87 Dec 109.85 c, 1d) 157.77 c 0	ear:]]]]]]]]]]]]]]]]]]	(42) (43) (43) (44) (45) (46) (47) (48)
4. Wa Assum if TF if TF Annual <i>Reduce</i> not more (44)m= <i>Hot wate</i> (44)m= <i>Hot wate</i> (45)m= <i>If instant</i> (46)m= Water = Storage If comr Otherw Water = a) If m Tempe	ed occu A > 13.9 A \pm 13.9 A \pm 13.9 average the annual the ann	pancy, I pancy	N + 1.76 x ater usag hot water person per Mar day for ea 101.87 used - cal 147.03 ng at point 0 includin nd no ta hot wate eclared la m Table	[1 - exp ge in litre usage by a day (all w Apr ach month 97.87 culated mo 128.18 fof use (no 0 ng any so ank in dw er (this in oss facto 2b	(-0.0003 es per da 5% if the o vater use, <i>I</i> May Vd,m = fa 93.88 onthly = 4. 123 o hot water 0 olar or W velling, e ocludes i or is kno	349 x (TF ay Vd,av Iwelling is hot and co Jun ctor from 1 89.88 190 x Vd,r 106.14 r storage), 0 /WHRS nter 110 nstantar wn (kWh	FA -13.9 erage = designed i ld) Jul Table 1c x 89.88 m x nm x D 98.35 enter 0 in 0 storage 0 litres in neous co n/day):)2)] + 0.0 (25 x N) to achieve Aug (43) 93.88 97 <i>m</i> / 3600 112.86 boxes (46) 0 within sa (47) within sa	0013 x (+ 36 a water us Sep 97.87 	TFA -13. se target o Oct 101.87 Total = Su 133.1 Total = Su 0 sel o' in (2. 9) Nov 105.86 m(44) ₁₁₂ = bbles 1b, 1 145.29 m(45) ₁₁₂ = 0	kWh/y 76 .87 .87 .09.85 c, 1d) 157.77 0 0	ear:	(42) (43) (43) (44) (45) (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 Tabl on 4.3 e 2b	le 2 (kWl	n/litre/da	y)					0 0 0		(51) (52) (53)
Energy Enter	/ lost fro (50) or (om water (54) in (5	storage 55)	e, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54) (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)] ÷ (50	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	y circuit	loss (an	nual) fro	om Table	e 3					•		0		(58)
Primar (mod	y circuit	loss cal	culated from Tab	for each le H5 if t	month (here is s	59)m = (solar wat	58) ÷ 36 er heatir	5 × (41) ng and a	m 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	n month ((61)m =	(60) ÷ 36	65 × (41))m		I				
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	leat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	138.47	121.11	124.98	108.96	104.55	90.22	83.6	95.93	97.08	113.13	123.49	134.11		(62)
Solar DH	-W 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 C	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter						_	-				
(64)m=	138.47	121.11	124.98	108.96	104.55	90.22	83.6	95.93	97.08	113.13	123.49	134.11		_
								Outp	out from wa	ater heatei	r (annual)	12	1335.61	(64)
Heat g	ains fro	m water	heating,	, kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m]	
(65)m=	34.62	30.28	31.24	27.24	26.14	22.55	20.9	23.98	24.27	28.28	30.87	22.52		(65)
inclu	ide (57)	m in cald							24.27	20.20		33.53		
5. Int	ernal da		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	
Metab	ionnai ge	ains (see	culation (Table 5	of (65)m 5 and 5a	only if c):	ylinder is	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
	olic gair	ains (see as (Table	Table 5	of (65)m 5 and 5a tts	only if c):	ylinder is	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
	olic gain Jan	ains (see s (Table Feb	Table 5), Wat	of (65)m 5 and 5a tts Apr	only if c): May	ylinder is Jun	s in the c Jul	dwelling Aug	or hot w	ater is fr Oct	om com Nov	Dec	eating	
(66)m=	olic gain Jan 138.25	ains (see s (Table Feb 138.25	culation Table 5 5), Wat Mar 138.25	of (65)m 5 and 5a tts Apr 138.25	only if c): May 138.25	ylinder is Jun 138.25	Jul	dwelling Aug 138.25	Sep 138.25	Oct 138.25	om com Nov 138.25	Dec 138.25	eating	(66)
(66)m= Lightin	olic gain Jan 138.25 g gains	ains (see Is (Table Feb 138.25 (calcula	culation (Table 5 5), Wat Mar 138.25 ted in Ap	of (65)m 5 and 5a tts Apr 138.25 opendix	only if c): May 138.25 L, equati	Jun 138.25	Jul 138.25 L9a), a	Aug 138.25	Sep 138.25	Oct	om com Nov 138.25	Dec	eating	(66)
(66)m= Lightin (67)m=	olic gain Jan 138.25 g gains 23.27	ains (see Is (Table Feb 138.25 (calcula 20.66	Table 5 5), Wat Mar 138.25 ted in Ap 16.8	of (65)m 5 and 5a tts Apr 138.25 opendix 12.72	only if c): 138.25 L, equati 9.51	Jun 138.25 on L9 on 8.03	Jul 138.25 L9a), a 8.68	Aug 138.25 Iso see 11.28	Sep 138.25 Table 5 15.14	20:20 ater is fr Oct 138.25	om com Nov 138.25 22.43	33.53 munity h Dec 138.25 23.91	eating	(66)
(66)m= Lightin (67)m= Appliar	olic gain Jan 138.25 g gains 23.27 nces ga	ains (see Feb 138.25 (calcula 20.66 ins (calc	ted in Apulation of the second	of (65)m 5 and 5a tts Apr 138.25 opendix 12.72 n Append	only if c): 138.25 L, equati 9.51 dix L, eq	Jun 138.25 on L9 or 8.03 uation L	Jul 138.25 r L9a), a 8.68 13 or L13	Aug 138.25 Iso see 11.28 3a), also	Sep 138.25 Table 5 15.14 see Ta	20:20 ater is fr 0ct 138.25 19.22 ble 5	om com Nov 138.25 22.43	33.53 munity h Dec 138.25 23.91	eating	(66) (67)
(66)m= Lightin (67)m= Applian (68)m=	olic gain Jan 138.25 g gains 23.27 nces ga 260.96	ains (see Feb 138.25 (calcula 20.66 ins (calc 263.67	ted in Ap 16.8 ulated ir 256.85	of (65)m 5 and 5a 138.25 0pendix 12.72 1 Append 242.32	only if c): 138.25 L, equati 9.51 dix L, eq 223.98	ylinder is Jun 138.25 ion L9 or 8.03 uation L 206.75	Jul 138.25 L9a), a 8.68 13 or L13 195.23	Aug 138.25 Iso see 11.28 3a), alsc 192.52	Sep 138.25 Table 5 15.14 9 see Ta 199.35	20:20 ater is fr 0ct 138:25 19:22 ble 5 213:88	om com Nov 138.25 22.43 232.21	33.53 munity h Dec 138.25 23.91 249.45	eating	(66) (67) (68)
(66)m= Lightin (67)m= Applian (68)m= Cookir	olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains	ains (see Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula	ted in Ap 25. Wat Mar 138.25 ted in Ap 16.8 ulated ir 256.85	of (65)m 5 and 5a tts Apr 138.25 opendix 12.72 n Append 242.32 ppendix	only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat	ylinder is Jun 138.25 on L9 of 8.03 uation L 206.75 ion L15	Jul 138.25 L9a), a 8.68 13 or L1: 195.23 or L15a)	Aug 138.25 Iso see 11.28 3a), also 192.52	Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table	20:20 ater is fr 138.25 19.22 ble 5 213.88 5	om com Nov 138.25 22.43 232.21	33.53 munity h Dec 138.25 23.91 249.45	eating	(66) (67) (68)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m=	olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82	ains (see Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82	ted in Apr 256.85 ted in Apr 256.85 ted in Apr 256.85 ted in Apr 256.85	of (65)m 5 and 5a 4 Apr 138.25 5 opendix 12.72 6 Appendix 242.32 5 ppendix 36.82	only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82	ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82	Jul 138.25 138.25 13 or L13 195.23 or L15a) 36.82	Aug 138.25 Iso see 11.28 3a), also 192.52 , also se 36.82	Sep 138.25 Table 5 15.14 9 see Ta 199.35 9 Table 36.82	20:20 ater is fr 0ct 138.25 19.22 ble 5 213.88 5 36.82	om com Nov 138.25 22.43 232.21 36.82	33.53 munity h Dec 138.25 23.91 249.45 36.82	eating	(66) (67) (68) (69)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps	olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai	ains (see Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains	ted in Ap (Table 5), Wat Mar 138.25 ted in Ap 16.8 ulated ir 256.85 ted in A 36.82 (Table 5	of (65)m 5 and 5a 138.25 0pendix 12.72	only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82	ylinder is Jun 138.25 on L9 or 8.03 uation L 206.75 ion L15 36.82	Jul 138.25 L9a), a 8.68 13 or L13 195.23 or L15a) 36.82	Aug 138.25 Iso see ⁻ 11.28 3a), also 192.52 , also se 36.82	Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82	20:20 ater is fr 0ct 138:25 19:22 ble 5 213:88 5 36:82	om com Nov 138.25 22.43 232.21 36.82	33.53 munity h Dec 138.25 23.91 249.45 36.82	eating	(66) (67) (68) (69)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m=	olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fan 0	ains (see Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 0	Culation (Table 5), Wat Mar 138.25 ted in Ap 16.8 ulated in 256.85 ted in A 36.82 (Table 5 0	of (65)m 5 and 5a 138.25 0pendix 12.72 0 Appendix 242.32 0 ppendix 36.82 5a) 0	only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82 0	ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82 0	Jul 138.25 - L9a), a 8.68 13 or L1: 195.23 or L15a) 36.82 0	Aug 138.25 Iso see 11.28 3a), also 192.52 , also se 36.82	24:21 or hot w Sep 138.25 Table 5 15.14 0 see Ta 199.35 ee Table 36.82 0	20:20 ater is fr 138.25 19.22 ble 5 213.88 5 36.82 0	om com Nov 138.25 22.43 232.21 36.82 0	33.53 munity h Dec 138.25 23.91 249.45 36.82 0	eating	(66) (67) (68) (69) (70)
(66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses	olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai 0 s e.g. ev	ains (see Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 0 vaporatio	ted in Ap (Table 5), Wat Mar 138.25 ted in Ap 16.8 ulated ir 256.85 ted in A 36.82 (Table 5 0 0	of (65)m 5 and 5a 138.25 5 and 5a 138.25 5 apendix 12.72 12.72 12.72 12.72 12.72 12.72 12.72 136.82 5a) 0 tive valu	only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82 0 es) (Tab	ylinder is Jun 138.25 on L9 or 8.03 uation L 206.75 ion L15 36.82 0 le 5)	Jul 138.25 r L9a), a 8.68 13 or L13 195.23 or L15a) 36.82 0	Aug 138.25 Iso see 11.28 3a), also 192.52 , also se 36.82 0	24:21 or hot w Sep 138.25 Table 5 15.14 9 see Ta 199.35 9 Table 36.82 0	20:20 ater is fr 0ct 138.25 19.22 ble 5 213.88 5 36.82 0	om com Nov 138.25 22.43 232.21 36.82 0	33.53 munity h Dec 138.25 23.91 249.45 36.82 0	eating	(66) (67) (68) (69) (70)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fai 0 s e.g. ev -110.6	ains (see Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 0 vaporatio -110.6	Culation of Control Co	of (65)m 5 and 5a 138.25 0pendix 12.72 12.	only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82 0 es) (Tab -110.6	ylinder is Jun 138.25 on L9 or 8.03 uation L 206.75 ion L15 36.82 0 le 5) -110.6	s in the c Jul 138.25 L9a), a 8.68 13 or L13 195.23 or L15a) 36.82 0	Aug 138.25 Iso see 11.28 3a), also 192.52 , also se 36.82 0	24:21 or hot w Sep 138.25 Table 5 15.14 0 see Ta 199.35 ee Table 36.82 0 -110.6	20.20 ater is fr 0 138.25 19.22 ble 5 213.88 5 36.82 0 -110.6	om com Nov 138.25 22.43 232.21 36.82 0 -110.6	33.53 munity h Dec 138.25 23.91 249.45 36.82 0	eating	(66) (67) (68) (69) (70) (71)
(66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	olic gain Jan 138.25 g gains 23.27 nces ga 260.96 ng gains 36.82 s and fan 0 s e.g. ev -110.6 heating	ains (see Feb 138.25 (calcula 20.66 ins (calc 263.67 (calcula 36.82 ns gains 0 raporatio -110.6 gains (T	Culation (Table 5), Wat Mar 138.25 ted in Ap 16.8 ulated in 256.85 ted in A 36.82 (Table 5)	of (65)m 5 and 5a 5 and 5a 4 Apr 138.25 5 ppendix 12.72 12	only if c): 138.25 L, equati 9.51 dix L, eq 223.98 L, equat 36.82 0 es) (Tab	ylinder is Jun 138.25 ion L9 of 8.03 uation L 206.75 ion L15 36.82 0 le 5) -110.6	Jul 138.25 - L9a), a 8.68 13 or L1: 195.23 or L15a) 36.82 0 -110.6	Aug 138.25 Iso see 11.28 3a), also 192.52 , also se 36.82 0 -110.6	24:21 or hot w Sep 138.25 Table 5 15.14 9 see Ta 199.35 ee Table 36.82 0 -110.6	20:20 ater is fr 0ct 138:25 19:22 ble 5 213:88 5 36:82 0 -110.6	om com Nov 138.25 22.43 232.21 36.82 0 -110.6	33.53 munity h Dec 138.25 23.91 249.45 36.82 0 -110.6	eating	(66) (67) (68) (69) (70) (71)



Total internal	gains =					(66)	m + (67)m	n + (68	3)m + ((69)m + (7	70)m +	(71)m + (72)	m		
(73)m= 395.23	393.87	380.12	357.35	333.1	3	10.57	296.47	300	.51	312.66	335.58	3 362	382.9		(73)
6. Solar gains	3:														
Solar gains are c	alculated u	using sola	r flux from	Table 6a	and	assoc	iated equa	tions	to conv	vert to the	e applic	able orientati	on.		
Orientation: A T	Access F able 6d	actor	Area m²			Flu Tal	x ole 6a		ې Ta	g_ ble 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.8	37	x	1	1.28	x		0.4	x	0.7	=	4.09	(75)
Northeast 0.9x	0.77	x	1.	2	x	1	1.28	x		0.4	×	0.7	=	2.63	(75)
Northeast 0.9x	0.77	x	1.8	37	x	2	2.97	x		0.4	x	0.7	=	8.33	(75)
Northeast 0.9x	0.77	x	1.	2	x	2	2.97	×		0.4	x	0.7	=	5.35	(75)
Northeast 0.9x	0.77	x	1.8	37	x	4	1.38	x		0.4	×	0.7	=	15.01	(75)
Northeast 0.9x	0.77	x	1.	2	x	4	1.38	x		0.4	×	0.7	=	9.63	(75)
Northeast 0.9x	0.77	x	1.8	37	x	6	57.96	x		0.4	x	0.7	=	24.66	(75)
Northeast 0.9x	0.77	x	1.	2	x	6	57.96	x		0.4	x	0.7	=	15.82	(75)
Northeast 0.9x	0.77	x	1.8	37	x	9	1.35	x		0.4	x	0.7	=	33.15	(75)
Northeast 0.9x	0.77	x	1.	2	x	9	1.35	x		0.4	x	0.7	=	21.27	(75)
Northeast 0.9x	0.77	x	1.8	37	x	9	7.38	x		0.4	×	0.7	=	35.34	(75)
Northeast 0.9x	0.77	x	1.	2	x	9	7.38	x		0.4	x	0.7	=	22.68	(75)
Northeast 0.9x	0.77	x	1.8	37	x	ę	91.1	x		0.4	x	0.7	=	33.06	(75)
Northeast 0.9x	0.77	x	1.	2	x	ę	91.1	x		0.4	×	0.7	=	21.21	(75)
Northeast 0.9x	0.77	x	1.8	37	x	7	2.63	x		0.4	×	0.7	=	26.35	(75)
Northeast 0.9x	0.77	x	1.	2	x	7	2.63	x		0.4	×	0.7	=	16.91	(75)
Northeast 0.9x	0.77	x	1.8	37	x	5	0.42	x		0.4	x	0.7	=	18.3	(75)
Northeast 0.9x	0.77	x	1.	2	x	5	60.42	x		0.4	×	0.7	=	11.74	(75)
Northeast 0.9x	0.77	x	1.8	37	x	2	8.07	×		0.4	×	0.7	=	10.18	(75)
Northeast 0.9x	0.77	x	1.	2	x	2	8.07	x		0.4	×	0.7	=	6.54	(75)
Northeast 0.9x	0.77	x	1.8	37	x		14.2	x		0.4	×	0.7	=	5.15	(75)
Northeast 0.9x	0.77	x	1.	2	x		14.2	x		0.4	×	0.7	=	3.31	(75)
Northeast 0.9x	0.77	x	1.8	37	x	ģ	9.21	x		0.4	×	0.7	=	3.34	(75)
Northeast 0.9x	0.77	x	1.	2	x	ģ	9.21	x		0.4	×	0.7	=	2.15	(75)
Southeast 0.9x	0.77	x	1.9	98	x	3	6.79	x		0.4	×	0.7	=	14.14	(77)
Southeast 0.9x	0.77	x	1.9	98	x	3	6.79	x		0.4	×	0.7	=	14.14	(77)
Southeast 0.9x	0.77	x	1.9	98	x	3	6.79	x		0.4	×	0.7	=	14.14	(77)
Southeast 0.9x	0.77	x	1.9	98	x	3	6.79	x		0.4	×	0.7	=	14.14	(77)
Southeast 0.9x	0.77	x	3.2	26	x	3	6.79	x		0.4	×	0.7	=	23.27	(77)
Southeast 0.9x	0.77	x	3.2	26	x	3	6.79	×		0.4	x	0.7	=	23.27	(77)
Southeast 0.9x	0.77	x	3.2	26	x	3	6.79	×		0.4	x	0.7	=	23.27	(77)
Southeast 0.9x	0.77	x	1.9	98	x	6	2.67	x		0.4	x	0.7	=	24.08	(77)
Southeast 0.9x	0.77	x	1.9	98	x	6	2.67	x		0.4	x	0.7	=	24.08	(77)
Southeast 0.9x	0.77	x	1.9	8	x	6	2.67	x		0.4	x	0.7	=	24.08	(77)



Southeast 0.9x Southeast 0.9x Southeast 0.9x Southeast 0.9x Southeast 0.9x Southeast 0.9x	0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.77) x) x) x) x) x x) x	1.98 3.26 3.26 3.26 1.98	x x x x	62.67 62.67 62.67	x x x	0.4	x x	0.7] =	24.08 39.65	(77) (77)
Southeast 0.9x Southeast 0.9x Southeast 0.9x Southeast 0.9x Southeast 0.9x	0.77 0.77 0.77 0.77 0.77 0.77 0.77 0.77] x] x] x] x] x	3.26 3.26 3.26 1.98	x x x	62.67 62.67	x x	0.4	x	0.7] =	39.65	(77)
Southeast 0.9x Southeast 0.9x Southeast 0.9x Southeast 0.9x	0.77 0.77 0.77 0.77 0.77 0.77 0.77] ×] ×] ×] ×	3.26 3.26 1.98	x x	62.67	x	0.4			-		
Southeast _{0.9x} Southeast _{0.9x} Southeast _{0.9x}	0.77 0.77 0.77 0.77 0.77	x x x	3.26 1.98	x			0.4	Х	0.7	=	39.65	(77)
Southeast 0.9x Southeast 0.9x	0.77 0.77 0.77 0.77] x] x	1.98		62.67	x	0.4	x	0.7] =	39.65	(77)
Southeast 0.9x	0.77 0.77 0.77	x		×	85.75	x	0.4	x	0.7] =	32.95	(77)
	0.77		1.98	x	85.75	x	0.4	x	0.7] =	32.95	(77)
Southeast 0.9x	0.77	x	1.98	x	85.75	x	0.4	x	0.7	=	32.95	(77)
Southeast 0.9x		x	1.98	x	85.75	x	0.4	x	0.7	=	32.95	(77)
Southeast 0.9x	0.77	x	3.26	×	85.75	x	0.4	x	0.7] =	54.24	(77)
Southeast 0.9x	0.77	x	3.26	×	85.75	x	0.4	x	0.7] =	54.24	(77)
Southeast 0.9x	0.77	x	3.26	×	85.75	x	0.4	x	0.7] =	54.24	(77)
Southeast 0.9x	0.77	x	1.98	×	106.25	x	0.4	x	0.7] =	40.82	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7	=	40.82	(77)
Southeast 0.9x	0.77	x	1.98	x	106.25	x	0.4	x	0.7] =	40.82	(77)
Southeast 0.9x	0.77	x	1.98	×	106.25	x	0.4	x	0.7] =	40.82	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	3.26	x	106.25	x	0.4	x	0.7	=	67.21	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7] =	45.72	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	1.98	x	119.01	x	0.4	x	0.7	=	45.72	(77)
Southeast 0.9x	0.77	x	3.26	×	119.01	x	0.4	x	0.7] =	75.28	(77)
Southeast 0.9x	0.77	x	3.26	×	119.01	x	0.4	x	0.7] =	75.28	(77)
Southeast 0.9x	0.77	x	3.26	×	119.01	x	0.4	x	0.7] =	75.28	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	1.98	×	118.15	x	0.4	x	0.7] =	45.39	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7] =	45.39	(77)
Southeast 0.9x	0.77	x	1.98	x	118.15	x	0.4	x	0.7	=	45.39	(77)
Southeast 0.9x	0.77	x	3.26	×	118.15	x	0.4	x	0.7] =	74.74	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7] =	74.74	(77)
Southeast 0.9x	0.77	x	3.26	x	118.15	x	0.4	x	0.7] =	74.74	(77)
Southeast 0.9x	0.77	x	1.98	×	113.91	x	0.4	x	0.7] =	43.76	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	x	0.4	x	0.7	=	43.76	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	x	0.4	x	0.7] =	43.76	(77)
Southeast 0.9x	0.77	x	1.98	x	113.91	x	0.4	x	0.7	=	43.76	(77)
Southeast 0.9x	0.77	x	3.26	×	113.91	x	0.4	x	0.7	=	72.06	(77)
Southeast 0.9x	0.77	x	3.26	x	113.91	x	0.4	x	0.7	=	72.06	(77)
Southeast 0.9x	0.77	x	3.26	×	113.91	x	0.4	x	0.7	=	72.06	(77)
Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7	=	40.11	(77)
Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7	=	40.11	(77)



Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7	=	40.11	(77)
Southeast 0.9x	0.77	x	1.98	x	104.39	x	0.4	x	0.7	1 =	40.11	(77)
Southeast 0.9x	0.77	x	3.26	x	104.39	×	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	x	3.26	x	104.39	x	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	×	3.26	x	104.39	x	0.4	x	0.7] =	66.03	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7] =	35.67	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7	=	35.67	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7	=	35.67	(77)
Southeast 0.9x	0.77	x	1.98	x	92.85	x	0.4	x	0.7	=	35.67	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7] =	58.74	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	3.26	x	92.85	x	0.4	x	0.7	=	58.74	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7] =	26.61	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	1.98	x	69.27	x	0.4	x	0.7	=	26.61	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7] =	43.82	(77)
Southeast 0.9x	0.77	x	3.26	x	69.27	x	0.4	x	0.7	=	43.82	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7] =	16.93	(77)
Southeast 0.9x	0.77	x	1.98	x	44.07	x	0.4	x	0.7	=	16.93	(77)
Southeast 0.9x	0.77	x	3.26	x	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	3.26	x	44.07	x	0.4	x	0.7	=	27.88	(77)
Southeast 0.9x	0.77	x	3.26	x	44.07	x	0.4	x	0.7] =	27.88	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7] =	12.1	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7] =	12.1	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7	=	12.1	(77)
Southeast 0.9x	0.77	x	1.98	x	31.49	x	0.4	x	0.7] =	12.1	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7	=	19.92	(77)
Southeast 0.9x	0.77	x	3.26	x	31.49	x	0.4	x	0.7] =	19.92	(77)
Southwest _{0.9x}	0.77	x	1.98	x	36.79]	0.4	x	0.7] =	14.14	(79)
Southwest _{0.9x}	0.77	x	1.98	x	36.79		0.4	x	0.7	=	14.14	(79)
Southwest _{0.9x}	0.77	x	1.98	x	36.79]	0.4	x	0.7] =	14.14	(79)
Southwest _{0.9x}	0.77	x	1.98	x	62.67]	0.4	x	0.7	=	24.08	(79)
Southwest _{0.9x}	0.77	x	1.98	x	62.67]	0.4	x	0.7] =	24.08	(79)
Southwest0.9x	0.77	x	1.98	x	62.67]	0.4	x	0.7] =	24.08	(79)
Southwest _{0.9x}	0.77	x	1.98	x	85.75]	0.4	x	0.7	=	32.95	(79)
Southwest _{0.9x}	0.77	x	1.98	×	85.75]	0.4	×	0.7] =	32.95	(79)
-												



Southwest0.9x 0.77 x 1.98 x 106.25 0.4 x 0.7 Southwest0.9x 0.77 x 1.98 x 106.25 0.4 x 0.7 Southwest0.9x 0.77 x 1.98 x 106.25 0.4 x 0.7 Southwest0.9x 0.77 x 1.98 x 106.25 0.4 x 0.7 Southwest0.9x 0.77 x 1.98 x 106.25 0.4 x 0.7 Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 Southwest0.9x 0.77 x 1.98 x 118.15 0.4 x 0.7	40.82 (79) 40.82 (79)									
Southwest0.9x 0.77 x 1.98 x 106.25 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 106.25 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 106.25 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 118.15 0.4 x 0.7 x	40.82 (79)									
Southwest0.9x 0.77 x 1.98 x 106.25 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 118.15 0.4 x 0.7 x	40.82 (70)									
Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 118.15 0.4 x 0.7 x	40.02 (73)									
Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 118.15 0.4 x 0.7 x	45.72 (79)									
Southwest0.9x 0.77 x 1.98 x 119.01 0.4 x 0.7 x Southwest0.9x 0.77 x 1.98 x 118.15 0.4 x 0.7 x	45.72 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 118.15 0.4 x 0.7	45.72 (79)									
	45.39 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 118.15 0.4 x 0.7	45.39 (79)									
Southwest0.9x 0.77 x 1.98 x 118.15 0.4 x 0.7	45.39 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 113.91 0.4 x 0.7	43.76 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 113.91 0.4 x 0.7	43.76 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 113.91 0.4 x 0.7	: 43.76 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 104.39 0.4 x 0.7	40.11 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 104.39 0.4 x 0.7	40.11 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 104.39 0.4 x 0.7	: 40.11 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 92.85 0.4 x 0.7	: 35.67 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 92.85 0.4 x 0.7	: 35.67 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 92.85 0.4 x 0.7	: 35.67 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 69.27 0.4 x 0.7	: 26.61 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 69.27 0.4 x 0.7	26.61 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 69.27 0.4 x 0.7	: 26.61 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 44.07 0.4 x 0.7	: 16.93 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 44.07 0.4 x 0.7	: 16.93 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 44.07 0.4 x 0.7	: 16.93 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 31.49 0.4 x 0.7	: 12.1 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 31.49 0.4 x 0.7	: 12.1 (79)									
Southwest _{0.9x} 0.77 x 1.98 x 31.49 0.4 x 0.7	: 12.1 (79)									
Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m										
(83)m- 1755 30117 418 01 527 87 600 33 500 08 576 78 522 14 455 06 224 46 240 64 440 0	(83)									
	-									
Total gains – internal and solar $(84)m = (73)m + (83)m$, watts	<u>?</u> (84)									
Total gains – internal and solar (84)m = $(73)m + (83)m$, watts (84)m= 570.73 695.04 798.13 885.22 933.43 910.55 873.26 822.62 768.62 670.04 572.71 455.96	7 Mean internal temperature (heating season)									
Total gains – internal and solar $(84)m = (73)m + (83)m$, watts $(84)m = 570.73$ 695.04 798.13 885.22 933.43 910.55 873.26 822.62 768.62 670.04 572.61 532.8 7. Mean internal temperature (heating season)										
Total gains – internal and solar $(84)m = (73)m + (83)m$, watts $(84)m = 570.73$ 695.04 798.13 885.22 933.43 910.55 873.26 822.62 768.62 670.04 572.61 532.8 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)	21 (85)									
Total gains – internal and solar $(84)m = (73)m + (83)m$, watts $(84)m = 570.73$ 695.04 798.13 885.22 933.43 910.55 873.26 822.62 768.62 670.04 572.61 532.8 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)	21 (85)									
Total gains – internal and solar $(84)m = (73)m + (83)m$, watts (84)m = 570.73 695.04 798.13 885.22 933.43 910.55 873.26 822.62 768.62 670.04 572.61 532.8 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	21 (85)									
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 570.73 695.04 798.13 885.22 933.43 910.55 873.26 822.62 768.62 670.04 572.61 532.8 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) (86)m= 1 1 0.99 0.98 0.93 0.84 0.7 0.74 0.91 0.98 1 1	21 (85) : 									
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 570.73 695.04 798.13 885.22 933.43 910.55 873.26 822.62 768.62 670.04 572.61 532.8 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) [86)m= 1 1 0.99 0.98 0.93 0.84 0.7 0.74 0.91 0.98 1 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) 1 1 1 1 1	21 (85)									
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 570.73 695.04 798.13 885.22 933.43 910.55 873.26 822.62 768.62 670.04 572.61 532.8 7. Mean internal temperature (heating season) Total gains for living area, h1,m (see Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Mar Apr May Jun Jul Aug Sep Oct Nov Deatest (86)m= 1 1 0.99 0.98 0.93 0.84 0.7 0.74 0.91 0.98 1 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.23 19.42 19.72 20.11 20.5 20.8 20.93 20.91 20.67 20.17 19.62 19.19	21 (85) (86) (87)									
Total gains – internal and solar $(84)m = (73)m + (83)m$, watts Total gains – internal and solar $(84)m = (73)m + (83)m$, watts (84)m= $(570.73 \ 695.04 \ 798.13 \ 885.22 \ 933.43 \ 910.55 \ 873.26 \ 822.62 \ 768.62 \ 670.04 \ 572.61 \ 532.8 \ 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) Mar Apr May Jun Jul Aug Sep Oct Nov Dee (86)m= 1 1 0.99 0.98 0.93 0.84 0.7 0.74 0.91 0.98 1 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.23 19.42 19.72 20.11 20.5 20.8 20.93 20.91 20.67 20.17 19.62 19.15 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) $	21 (85) (86) (87)									



Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.99	0.96	0.9	0.74	0.53	0.58	0.85	0.97	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.07	18.25	18.55	18.95	19.31	19.57	19.65	19.65	19.48	19.01	18.46	18.03		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.33	(91)
Moon	intorna	l tompor	aturo (fo	or the wh	olo dwol	lling) – fl	$\Lambda \sim T1$	⊥ (1 _ fl	۸) v T2			I		_
(92)m=	18.45	18.64	18.94	19.33	19.71	19.98	20.08	20.07	19.88	19.39	18.84	18.42		(92)
Apply	adiustr	nent to t	he mear	internal	temper	ature fro	m Table	4e whe	re appro	nriate				
(93)m=	18.45	18.64	18.94	19.33	19.71	19.98	20.08	20.07	19.88	19.39	18.84	18.42		(93)
8. Spa	ace hea	tina real	Jirement		-									. ,
Set Ti the ut	Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate													
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1 <u>, , , , , , , , , , , , , , , , , , , </u>										
(94)m=	1	0.99	0.98	0.96	0.9	0.77	0.59	0.64	0.86	0.97	0.99	1		(94)
Usefu	l gains,	hmGm	, W = (9	4)m x (84	4)m									
(95)m=	568.96	690.15	785.3	849.77	840.57	700.44	511.23	525.33	662.17	650.9	569.08	531.57		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8							I	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an interr	hal tempe	erature,	Lm , W =	=[(39)m :	x [(93)m·	– (96)m					
(97)m=	2245.58	2177.68	1969.61	1643.03	1259.51	842.22	544.74	573.5	906.32	1383.1	1851.47	2245.92		(97)
Space	e heatin	g require	ement fo	or each n	nonth, k\	Nh/mont	h = 0.02	4 x [(97))m – (95)m] x (4 ⁻	1)m			
								- , ,				-		
(98)m=	1247.41	999.62	881.13	571.15	311.7	0	0	0	0	544.76	923.32	1275.48		
(98)m=	1247.41	999.62	881.13	571.15	311.7	0	0	0 Tota	0 I per year	544.76 (kWh/year	923.32 r) = Sum(9	1275.48 8) _{15,912} =	6754.55	(98)
(98)m=	1247.41 e heatin	999.62 g require	881.13 ement in	571.15 kWh/m ²	311.7 2/year	0	0	0 Tota	0 I per year	544.76 (kWh/year	923.32 r) = Sum(9	1275.48 8) _{15,912} =	6754.55	(98) (99)
(98)m= Space 8c. Sp	1247.41 e heatin	999.62 g require oling rec	881.13 ement in guiremer	571.15 kWh/m²	311.7 ?/year	0	0	0 Tota	0 I per year	544.76 (kWh/year	923.32 r) = Sum(9	1275.48 8) _{15,912} =	6754.55 65.63	(98) (99)
(98)m= Space 8c. Sp Calcu	1247.41 e heatin pace co lated fo	999.62 g require oling rec r June, s	881.13 ement in juiremer July and	571.15 kWh/m² nt August.	311.7 ^{2/} year See Tal	0 Die 10b	0	0 Tota	0 I per year	544.76 (kWh/year	923.32 [•]) = Sum(9	1275.48 8) _{15,912} =	6754.55 65.63	(98) (99)
(98)m= Space 8c. Sp Calcu	1247.41 e heatin pace cou lated fo Jan	999.62 g require oling rec r June, c Feb	881.13 ement in juiremer July and Mar	571.15 kWh/m² nt August. Apr	311.7 ² /year See Tal May	0 ole 10b Jun	0 Jul	0 Tota Aug	0 I per year Sep	544.76 (kWh/year Oct	923.32 ;) = Sum(9 Nov	1275.48 (8)15.912 =	6754.55 65.63	(98) (99)
(98)m= Space 8c. Sp Calcu Heat	1247.41 e heatin Dace co lated fo Jan oss rate	999.62 g require oling rec r June, C Feb e Lm (ca	881.13 ement in juiremer July and Mar Ilculated	571.15 kWh/m ² nt August. Apr using 25	311.7 2/year See Tal May 5°C inter	0 ole 10b Jun nal temp	0 Jul perature	0 Tota Aug and exte	0 I per year Sep ernal ten	544.76 (kWh/year Oct	923.32 r) = Sum(9 Nov e from T	1275.48 8) _{15,912} = Dec Table 10)	6754.55	(98) (99)
(98)m= Space 8c. Sp Calcu Heat (100)m=	1247.41 e heatin bace co lated fo Jan oss rate 0	999.62 g require oling rec r June, c Feb e Lm (ca 0	881.13 ement in juiremer July and Mar Iculated 0	571.15 kWh/m ² ht August. Apr using 25	311.7 2/year See Tab May 5°C inter 0	0 ole 10b Jun nal temp 1472.07	0 Jul perature 1158.86	0 Tota Aug and exte 1189.16	0 I per year Sep ernal ten 0	544.76 (kWh/year Oct nperatur 0	923.32) = Sum(9 Nov e from T 0	1275.48 1275.48 15.912 = Dec Table 10) 0	6754.55	(98) (99) (100)
(98)m= Space 8c. Sp Calcu Heat 1 (100)m= Utilisa	1247.41 e heatin pace coo lated fo Jan oss rate 0 ation fac	999.62 g require oling rec r June, c Feb e Lm (ca 0 ctor for lo	881.13 ement in juiremer July and Mar Iculated 0 oss hm	571.15 kWh/m² August. Apr using 25 0	311.7 2/year See Tal May 5°C inter 0	0 ole 10b Jun mal temp 1472.07	0 Jul perature 1158.86	0 Tota Aug and exte	0 I per year Sep ernal tem 0	544.76 (kWh/year Oct nperatur 0	923.32 r) = Sum(9 Nov e from T 0	1275.48 8)15912 = Dec able 10) 0	6754.55	(98) (99) (100)
(98)m= Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m=	1247.41 e heatin Dace co lated fo Jan oss rate 0 ation fac	999.62 g require r June, Feb E Lm (ca 0 tor for lo	881.13 ement in July and Mar Iculated 0 oss hm 0	571.15 kWh/m ² ht August. Apr using 25 0	311.7 2/year See Tal May 5°C inter 0	0 ole 10b Jun nal temp 1472.07 0.7	0 Jul perature 1158.86 0.79	0 Tota Aug and exte 1189.16	0 I per year Sep ernal ten 0	544.76 (kWh/year Oct nperatur 0	923.32) = Sum(9 Nov e from T 0 0	1275.48 1275.48 10,0,0,12 = Dec Table 10) 0 0	6754.55	(98) (99) (100) (101)
(98)m= Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu	1247.41 e heatin bace cool lated fo Jan oss rate 0 ation fac 0 I loss, h	999.62 g require oling rec r June, C Feb e Lm (ca 0 etor for lc 0 mLm (V	881.13 ement in juiremen July and Mar Iculated 0 oss hm 0 Vatts) =	571.15 kWh/m ² August. Apr using 25 0 0 (100)m x	311.7 2/year See Tab May 5°C inter 0 0 (101)m	0 ole 10b Jun nal temp 1472.07 0.7	0 Jul perature 1158.86 0.79	0 Tota Aug and exte 1189.16 0.76	0 I per year Sep ernal ten 0	544.76 (kWh/year Oct nperatur 0	923.32) = Sum(9 Nov e from T 0 0	1275.48 8)15912 = Dec Table 10) 0	6754.55	(98) (99) (100) (101)
(98)m= Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m=	1247.41 e heatin Dace coulated fo Jan oss rate 0 ation fac 0 I loss, h 0	999.62 g require r June, C Feb e Lm (ca 0 etor for lo 0 mLm (V 0	881.13 ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0	571.15 kWh/m ² August. Apr using 25 0 (100)m x 0	311.7 /year See Tal May 5°C inter 0 (101)m 0	0 ole 10b Jun nal temp 1472.07 0.7 1032.21	0 Jul perature 1158.86 0.79 915.06	0 Tota Aug and exte 1189.16 0.76	0 I per year Sep ernal ten 0 0	544.76 (kWh/year Oct nperatur 0 0	923.32 •) = Sum(9	1275.48 1275.48 15.912 = Dec Table 10) 0 0	6754.55 65.63	(98) (99) (100) (101) (102)
(98)m= Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains	1247.41 e heatin bace cool lated fo Jan oss rate 0 ation fac 0 I loss, h 0 s (solar s	999.62 g require oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca	881.13 ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated	571.15 kWh/m ² August. Apr using 25 0 (100)m x 0 for appli	311.7 ² /year See Tab May 5°C inter 0 (101)m 0 cable we	0 ole 10b Jun nal temp 1472.07 0.7 1032.21 eather re	0 Jul Derature 1158.86 0.79 915.06 egion, se	0 Tota Aug and exte 1189.16 0.76 899.51 e Table	0 I per year Sep ernal ten 0 0 10)	544.76 (kWh/year Oct nperatur 0 0	923.32) = Sum(9 Nov e from T 0 0	1275.48 8)15912 = Dec Table 10) 0 0	6754.55	(98) (99) (100) (101) (102)
(98)m= Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	1247.41 e heatin bace coulated fo Jan oss rate 0 ation fac 0 I loss, h 0 s (solar g 0	999.62 g require r June, C Feb e Lm (ca 0 etor for lo 0 mLm (V 0 gains ca 0	881.13 ement in juirement July and	571.15 kWh/m ² August. Apr using 25 0 (100)m x 0 for appli 0	311.7 2/year See Tal May 5°C inter 0 (101)m 0 cable we 0	0 ole 10b Jun nal temp 1472.07 0.7 1032.21 eather re 1170.9	0 Jul perature 1158.86 0.79 915.06 egion, se 1124.99	0 Tota Aug and exte 1189.16 0.76 899.51 e Table 1067.69	0 I per year Sep ernal ten 0 0 10) 0	544.76 (kWh/year Oct nperatur 0 0 0 0	923.32 •) = Sum(9	1275.48 1275.48 15.912 = Dec Table 10) 0 0 0 0	6754.55 65.63	(98) (99) (100) (101) (102) (103)
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(98)m= Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	1247.41 e heatin bace co lated fo Jan oss rate 0 ation fac 0 l loss, h 0 s (solar s 0 c (solar s 0 d) m to 0	999.62 g require r June, c Feb e Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require 2 zero if (881.13 ement in juirement July and July and July and July and July and July and July and July and July and July and July and Nar Iculated 0 Iculated 0 Iculated 0 ement for 104)m 0	571.15 kWh/m ² August. Apr using 25 0 (100)m x 0 for appli 0 for appli 0 or month, < 3 × (98	311.7 2/year See Tat May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c m 0	0 ole 10b Jun nal temp 1472.07 0.7 1032.21 eather re 1170.9 <i>dwelling</i> , 99.85	0 Jul perature 1158.86 0.79 915.06 egion, se 1124.99 continuo	0 Tota Aug and exte 1189.16 0.76 899.51 e Table 1067.69 Dus (kW	0 I per year Pernal tem 0 0 10) 0 (h) = 0.00 0	544.76 (kWh/year 0 0 0 24 x [(10 0	923.32 r) = Sum(9)	1275.48 (8)15912 = Dec able 10) 0 0 102)m] : 0	6754.55 65.63 x (41)m	(98) (99) (100) (101) (102) (103)
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Space of	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n				_			
(107)m=	0	0	0	0	0	24.96	39.05	31.28	0	0	0	0)		
	Total = Sum(107) = (107)											95.29	(107)		
Space cooling requirement in kWh/m²/year							(107) ÷ (4) =					0.93	(108)		
8f. Fabi	ic Ener	gy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)					
Fabric	Energy	/ Efficier	псу						(99) ·	+ (108) =	=		[66.55	(109)



APPENDIX G. CLASS E UNIT (BRUKL OUTPUT DOCUMENTS)

APPENDIX P21-088/Issue 03/17 August 2021

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

238 Kilburn High Road (Be Lean)

As designed

Date: Thu Jul 22 17:19:13 2021

Administrative information

Building Details

Address: 238 Kilburn High Road, London, NW6 2BS

Certification tool

Calculation engine: Apache Calculation engine version: 7.0.13 Interface to calculation engine: IES Virtual Environment Interface to calculation engine version: 7.0.13 BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name Telephone number: Phone Address: Street Address, City, Postcode

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	38.4				
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	38.4				
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	35.9				
Are emissions from the building less than or equal to the target?	BER =< TER				
Are as built details the same as used in the BER calculations?	Separate submission				

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

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

Building fabric

Element	Ua-Limit	Ua-Calc	Ui-Calc	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	GF000000:Surf[2]
Floor	0.25	0.15	0.15	GF000000:Surf[0]
Roof	0.25	-		UNKNOWN
Windows***, roof windows, and rooflights	2.2	-		No windows or rooflights in building
Personnel doors	2.2	-		No Personnel doors in building
Vehicle access & similar large doors	1.5	-		No Vehicle access doors in building
High usage entrance doors	3.5		-	No High usage entrance doors in building
Used imit = Limiting area-weighted average U-values [M	//(m ² K)]			·

 $U_{a-Calc} = Calculated area-weighted average U-values [W/(mrK)]$

Ui-Calc = Calculated maximum individual element U-values [W/(m²K)]

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

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

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	0.91	4	0	0	0.75
Standard value	0.91*	2.6	N/A	N/A	0.5
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for thi	s HVAC syster	n NO
* Standard shown is t efficiency is 0.86. For	for gas single boiler system any individual boiler in a n	s <=2 MW output. For sing nulti-boiler system, limiting	le boiler systems >2 MW o efficiency is 0.82.	r multi-boiler system	ns, (overall) limiting

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	13		SFP [V				' [W/(l/s)]					UD officionay	
5	ID of system type	Α	В	С	D	E	F	G	H		нк епісіенсу		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard	
GF.Class E unit		-	-	-	1.6	-	-		-	-	-	N/A	

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
GF.Class E unit	, .	80	22	923

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF.Class E unit	NO (-9.1%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?			
Is evidence of such assessment available as a separate submission?	YES		
Are any such measures included in the proposed design?			

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	76.5	76.5
External area [m ²]	144.8	144.8
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	5	5
Average conductance [W/K]	80.1	69.75
Average U-value [W/m ² K]	0.55	0.48
Alpha value* [%]	10	10

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional		
Heating	16.56	10.49		
Cooling	16.09	14.7		
Auxiliary	7.51	3.06		
Lighting	38.54	52.52		
Hot water	1.7	1.87		
Equipment*	20.26	20.26		
TOTAL**	80.39	82.64		

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

Energy Production by Technology [kWh/m²]

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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	215.03	233.16
Primary energy* [kWh/m ²]	211.27	225.22
Total emissions [kg/m ²]	35.9	38.4

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

Building Use

% Area Building Type 100 A1/A2 Retail/Financial and Professional services A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways B1 Offices and Workshop businesses B2 to B7 General Industrial and Special Industrial Groups B8 Storage or Distribution C1 Hotels C2 Residential Institutions: Hospitals and Care Homes C2 Residential Institutions: Residential schools C2 Residential Institutions: Universities and colleges C2A Secure Residential Institutions **Residential spaces** D1 Non-residential Institutions: Community/Day Centre D1 Non-residential Institutions: Libraries, Museums, and Galleries D1 Non-residential Institutions: Education D1 Non-residential Institutions: Primary Health Care Building D1 Non-residential Institutions: Crown and County Courts D2 General Assembly and Leisure, Night Clubs, and Theatres Others: Passenger terminals Others: Emergency services Others: Miscellaneous 24hr activities Others: Car Parks 24 hrs

Others: Stand alone utility block

HVAC Systems Performance										
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity						2				
	Actual	50.6	164.5	16.6	16.1	7.5	0.85	2.84	0.91	4
	Notional	32.6	200.6	10.5	14.7	3.1	0.86	3.79		

Key to terms

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U і-тур	Ui-Min	Surface where the minimum value occurs*
Wall	0.23	0.18	GF000000:Surf[2]
Floor	0.2	0.15	GF000000:Surf[0]
Roof	0.15	-	UNKNOWN
Windows, roof windows, and rooflights	1.5		No windows or rooflights in building
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{I-Typ} = Typical individual element U-values [W/(m ²	<)]		U _{I-Min} = Minimum individual element U-values [W/(m ² K)]
* There might be more than one surface where the	minimum L	J-value oc	curs.

Air Permeability	Typical value	This building
m ³ /(h.m ²) at 50 Pa	5	5

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

238 Kilburn High Road (Be Lean)

As designed

Date: Thu Jul 22 17:21:20 2021

Administrative information

Building Details

Address: 238 Kilburn High Road, London, NW6 2BS

Certification tool

Calculation engine: Apache Calculation engine version: 7.0.13 Interface to calculation engine: IES Virtual Environment Interface to calculation engine version: 7.0.13 BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name Telephone number: Phone Address: Street Address, City, Postcode

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	37.9
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	37.9
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	34.8
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	Ua-Limit	Ua-Calc	Ui-Calc	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	GF000000:Surf[2]
Floor	0.25	0.15	0.15	GF000000:Surf[0]
Roof	0.25	-	-	UNKNOWN
Windows***, roof windows, and rooflights	2.2	-	-	No windows or rooflights in building
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5		-	No High usage entrance doors in building
Ustimit = Limiting area-weighted average U-values M	//(m ² K)]			•

 U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

Ui-Calc = Calculated maximum individual element U-values [W/(m²K)]

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

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

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

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

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

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

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

1- VRF

17	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency			
This system	3	4	0	0	0.75			
Standard value	2.5*	2.6	N/A	N/A	0.5			
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO								
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.								

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

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

Zone name		SFP [W/(l/s)]										
	ID of system type	Α	В	С	D	E	F	G	H	1	HR emiciency	
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
GF.Class E unit		-	-	-	1.6	-	-		-	-	-	N/A

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
GF.Class E unit	, .	80	22	923

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF.Class E unit	NO (-9.1%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?						
Is evidence of such assessment available as a separate submission?	YES					
Are any such measures included in the proposed design?	YES					

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	76.5	76.5
External area [m ²]	144.8	144.8
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	5	5
Average conductance [W/K]	80.1	69.75
Average U-value [W/m ² K]	0.55	0.48
Alpha value* [%]	10	10

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.02	3.54
Cooling	16.09	14.7
Auxiliary	7.51	3.06
Lighting	38.54	52.52
Hot water	1.7	1.87
Equipment*	20.26	20.26
TOTAL**	68.86	75.68

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

Energy Production by Technology [kWh/m²]

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

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	215.03	233.16
Primary energy* [kWh/m ²]	206.1	223.01
Total emissions [kg/m ²]	34.8	37.9

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

Building Use

100

% Area Building Type A1/A2 Retail/Financial and Professional services A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways B1 Offices and Workshop businesses B2 to B7 General Industrial and Special Industrial Groups B8 Storage or Distribution C1 Hotels C2 Residential Institutions: Hospitals and Care Homes C2 Residential Institutions: Residential schools C2 Residential Institutions: Universities and colleges C2A Secure Residential Institutions **Residential spaces** D1 Non-residential Institutions: Community/Day Centre D1 Non-residential Institutions: Libraries, Museums, and Galleries D1 Non-residential Institutions: Education D1 Non-residential Institutions: Primary Health Care Building D1 Non-residential Institutions: Crown and County Courts D2 General Assembly and Leisure, Night Clubs, and Theatres Others: Passenger terminals Others: Emergency services Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs

Others: Stand alone utility block

ŀ	HVAC Systems Performance										
Sy	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[\$1	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	50.6	164.5	5	16.1	7.5	2.8	2.84	3	4	
	Notional	32.6	200.6	3.5	14.7	3.1	2.56	3.79			

Key to terms

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U і-Тур	Ui-Min	Surface where the minimum value occurs*			
Wall	0.23	0.18	GF000000:Surf[2]			
Floor	0.2	0.15	GF000000:Surf[0]			
Roof	0.15	-	UNKNOWN			
Windows, roof windows, and rooflights	1.5		No windows or rooflights in building			
Personnel doors	1.5	-	No Personnel doors in building			
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building			
High usage entrance doors	1.5	-	No High usage entrance doors in building			
UI-Typ = Typical individual element U-values [W/(m ²	()]	U _{i-Min} = Minimum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the minimum U-value occurs.						

Air Permeability	Typical value	This building
m ³ /(h.m ²) at 50 Pa	5	5