

# **Sustainability Statement**

# Proposed Residential Development at

Garages to the south of 27a West End Lane, London, NW6 4QJ

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## 1. Executive Summary

This report has been produced on behalf of Street Plot Ltd to form part of the planning application to The London Borough of Camden for the development at West End Lane.



The development consists of 3no. residential units. Build Energy Ltd have been appointed to produce an Sustainability Statement presenting how the development will comply with the requirements of The London Borough of Camden. As required, a 20% improvement over Part L 2013 of the Building Regulations is to be evidenced as well as a 20% reduction in on-site carbon emissions through renewable technologies. The strategy for reducing emissions is based on the Energy Hierarchy, as follows:

- Reduce the demand for energy
- Supply energy efficiently
- Use renewable energy

In order to minimise the use of energy by this development, a low carbon approach for the design of the building's fabric and associated systems has been used.

The fabric has been designed to be highly air tight, with a Design Air Permeability rate of 5 m<sup>3</sup>/hm<sup>2</sup> and the use of Accredited Construction Details throughout.

The use of gas fired Combined Heat and Power (CHP) and boiler units has been considered but for a development of this scale and heat demand, it has been deemed inappropriate. The potential to connect to an existing heat network has been investigated and no opportunities exist at present.

The use of photovoltaic solar panels has been identified as the optimum strategy for lowering  $CO_2$  emissions over and above the improvements achieved through fabric and building services efficiency. A system of at least 0.98kWp (horizontal on the roof) per house results in a 20.3% reduction in carbon emission through renewable energy, meeting the 20% target.

It has been identified that these energy measures have resulted in a reduction in CO<sub>2</sub> emissions of 24.7% when measured against Part L 2013 Building Regulations, meeting the 20% target (Code Level 4 equivalent).

The following chart details the reductions in carbon emissions as a result of following the energy hierarchy.



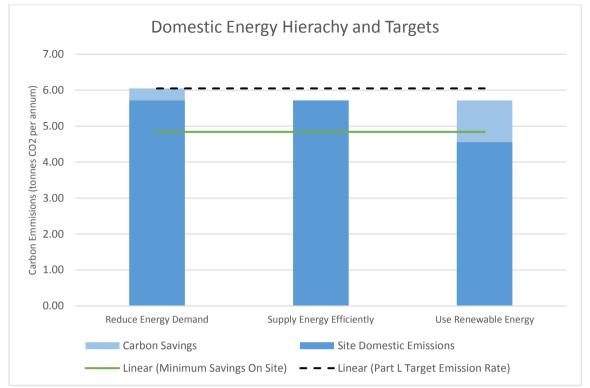


Figure 1 – Carbon Emissions at West End Lane before and after measures from the Energy Hierarchy.

## 2. Introduction

Street Plot Ltd are proposing to submit a planning application to The London Borough of Camden for the development at West End Lane.

The proposed development at West End Lane comprises 3no. three storey houses.

Build Energy Ltd have been appointed to produce a site-wide Sustainability Statement report identifying how the development will address the policies set out by The London Borough of Camden. These include reducing carbon emissions, efficient water use and Sustainable Drainage Systems (SuDS).

The strategy for reducing carbon emissions is based on the Energy Hierarchy, as follows:

- Reduce the demand for energy
- Supply energy efficiently
- Use renewable energy

The use of passive design and energy efficient features are key to reducing energy demand. The proposed energy efficiency measures include a well-insulated building fabric, high air tightness and efficient combi boilers. These measures will go some way towards achieving compliance, however, renewable energy technologies will be required in order to demonstrate compliance with requirements set out under relevant planning policy. The strategy is based on information provided by the project design team.

The embodied energy of the development is out of the scope of this report. The focus will be on delivered energy demand.



## 3. Planning Policy Guidance & Legislation Affecting West End Lane

The following guidance documents will apply to the development;

- Camden Core Strategy 2010-2015 Local Development Framework
- Camden Planning Guidance: Sustainability (CPG3)

StreetPlot Ltd have also received pre-application advice from Camden Council detailing the sustainability requirements of the development. These requirements are as follows

- Code Level 4 Equivalent for carbon emissions a 20% reduction below Part L Building Regulations 2013.
- A 20% reduction in on-site carbon emissions through renewable technologies, unless demonstrated that this is not feasible.
- A maximum internal water use of 105 litres per person per day, with an additional 5 litres per person per day for external water use.
- The incorporation of green or brown roofs wherever suitable.
- The use of Sustainable Drainage Systems and a reduction of surface run-off rates by 50% across the development.
- The incorporation of bird and bat boxes where there are opportunities for these.



## 4. Carbon Emissions

### **Energy Strategy Objective**

The purpose of this energy strategy is to demonstrate that climate change mitigation measures have been fully considered and appropriately selected and specified as part of the scheme's design.

In accordance with the guidance notes, after establishing the baseline carbon emissions of the site, the strategy for the development at West End Lane follows the Energy Hierarchy given in Camden Planning Guidance (Reduce the demand for energy, Supply Energy Efficiently, Use Renewable Energy) in appraising appropriate measures to reduce carbon emissions.

The following sections provide more details on each of the steps of the Energy Hierarchy.

### Methodology

Government approved software (Stroma FSAP 2012) has been used to calculate energy consumption based on current SAP methodology (2013).

All proposed plots within this development have been modelled.



### **Energy Strategy**

The total carbon emissions at the various stages of the energy hierarchy can be seen in Appendix A. The SAP worksheets showing the carbon emissions of each house at the various stages can be seen in Appendix B.

### **Baseline Energy Assessment**

Before energy efficiency measures are investigated, it is important to establish the baseline carbon emissions (the maximum allowed value that meets Part L Building Regulations 2013) of the development, for comparison and evaluation of energy and efficiency proposals for the development. The total base line emissions are found to be 6.05 tonnes CO<sub>2</sub> per annum.

#### Reduce the demand for energy

The primary focus for providing an energy efficient development is driven through the generation of a design that takes advantage of energy use reduction through improved building fabric and engineering services.

The energy demand of the development will be reduced through incorporation of measures including high levels of thermal insulation, detailing to reduce air permeability, construction details at junctions that reduce thermal bridging, and the use of low-energy lighting.

The use of building fabric specifications that better the minimum requirements of Part L as well as maximising daylight will allow for the reduction in the need for heating and lighting through better building design.

Highly efficient combi boilers have been specified to provide efficient heating. Weather compensators and time and temperature zone controls have also been incorporated to ensure the time and areas of heating result in minimal wasted heating.

After reducing the demand for energy, the emissions are found to be 5.72 tonnes CO<sub>2</sub> per annum.

### Supply energy efficiently

The next step in the energy hierarchy is investigating the use of decentralised energy such as combined heat and power systems and heat networks.

All of the London Boroughs have over the course of several years been producing or commissioning heat map studies to explore the viability of decentralised heat networks. The London Borough of Camden completed the 'District Heat Network Local Development Order' in March 2011. The London Heat Map has also been consulted.

A snapshot from The London Heat Map is shown below. There are no existing networks close enough to be shown. The development is around 450m from the nearest potential network (shown in red), and therefore the costs involved in extending the network would outweigh the advantages from a connection due to the small size of the development. Because the site lies outside the potential areas for decentralised energy (shown in purple), this also shows the site would be unfeasible to connect to the network.



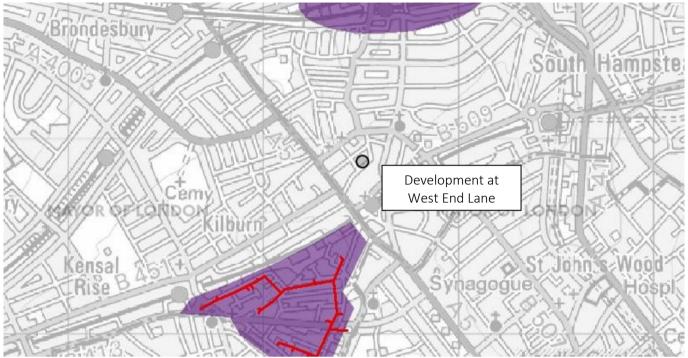


Figure 2 – London Heat Map view of West End Lane.

The possibility of connecting to future networks has also been considered, and after consultation with M&E advice it is apparent that the cost of the central plant and distribution and heat interface units is likely to be far in excess of a boiler and gas installation to each house. The running costs are also likely to be higher due to the standing losses, management and maintenance of the central plant.

Combined Heat and Power units (CHP) require significant infrastructure and a substantial heat demand. In order to obtain maximum efficiency, it is necessary to have an energy demand profile which is evenly spread throughout the day and night. A CHP unit will operate efficiently when running continuously and so requires its energy to be used continuously to avoid wastage. This usage profile does not match that of the proposed development and hence a CHP system is not recommended for this site of three houses.

Therefore this stage of the hierarchy makes no change to the carbon emissions.

### Use Renewable Energy

The third and final stage of the energy hierarchy is the use of renewable energy. The potential of a range of renewable energy systems has been assessed to ascertain if their characteristics will be suited to serve the energy requirements of this development and thereby be used to offset  $CO_2$  emissions.

A number of high efficiency or renewable technologies have been reviewed for use in this development. The review of green technologies identifies that the development will be suitable for the inclusion of photovoltaic solar panels.

Providing 0.98 kWp to each house will reduce total emissions to 4.55 tonnes CO<sub>2</sub> per annum. This is a reduction of 20.3% from 5.72 tonnes CO<sub>2</sub> per annum, meeting the target for reducing on-site emissions by 20% through renewable energy.

### **Emission Reduction Results**

By recording the baseline and final emissions we are able to assess the effects of improvements detailed above on the West End Lane development. These are shown in Appendix A in the conclusions of this report, and amount to a total reduction in carbon emissions of 24.7%, meeting the target a 20% carbon emissions reduction below Part L Building Regulations 2013.

The addition of renewable energy results in an emission reduction of 20.3%, meeting the 20% target.



### **Proposed Specification for West End Lane**

Based on this review, the specification of the project at West End Lane has been selected to achieve or better the standards identified in Approved Document Part L wherever possible:

- U-value of exposed floors 0.13 W/m<sup>2</sup>K.
- U-value of exposed walls 0.18 W/m<sup>2</sup>K.
- U-value of party walls 0 W/m<sup>2</sup>K (fully-filled cavity with sealed edges or solid).
- U-value of roofs 0.13 W/m<sup>2</sup>K.
- U-value of windows 1.4 W/m<sup>2</sup>K, whole-window U-value.
- U-value of doors 1.0 W/m<sup>2</sup>K, whole-door U-value.
- Thermal bridging to be addressed with Accredited Construction Details applied throughout.
- Air permeability of 5 m<sup>3</sup>/m<sup>2</sup>.h @50Pa has been specified to be achieved on testing.
- Worcester Greenstar 28CDi Compact ErP gas boilers with time and temperature zone controls and weather compensators.
- 100% low energy light fittings.
- Photovoltaic panels equating to a system peak power of 0.98kWp per plot. This is proposed as 4no. 245W panels per house, positioned horizontally on the roof.



## 5. Renewable Technology Consideration

As part of this process, a number of technologies have been considered, with feasibility / viability and practicality considered given the various design considerations.

A feasibility study has been undertaken, identifying the following:

- Appropriate technologies.
- Energy generated from Low and Zero Carbon Technologies per annum.
- Available funding grants.
- Life cycle cost of specification (including allowances for payback).
- Local planning criteria (Inc. preferred solutions).
- Feasibility of exporting heat / electricity from chosen system.

In order to fully identify appropriate technologies, an initial evaluation has been undertaken based on the expected baseline carbon emissions. Baseline emissions are calculated on a development with identical geometry built to meet Building Regulations, thus using standard building fabric parameters and notional heating systems.



### **Photovoltaics**

The PV panels should be orientated between southeast and southwest (optimally south). The optimal tilt angle (inclination of panel from horizontal) should be calculated to ensure the best possible output of the system during the year. In the UK, the angles of most pitched roofs are suitable for mounting PV panels.

Panels can also be mounted on A-frames on flat-roofed buildings. PV technology comes in a range of forms: PV panels that can be retrofitted to the roof of an existing building or equally, sunk to fit flush with the roof line; PV cells that are 'laminated' between sheets of glass to provide shading in a glazed area, and PV cladding.

PV systems are low maintenance as they have no moving parts and panels generally have 25 year warranties, although the lifetime of the panel can be expected to be beyond this time.

#### **Technical Considerations**

The PV systems should not be shaded. Shading caused by other buildings, greenery and roof 'furniture' such as chimneys or satellite dishes, even over a small area of the panel, can significantly reduce performance. Excess energy can be exported to the grid. Although the Feed-in Tariffs are



generally not high, exporters can negotiate with their utility company. Future consideration may be given to the benefits of battery storage.

#### **Economic Considerations**

Payback times for this technology are usually approximately twenty years; but this is reducing year on year as the technology matures and are set to reduce further as fuel prices increase. Integrating PV into a building and replacing other building materials can further offset the cost.

#### Suitability at the West End Lane Development

PV has been identified as a suitable technology for incorporation at West End Lane allowing the required 20% reduction in carbon emissions through renewable energy to be met. A minimum of 0.98kWp per plot is required to meet this target.



### **Solar Water Heating**

A solar collector comprises the housing that contains piping, through which the carrier fluid circulates, and a glass panel to retain the radiation from the Sun. The temperature inside the collector increases and this heat is then transferred to a carrier fluid. In an open loop system, the hot water is heated directly.

Solar thermal panels are generally black in appearance for maximising energy absorption and the glass panels have a special coating in order to retain as much heat as possible.

Two types of collector exist: flat plate and evacuated tube. Flat plate collectors can be mounted on or flush with the roof. The air in the collection tubes can be evacuated to reduce heat losses within the frame by convection. Evacuated tube collectors need to be re-evacuated every few years. They are more difficult to install but are more efficient and allow higher temperature heating



#### **Benefits**

Solar thermal collectors offer a good price-performance ratio. Solar hot water

systems are best suited to developments with high hot water requirements, such as hotels, care homes and leisure centres. Many systems have been installed in the UK and they work well, even without direct sunlight.

#### **Technical Considerations**

Solar thermal systems should be sized to the hot water requirements of the user since any excess heat that is generated cannot be exported elsewhere. The optimal angle for mounting depends on when the water demand is greatest. Ideally, the collectors should be mounted onto a non-shaded, south-facing roof.

### **Economic Considerations**

Solar thermal technology is a cost effective way to reduce carbon emissions, especially if it is replacing electric water heating.

### Suitability at the West End Lane Development

Due to limited roof space at West End Lane, solar hot water cannot be used effectively alongside photovoltaic arrays. Accordingly it is considered preferable to install photovoltaic arrays over solar hot water where only one technology can be favoured.



## **Air Source Heat Pumps**

Air source heat pumps work by converting the energy of the outside air into heat, creating a comfortable temperature inside the building as well as supplying energy for the hot water system. As with all heat pumps, air source models are most efficient when supplying low temperature systems such as underfloor heating.

An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can extract heat from the air even when the outside temperature is as low as minus 15°C. Cold water or another fluid is circulated through pipes, picking up the ambient temperature and then passing through the heat exchanger (the evaporator) in the heat pump unit.

The heat exchanger extracts heat from the fluid, using a refrigerant compression cycle to upgrade the heat to a usable temperature (+55°C). This heat is then transferred to the heating system via another heat exchanger, the condenser of the heat pump.



Accordingly ASHP heating systems generally run at a lower temperature than conventional heating systems. There are two main types of air source

heat pumps. An air-to-water system uses the heat to warm water. Heat pumps heat water to a lower temperature than a standard boiler system would, so they are better suited to underfloor heating systems than radiator systems.

An air-to-air system produces warm air, which is circulated by fans to heat the building. Whilst heat pumps are not a wholly renewable energy source due to use of electricity, the renewable component is considered as the heat is extracted from the air. It is measured as the difference between heat outputs, less the primary electrical energy input. Using this heat, for every Watt of electrical energy supplied to the system, 4 Watts or more of heating energy can be supplied to a heating system. This 'Coefficient of Performance' (CoP) of 4 is effectively an 'efficiency' of 400% for the system and compares very favourably with even the best gas condensing boiler's efficiency of around 85%. The smaller the temperature difference between the source and the output temperature of the heat pump (i.e. the temperature of the distribution system) the higher the heat pump's CoP.

### **Benefits**

Unlike boilers, there is no pollution on-site and as the mix of power stations used to supply the electricity grid gets 'cleaner', with more renewable electricity generation being brought on line, so the carbon emissions from the heat pumps system will decrease even further.

The key operational benefit of air source heat pumps for the user is the reduction in fuel bills. In addition, space savings can be made over other plant types as an air source heat pump unit is compact, and requires no storage space for fuel.

### **Technical Considerations**

Since air source heat pumps produce less heat than traditional boilers, it is essential that the building where the air source heat pump is proposed is well insulated and draught proofed for the heating system to be effective. Fans and compressors integral to the air source heat pump unit generate some noise, but this is generally acceptable especially where outdoor units can be located away from windows and adjacent buildings. By selecting a heat pump with an outdoor sound rating of 7.6 dB or lower and mounting the unit on a noise-absorbing base these issues can be resolved for the site.

### **Economic Considerations**

Costs for installing a typical system vary but they are considerably more economical to install than an equivalent capacity ground source heat system and can produce similar levels of energy and carbon savings. Actual running costs and savings for space heating will vary depending on a number of factors - including the size and use pattern of the building and how well insulated it is.

### Suitability at the West End Lane Development

Due to outdoor space constraints and noise considerations, it is preferred to opt for photovoltaic panels.





### **Biomass Heating**

Biomass can be burnt directly to provide heat in buildings using wood from forests, urban tree pruning, and farmed coppices or as liquid biofuel, such as bio diesel. In non-domestic applications, biomass boilers replace conventional fossil fuel boilers and come with automated features to enable reduced user intervention.

With the long term availability of fossil fuels such as oil and gas, and the persistent number of price rises of oil and natural gas a growing concern in the UK, alternative heating methods such as wood burning boilers are becoming more popular.

Due to technical advances in wood burning technology, and improvements in the preparation of wood fuels, efficiencies of new wood pellet burning boilers have increased to around 90%, with carbon monoxide emissions dropping dramatically.

There are three types of wood burning boiler - logs, woodchips and wood pellets. Wood logs are the most readily available, generally produced as a by-product from forestry and woodland from sawmills, tree surgery and wind damage.



Wood chips have a high moisture content which tends to restrict their efficiency to only 50% and they tend to suffer from blockages hence we would be cautious about their use on this site. Storage space requirements are also high due to the irregularity of the chips. Wood pellets are made from dry waste wood, such as used pallets and off-cuts/sawdust from furniture manufacturers. The waste wood is compressed into uniform, high density pellets that are easier to transport, handle and store than other forms of wood fuel.

### Technical and Economic Considerations

Biomass combustion systems (BCS) are generally more mechanically complex than conventional boiler heating systems, especially when it comes to fuel delivery, storage, handling and combustion. The complexity is necessary because of the different combustion characteristics of biomass as compared to conventional fossil fuels. The increased complexity means higher capital costs than for conventional systems. BCSs typically require more frequent maintenance and greater operator attention than conventional systems. As a result, the degree of operator dedication to the system is critical to its success. They often require special attention to fire insurance premiums, air quality standards, ash disposal options and general safety issues.

### Suitability at the West End Lane Development

Due to the size of the proposed project, biomass energy has not been considered as an economically suitable technology for this development.



## 7. Other Sustainability Considerations

## Water Efficiency

Water use calculation software has been used to determine a fitting specification that achieves a water consumption total of 110 litres per person per day, as per Camden Council's requirements. This is 105 litres for internal use and 5 litres for external use. The specification of fittings is shown in Appendix C.

## **Overheating Considerations**

An overheating assessment has been carried out as a part of the process to produce SAP calculations. This assessment is related to the factors that contribute to internal temperature: solar gain (taking account of orientation, shading and glazing transmission), ventilation (taking account of window opening in hot weather), thermal capacity and mean summer temperature for the location of the dwelling. Full details of this methodology and relevant calculations can be found in the latest approved SAP document.

Using these criteria, the proposed development at West End Lane has been found to be compliant with overheating rules within SAP, which is for the overheating risk to be 'medium' or lower.

The results for overheating risk are as follows

- House 1 Slight
- House 2 Not significant
- House 3 Not significant

These calculations can be seen in Appendix D.

## SuDS (Sustainable Drainage Systems)

A SuDS assessment has been carried out by Create Engineers.

### **Green Roofs**

Green roofing is proposed on both the 1<sup>st</sup> floor roof and the 2<sup>nd</sup> floor roof. These will enhance biodiversity, reduce rainfall run-off and increase cooling during hot periods. The proposed green roof is a Optigreen System Type "Nature Roof" and can be seen in Appendix E.

### **Bird and Bat Boxes**

Three bat houses and three sparrow terrace boxes will be incorporated into the brickwork of the development. Details of these can be seen in the Design and Access Statement.



## 8. Conclusion

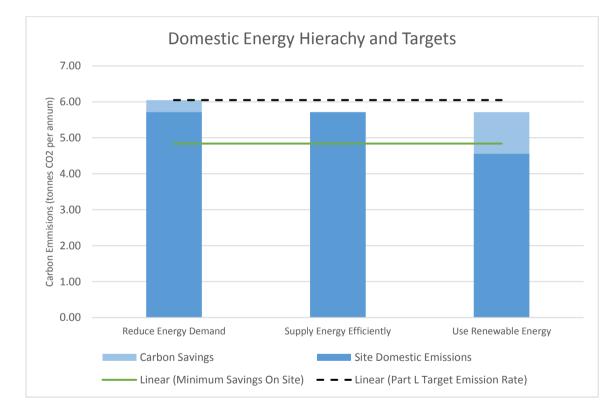
This strategy is based on the Energy Hierarchy, as follows:

- Use less energy.
- Supply energy efficiently.
- Use renewable energy.

CO<sub>2</sub> emission savings can be achieved through the use of the following proposal:

- Improved fabric energy efficiency.
- Efficient boilers with weather compensators and time and temperature zone controls.
- Photovoltaic solar panels (total system size of 0.98kWp per property).

These measures result in a reduction in  $CO_2$  emissions of 24.7% when measured against Part L 2013 Building Regulations. The addition of solar PV has resulted in a reduction of on-site emissions of 20.3%. Therefore the targets of a 20% improvement on Part L Boiling Regulations 2013 and a 20% reduction in emissions through renewable energy have both been met.



The following chart details the reductions in CO<sub>2</sub> emissions as a result of following the energy hierarchy.

Figure 3 – Carbon Emissions at West End Lane before and after measures from the Energy Hierarchy.

Further sustainability measures of water use, biodiversity, overheating and sustainable drainage have also been demonstrated.



## 9. Appendices

Appendix A - Domestic Results Tables

Appendix B – SAP Worksheets

- House 1 TER (Target Emission Rate) Worksheet
- House 2 TER Worksheet
- House 3 TER Worksheet
- House 1 After Reducing Energy Demand DER (Dwelling Emission Rate) Worksheet
- House 2 After Reducing Energy Demand DER Worksheet
- House 3 After Reducing Energy Demand DER Worksheet
- House 1 After Renewable Energy DER Worksheet
- House 2 After Renewable Energy DER Worksheet
- House 3 After Renewable Energy DER Worksheet

Appendix C – Part G Compliance Report

Appendix D – Overheating Calculations

Appendix E – Green Roof



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## **Cumulative Emissions & Savings**

	Carbon dioxide emissions for domestic buildings (Tonnes CO <sub>2</sub> per annum)
Baseline: Part L 2013 of the Building	
Regulations Compliant Development	6.05
After Reducing Energy Demand	5.72
After Supplying Energy Efficiently	5.72
After Using Renewable Energy	4.55

Table 1: Carbon dioxide emissions after each stage of the Energy Hierarchy

	Regulated carbon dioxide savings								
	(Tonnes CO <sub>2</sub> / annum)	% saving compared to baseline	% saving compared to previous stage						
Savings from Reducing Energy Demand	0.33	5.53	5.53						
Savings from Supplying Energy Efficiently	0.00	0.00	0.00						
Savings from Using Renewable Energy	1.16	19.18	20.30						
Cumulative on site Savings	1.49	24.71							
Total Target Savings	1.21	20.00							

Table 2: Regulated carbon dioxide savings from each stage of the Energy Hierarchy

### **Results by Plot**

#### Baseline

Baseline: Part L 2013 of the Building	House 1	House 2	House 3
Regulations Compliant Development	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)
Baseline	2.171	1.797	2.082

#### Reduce Energy Demand

After Reducing Energy Demand	House 1	House 2	House 3
	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)
Baseline	2.171	1.797	2.082
Reduce Energy Demand	2.020	1.706	1.989
% Improvement	6.96	5.04	4.45

#### Supply Energy Efficiently

After Supplying Energy Efficiently	House 1	House 2	House 3
	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)
Baseline	2.171	1.797	2.082
Supply Energy Efficiently	2.020	1.706	1.989
% Improvement	6.96	5.04	4.45

#### Be Lean, Clean & Green

After Using Renewable Energy	House 1	House 2	House 3
	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)	CO <sub>2</sub> Emissions (tonnes CO <sub>2</sub> per annum)
Baseline	2.171	1.797	2.082
Use Renewable Energy	1.633	1.320	1.602
% Improvement	24.78	26.57	23.03

				User D	etails:						
Assessor Name:	Mitchell Fir			Strom	STRO	029125					
Software Name:	Stroma FS	AP 201	2		Softwa	Versio	on: 1.0.3.11				
			Р	roperty .	Address	House	1				
Address :	House 1, So	outh of 2	7a West	t End La	ne, Lond	don, NW	6 4QJ				
1. Overall dwelling dime	nsions:										
					a(m²)		Av. Hei	• • •	1	Volume(m <sup>3</sup> )	-
Ground floor				4	7.13	(1a) x	2.	45	(2a) =	115.47	(3a)
First floor				4	7.13	(1b) x	2.	75	(2b) =	129.61	(3b)
Second floor				2	4.95	(1c) x	2	.9	(2c) =	72.36	(3c)
Total floor area TFA = (1a	a)+(1b)+(1c)+	(1d)+(1e	)+(1r	1) <u>1</u>	19.21	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	317.43	(5)
2. Ventilation rate:					- 4		4 - 4 - 1				
	main heating		econdar eating	У	other		total			m <sup>3</sup> per hour	
Number of chimneys	0	+	0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+	0	+	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent far	าร						4	x ′	0 =	40	(7a)
Number of passive vents						Г	0	x ^	0 =	0	(7b)
Number of flueless gas fir	es					Γ	0	x 4	40 =	0	(7c)
									Δir ch	anges per ho	
Infiltration due to chimney	e flues and f	ans - (6)	a)+(6b)+(7	'a)+(7b)+(	7c) =	Г	40		÷ (5) =		](8)
If a pressurisation test has be						continue fr	40 om (9) to (		<del>.</del> (3) =	0.13	(0)
Number of storeys in th				( ))			() (	,		0	(9)
Additional infiltration								[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or	r timber f	frame or	0.35 fo	r masonr	y constr	ruction			0	(11)
if both types of wall are producting areas of openin			ponding to	the great	er wall are	a (after					
If suspended wooden fl			ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else e	enter 0							·	0	(13)
Percentage of windows	and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	- (15) =		0	(16)
Air permeability value,	q50, expresse	ed in cub	ic metre	s per ho	our per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili										0.38	(18)
Air permeability value applies	•	on test has	s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			٦
Number of sides sheltered Shelter factor	d				(20) = 1 -	[0.075 x (1	9)] =			0	(19) (20)
Infiltration rate incorporati	na shelter fac	tor			(21) = (18)		-/]			1	(20)
Infiltration rate modified for	-		ł		() (.0	, - (=•) -				0.38	
	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spo						7 P				I	
r	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
				l	I	l		l		I	

Wind F	actor (22	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltra	tion rate	e (allowir	ng for sł	nelter an	d wind s	peed) =	(21a) x (	(22a)m					
	0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44	]	
	ate effect echanical		-	ate for t	he appli	cable ca	se							(23a)
				ndix N. (2	3b) = (23a	a) x Fmv (e	equation (I	N5)), other	wise (23b	) = (23a)			0	(23a)
		• •	0 11		, ,	, ,		n Table 4h)	,	) (200)			0	
			-	-	-			HR) (24a		2b)m + ()	23b) × [′	1 – (23c)	0 0 ÷ 1001	(23c)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If	balanced	l mecha	anical ve	ntilation	without	heat rec	overy (N	MV) (24b	)m = (22	2b)m + (2	23b)	1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
,								on from o		_ /			•	
	<u> </u>		<u> </u>	•	, ,	, I	· · · ·	c) = (22b)	,		, 		1	(24a)
(24c)m=	L	0	0	0	0	0	0	0	0	0	0	0	J	(24c)
,						•		on from lo 0.5 + [(22		0.5]				
(24d)m=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	]	(24d)
Effe	ctive air c	hange	rate - en	ter (24a	) or (24t	o) or (24	c) or (24	d) in box	(25)				•	
(25)m=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	]	(25)
3 He	at losses	and he	at loss n	aramet	≏r.	-							-	
ELEN		Gros area	S	Openin m	gs	Net Ar A ,r		U-valu W/m2		A X U (W/ł	<)	k-value kJ/m²⊷		A X k kJ/K
Doors						-								()
						2.15	×	1	=	2.15				(26)
Windo	ws Type	1				2.15 11.8		1 /[1/( 1.4 )+	!	2.15 15.64				(26) (27)
	ws Type ws Type						x1		0.04] =					
Windov		2				11.8	x1	/[1/( 1.4 )+	0.04] = [ 0.04] = [	15.64				(27)
Windov	ws Type ws Type	2				11.8 5.91	x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = [ 0.04] = [ 0.04] = [	15.64 7.84	9			(27) (27)
Windo <sup>,</sup> Windo <sup>,</sup> Rooflig	ws Type ws Type	2				11.8 5.91 8.32	x1 x1 x1 x1 88 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = [ 0.04] = [ 0.04] = [	15.64 7.84 11.03	╡╷			(27) (27) (27)
Windov Windov Rooflig Floor	ws Type ws Type	2	49	28.1	8	11.8 5.91 8.32 1.61473	x1 x1 x1 88 x1 3 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + (	$0.04] = \begin{bmatrix} 0.04] \\ 0.04] = \begin{bmatrix} 0.04] \\ 0.04] = \begin{bmatrix} 0.04] \\ 0.04\end{bmatrix} = \begin{bmatrix} 0.04] \\ 0.04\end{bmatrix}$	15.64 7.84 11.03 2.74513	╡╷			(27) (27) (27) (27) (27b)
Windo <sup>,</sup> Windo <sup>,</sup>	ws Type ws Type	2 3		28.1		11.8 5.91 8.32 1.61476 47.13	x1 x1 x1 888 x1 33 x 11 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13	0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	15.64 7.84 11.03 2.74513 6.1269	╡╷			(27) (27) (27) (27) (27b) (28)
Windov Windov Rooflig Floor Walls Roof	ws Type ws Type	2 3 145.4 47.1	3			11.8 5.91 8.32 1.61474 47.13 117.3	x1 x1 x1 88 x1 3 x 1 x 2 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.18	$\begin{array}{c} 0.04] = \\$	15.64 7.84 11.03 2.74513 6.1269 21.12	╡╷			(27) (27) (27) (27b) (27b) (28) (29)
Windov Windov Rooflig Floor Walls Roof Total a * for win	ws Type ws Type ghts area of eld	2 3 145.4 47.1 ements	3 , m <sup>2</sup> ows, use et	1.61	ndow U-va	11.8 5.91 8.32 1.61474 47.13 117.3 45.52 239.7 alue calcul	x1 x1 x1 88 x1 3 x 1 x 2 x 5	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.18	$\begin{array}{c} 0.04\\ 0.04\\ \end{array} = \begin{bmatrix} \\ \\ \\ 0.04\\ \end{array} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	15.64 7.84 11.03 2.74513 6.1269 21.12 5.92		paragraph		(27) (27) (27) (27b) (27b) (28) (28) (29) (30)
Windov Windov Rooflig Floor Walls Roof Total a * for win ** includ	ws Type ws Type ghts area of ele dows and r	2 3 145.4 47.1 ements oof windo	3 , m <sup>2</sup> ows, use en sides of ini	1.61 ffective wi ternal wal	ndow U-va	11.8 5.91 8.32 1.61474 47.13 117.3 45.52 239.7 alue calcul	x1 x1 x1 88 x1 3 x 1 x 2 x 5	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.18 0.13	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0$	15.64 7.84 11.03 2.74513 6.1269 21.12 5.92		paragraph	3.2 72.3	(27) (27) (27) (27b) (27b) (28) (28) (29) (30) (31)
Windov Windov Rooflig Floor Walls Roof Total a * for win ** includ Fabric	ws Type ws Type ghts area of ele dows and r le the areas	2 3 145.4 47.1 ements oof windo s on both s, W/K =	3 , m <sup>2</sup> ows, use en sides of ini = S (A x	1.61 ffective wi ternal wal	ndow U-va	11.8 5.91 8.32 1.61474 47.13 117.3 45.52 239.7 alue calcul	x1 x1 x1 88 x1 3 x 1 x 2 x 5	$ \frac{1}{(1/(1.4)+)} \frac{1}{(1/(1.4)+)} \frac{1}{(1/(1.4)+)} \frac{1}{(1/(1.7)+)} 1$	$\begin{array}{c} 0.04\\$	15.64 7.84 11.03 2.74513 6.1269 21.12 5.92	s given in			(27) (27) (27) (27b) (27b) (28) (28) (29) (30) (31)
Windov Windov Rooflig Floor Walls Roof Total a * for win ** includ Fabric Heat c	ws Type ws Type ghts area of elu dows and r le the areas heat loss	2 3 145.4 47.1 ements oof windo s on both s, W/K = m = S(	3 , m <sup>2</sup> ows, use en sides of ini = S (A x A x k )	1.61 ffective wi ternal wal	ndow U-va	11.8 5.91 8.32 1.61474 47.13 117.3 45.52 239.7 alue calculations	x1 x1 x1 x8 x1 x8 x1 x x x 5 x x x 5	$ \frac{1}{(1/(1.4)+)} \frac{1}{(1/(1.4)+)} \frac{1}{(1/(1.4)+)} \frac{1}{(1/(1.7)+)} 1$	$\begin{array}{c} 0.04] = \\ 0.04] = \\ \\ 0.04] = \\ \\ 0.04] = \\ \\ \\ 0.04] = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	15.64 7.84 11.03 2.74513 6.1269 21.12 5.92 re)+0.04] a	s given in 2) + (32a).		72.3	(27) (27) (27) (27b) (27b) (28) (29) (30) (31) 9 (33) (34) (34)
Windov Windov Rooflig Floor Walls Roof Total a * for win ** includ Fabric Heat c Therm For desi	ws Type ws Type ghts area of ele dows and r le the areas heat loss apacity C al mass p	2 3 145.4 47.1 ements oof windo s on both s, W/K = Cm = S( parame nents who	3 , m <sup>2</sup> sides of ini = S (A x A x k ) ter (TMP ere the det	ffective wi ternal wal U) P = Cm + ails of the	ndow U-va Is and part - TFA) ir	11.8 5.91 8.32 1.61476 47.13 117.3 45.52 239.7 alue calculations	x1 x1 x8 x8 x1 x x x x 5 ated using	$ \frac{1}{(1/(1.4)+)} \frac{1}{(1/(1.4)+)} \frac{1}{(1/(1.4)+)} \frac{1}{(1/(1.7)+)} 1$	$\begin{array}{c} 0.04] = \\ 0.04] = \\ \\ 0.04] = \\ \\ 0.04] = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	15.64 7.84 11.03 2.74513 6.1269 21.12 5.92 re)+0.04] a .(30) + (32 tive Value:	2) + (32a).	(32e) =	72.3	(27) (27) (27) (27b) (27b) (28) (29) (30) (31) 9 (33) (34)
Windov Windov Rooflig Floor Walls Roof Total a * for win ** includ Fabric Heat c Therm For desi can be u	ws Type ws Type ghts area of ele dows and r le the areas heat loss apacity C al mass p ign assessr	2 3 145.4 47.1 ements oof windo s, W/K = Cm = S( parame ments who d of a det	3 , m <sup>2</sup> ows, use en sides of ini = S (A x A x k ) ter (TMP ere the det tailed calcu	1.61 ffective wi ternal wal U) P = Cm - ails of the ulation.	ndow U-va ls and part - TFA) ir construct	11.8 5.91 8.32 1.61474 47.13 117.3 45.52 239.7 alue calculations	x1 x1 x1 88 x1 3 x 1 x 2 x 5 ated using	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + ( 0.13 0.13 0.13 0.13 g formula 1/ (26)(30)	$\begin{array}{c} 0.04] = \\ 0.04] = \\ \\ 0.04] = \\ \\ 0.04] = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	15.64 7.84 11.03 2.74513 6.1269 21.12 5.92 re)+0.04] a .(30) + (32 tive Value:	2) + (32a).	(32e) =	72.3	(27) (27) (27) (27b) (27b) (28) (29) (30) (31) (31) 9 (33) (34) (34) (35)
Windov Windov Rooflig Floor Walls Roof Total a * for win ** includ Fabric Heat c Therm For desi can be u Therm	ws Type ws Type ghts area of elo dows and r le the areas heat loss apacity C al mass p ign assessr used instea	2 3 145.4 47.1 ements oof windo s on both s, W/K = Cm = S( cm	3 , m <sup>2</sup> sides of ini = S (A x A x k ) ter (TMP ere the det tailed calcu x Y) calc	$\frac{1.61}{1.61}$	ndow U-va ls and part - TFA) ir construct using Ap	11.8         5.91         8.32         1.61476         47.13         117.3         45.52         239.7         alue calculations         h kJ/m²K         ion are not         ppendix k	x1 x1 x1 88 x1 3 x 1 x 2 x 5 ated using	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.7 ) + ( 0.13 0.13 0.13 0.13 g formula 1/ (26)(30)	$\begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\$	15.64 7.84 11.03 2.74513 6.1269 21.12 5.92 re)+0.04] a .(30) + (32 tive Value:	2) + (32a).	(32e) =	72.3 0 250	(27) (27) (27) (27b) (27b) (28) (29) (30) (31) (31) 9 (33) (34) (35) 9 (36)

Ventila	tion hea	at loss ca	alculated	d monthly	ý				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	64.41	63.95	63.49	61.34	60.93	59.06	59.06	58.71	59.78	60.93	61.75	62.6		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	167.19	166.73	166.27	164.12	163.71	161.84	161.84	161.49	162.56	163.71	164.53	165.38		
								•		-	Sum(39)1.	12 /12=	164.12	(39)
		meter (H	,	<b></b>					. ,	= (39)m ÷				
(40)m=	1.4	1.4	1.39	1.38	1.37	1.36	1.36	1.35	1.36	1.37	1.38	1.39		
Numbe	er of day	vs in moi	nth (Tab	le 1a)					,	Average =	Sum(40)1	12 /12=	1.38	(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 ene	gy requ	irement:								kWh/ye	ar:	
A			. 1											( )
		ipancy, l 9. N = 1		: [1 - exp	(-0.0003	49 x (TF	- A -13.9	)2)] + 0.0	)013 x ( <sup>-</sup>	TFA -13.		86		(42)
	A £ 13.9				(			)_)] * •			-,			
								(25 x N) to achieve		o torgot o		2.13		(43)
		-		r day (all w		-	-		a waler ut	se largel o	I			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate				ach month	,			Ŭ Ŭ	Ocp		1107	Dee		
(44)m=	112.34	108.26	104.17	100.09	96	91.92	91.92	96	100.09	104.17	108.26	112.34		
										Total = Su	m(44) <sub>112</sub> =		1225.56	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x C	0Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	166.6	145.71	150.36	131.09	125.78	108.54	100.58	115.42	116.79	136.11	148.58	161.34		
										Total = Su	m(45) <sub>112</sub> =		1606.9	(45)
			• ·					boxes (46,	. ,					
	24.99		22.55	19.66	18.87	16.28	15.09	17.31	17.52	20.42	22.29	24.2		(46)
	storage e volum		includir	na any sa	olar or M		storane	within sa	me ves	ما		0		(47)
-		. ,		ank in dw			-			001		0		(47)
	•	•			•			ombi boil	ers) ente	er '0' in (	47)			
	storage			,					,	,	,			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				(	0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
0,	lost fro		storage	e, kWh/ye				(48) x (49)	=			0		(50)
b) If m	v lost fro anufact	urer's de	storage	e, kWh/ye cylinder l	oss fact		known:	(48) x (49)	=					
b) If m Hot wa	v lost fro anufact iter stora	urer's de age loss	storage eclared of factor fi	e, kWh/ye cylinder l rom Tabl	oss fact		known:	(48) x (49)	=			0		(50) (51)
b) If m Hot wa If comr	v lost fro anufact iter stora nunity h	urer's de age loss eating s	storage eclared of factor fi ee secti	e, kWh/ye cylinder l rom Tabl	oss fact		known:	(48) x (49)	=			0		(51)
b) If m Hot wa If comr Volume	v lost fro anufact iter stora munity h e factor	urer's de age loss	storage eclared o factor fi ee secti ble 2a	e, kWh/ye cylinder l rom Tabl on 4.3	oss fact		known:	(48) x (49)	=					
b) If m Hot wa If comr Volume Tempe	v lost fro anufact iter stora nunity h e factor erature fa	urer's de age loss eating s from Ta actor fro	storage eclared o factor fi ee secti ble 2a m Table	e, kWh/ye cylinder l rom Tabl on 4.3	oss facte e 2 (kWI		known: iy)	(48) x (49) (47) x (51)		53) =		0		(51) (52)
b) If m Hot wa If comr Volume Tempe Energy	v lost fro anufact iter stora munity h e factor erature fa v lost fro	urer's de age loss eating s from Ta actor fro	storage eclared o factor fi ee secti ble 2a m Table	e, kWh/ye cylinder l rom Tabl on 4.3 2b	oss facte e 2 (kWI		known: iy)			53) =		0 0 0		(51) (52) (53)
b) If m Hot wa If comr Volume Tempe Energy Enter	v lost fro lanufact iter stora munity h e factor erature fa v lost fro (50) or (	urer's de age loss eating s from Ta actor fro m water 54) in (5	storage eclared of factor fr ee secti ble 2a m Table storage 55)	e, kWh/ye cylinder l rom Tabl on 4.3 2b	oss facto e 2 (kWl ear		known: ıy)		x (52) x (			0 0 0 0 0 0		(51) (52) (53) (54)

If cylinder conta	ins dedicate	ed 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)
Primary circu	uit loss (ar	nnual) fro	om Table	Э 3							0		(58)
Primary circu					59)m = (	(58) ÷ 36	65 × (41)	m					
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	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 o	alculated	for each	month	(61)m =	(60) ÷ 36	65 × (41	)m						
(61)m= 50.96	6 46.03	50.96	49.32	48.92	45.33	46.84	48.92	49.32	50.96	49.32	50.96		(61)
Total heat re	quired for	water h	eating ca	alculated	l for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 217.5	6 191.74	201.32	180.4	174.7	153.87	147.42	164.34	166.11	187.07	197.89	212.3		(62)
Solar DHW inpu	it calculated	using App	endix G o	Appendix	H (negativ	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additior	nal lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix C	<u>3)</u>					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water heater													
(64)m= 217.5	6 191.74	201.32	180.4	174.7	153.87	147.42	164.34	166.11	187.07	197.89	212.3		-
							Outp	out from wa	ater heate	r (annual)₁	12	2194.72	(64)
Heat gains fi	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m	]	
<mark>(65)</mark> m= 68.13	59.96	62.73	55.92	54.05	47.42	45.15	50.61	51.16	58	61.73	66.39		(65)
include (57	7)m in cal	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. Internal	gains (see	e Table 5	5 and 5a	):									
Metabolic ga	ins (Table	e 5), Wat	ts	_		-			_		-		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
<mark>(66)</mark> m= 143.0	1 143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01		(66)
Lighting gair	is (calcula	ted in Ap	opendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5				_	
(67)m= 25.33	3 22.5	18.3	13.85	10.36	8.74	9.45	12.28	16.48	20.93	24.43	26.04		(67)
Appliances g	jains (calo	culated ir	n Appeno	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m= 284.1	8 287.13	279.7	263.88	243.91	225.14	212.6	209.65	217.08	232.9	252.87	271.64		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equa	tion L15	or L15a	), also se	e Table	5				
(69)m= 37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3		(69)
Pumps and f	ans gains	(Table &	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	on (nega	tive valu	es) (Tab	ole 5)								
(71)m= -114.4	1	1		ì									(71)
	1 -114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41		()
Water heatin			-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41		()
Water heatin (72)m= 91.58	ig gains (		-114.41 77.66	-114.41 72.65	-114.41 65.86	-114.41 60.69	-114.41 68.02	-114.41 71.06	-114.41 77.95	-114.41 85.74	-114.41 89.23		(72)
	ig gains ( <sup>-</sup> 8 89.22	Fable 5) 84.32	I	I	65.86	60.69		71.06	77.95	85.74	89.23		
(72)m= 91.58	ig gains ( <sup>-</sup> 8 89.22	Fable 5) 84.32	I	I	65.86	60.69	68.02	71.06	77.95	85.74	89.23		
(72)m= 91.58 Total intern	ag gains ( <sup>-</sup> 89.22 al gains = 467.76	Fable 5) 84.32	77.66	72.65	65.86 (66)	60.69 m + (67)m	68.02 n + (68)m +	71.06 - (69)m + (	77.95 (70)m + (7	85.74 1)m + (72)	89.23 m		(72)
(72)m=         91.58           Total interna         (73)m=           (73)m=         470           6. Solar gains and Solar ga	g gains ( 89.22 al gains = 467.76 ns: e calculated	Table 5)         84.32         451.22         using sola	77.66	72.65 395.82	65.86 (66) 368.65 and associ	60.69 m + (67)m 351.64 iated equa	68.02 + (68)m + 358.85	71.06 + (69)m + ( 373.53	77.95 (70)m + (7 400.69	85.74 1)m + (72) 431.94 le orientat	89.23 m 455.81		(72)
(72)m= 91.58 <b>Total intern</b> (73)m= 470 6. Solar gai	g gains ( 89.22 al gains = 467.76 ns: e calculated	Fable 5) 84.32 451.22 using sola actor	77.66	72.65 395.82 Table 6a	65.86 (66) 368.65 and associ	60.69 m + (67)m 351.64 iated equa	68.02 + (68)m + 358.85	71.06 + (69)m + ( 373.53	77.95 (70)m + (7 400.69 te applicat	85.74 1)m + (72) 431.94	89.23 m 455.81	Gains (W)	(72)

Northeast 0.9x	0.77	٦.	0.00	1	44.00	٦.,	0.00		0.7	1	00.00	(75)
Northeast 0.9x	0.77		8.32	×	11.28	X	0.63	X	0.7	=	28.69	
Northeast 0.9x	0.77	X N	8.32	X	22.97	X 1	0.63	X	0.7	=	58.4	(75)
L	0.77	X 	8.32	X	41.38	X 	0.63	X	0.7	=	105.21	(75)
Northeast 0.9x	0.77	X	8.32	X	67.96	X	0.63	X	0.7	=	172.79	(75)
Northeast 0.9x	0.77	×	8.32	X	91.35	X	0.63	X	0.7	=	232.27	(75)
Northeast 0.9x	0.77	×	8.32	X	97.38	X	0.63	X	0.7	=	247.62	(75)
Northeast 0.9x	0.77	X	8.32	×	91.1	×	0.63	X	0.7	=	231.64	(75)
Northeast 0.9x	0.77	×	8.32	X	72.63	X	0.63	x	0.7	=	184.67	(75)
Northeast 0.9x	0.77	X	8.32	×	50.42	x	0.63	x	0.7	=	128.2	(75)
Northeast 0.9x	0.77	X	8.32	×	28.07	x	0.63	x	0.7	=	71.37	(75)
Northeast 0.9x	0.77	x	8.32	x	14.2	x	0.63	x	0.7	=	36.1	(75)
Northeast 0.9x	0.77	x	8.32	x	9.21	x	0.63	x	0.7	=	23.43	(75)
Southeast 0.9x	0.77	x	11.8	x	36.79	x	0.63	x	0.7	=	132.69	(77)
Southeast 0.9x	0.77	x	11.8	x	62.67	x	0.63	x	0.7	=	226.02	(77)
Southeast 0.9x	0.77	x	11.8	x	85.75	x	0.63	x	0.7	=	309.24	(77)
Southeast 0.9x	0.77	x	11.8	x	106.25	x	0.63	x	0.7	=	383.17	(77)
Southeast 0.9x	0.77	x	11.8	x	119.01	x	0.63	x	0.7	=	429.18	(77)
Southeast 0.9x	0.77	x	11.8	x	118.15	x	0.63	x	0.7	=	426.08	(77)
Southeast 0.9x	0.77	x	11.8	x	113.91	x	0.63	x	0.7	=	410.78	(77)
Southeast 0.9x	0.77	x	11.8	x	104.39	x	0.63	x	0.7	=	376.46	(77)
Southeast 0.9x	0.77	x	11.8	x	92.85	x	0.63	x	0.7	=	334.85	(77)
Southeast 0.9x	0.77	×	11.8	×	69.27	x	0.63	x	0.7	=	249.8	(77)
Southeast 0.9x	0.77	x	11.8	x	44.07	x	0.63	x	0.7	=	158.93	(77)
Southeast 0.9x	0.77	x	11.8	x	31.49	x	0.63	x	0.7	=	113.55	(77)
Southwest <sub>0.9x</sub>	0.77	x	5.91	x	36.79	]	0.63	x	0.7	=	66.46	(79)
Southwest <sub>0.9x</sub>	0.77	x	5.91	x	62.67	]	0.63	x	0.7	=	113.2	(79)
Southwest <sub>0.9x</sub>	0.77	x	5.91	x	85.75	]	0.63	x	0.7	=	154.88	(79)
Southwest <sub>0.9x</sub>	0.77	x	5.91	x	106.25	]	0.63	x	0.7	=	191.91	(79)
Southwest <sub>0.9x</sub>	0.77	x	5.91	x	119.01	]	0.63	x	0.7	=	214.95	(79)
Southwest0.9x	0.77	x	5.91	x	118.15	]	0.63	x	0.7	=	213.4	(79)
Southwest <sub>0.9x</sub>	0.77	x	5.91	x	113.91	]	0.63	x	0.7	=	205.74	(79)
Southwest <sub>0.9x</sub>	0.77	x	5.91	x	104.39		0.63	x	0.7	=	188.55	(79)
Southwest0.9x	0.77	x	5.91	x	92.85	]	0.63	x	0.7	=	167.71	(79)
Southwest <sub>0.9x</sub>	0.77	x	5.91	x	69.27	]	0.63	x	0.7	=	125.11	(79)
Southwest <sub>0.9x</sub>	0.77	×	5.91	×	44.07	]	0.63	x	0.7	=	79.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	5.91	×	31.49	]	0.63	x	0.7	=	56.87	(79)
Rooflights 0.9x	1	x	1.61	×	26	×	0.63	x	0.7	=	16.66	(82)
Rooflights 0.9x	1	×	1.61	×	54	×	0.63	x	0.7	=	34.61	(82)
Rooflights 0.9x	1	x	1.61	×	96	) ×	0.63	x	0.7	=	61.53	(82)
Rooflights 0.9x	1	×	1.61	×	150	×	0.63	x	0.7	=	96.14	(82)
Rooflights 0.9x	1	×	1.61	×	192	×	0.63	x	0.7	=	123.05	(82)

	Rooflights $0.9x$ 1 x 1.61 x 200 x 0.63 x 0.7 = 128.18 (82)													
Rooflights 0.9x	1	×	1.6	61	x	200	×	0.63	x	0.7	=	128.18	(82)	
Rooflights 0.9x	1	x	1.6	61	x	189	x	0.63	x	0.7	=	121.13	(82)	
Rooflights 0.9x	1	×	1.6	61	x	157	<b>x</b>	0.63	x	0.7	=	100.62	(82)	
Rooflights 0.9x	1	x	1.6	61	x	115	x	0.63	x	0.7	=	73.7	(82)	
Rooflights 0.9x	1	x	1.6	61	x	66	) x [	0.63	x	0.7	=	42.3	(82)	
Rooflights 0.9x	1	x	1.6	61	x	33	) x [	0.63	x	0.7	=	21.15	(82)	
Rooflights 0.9x	1	x	1.6	61	x	21	) x [	0.63	_ x [	0.7	=	13.46	(82)	
Solar <u>g</u> ains ir	n watts, ca	alculated	for eac	h month	-	-	(83)m =	Sum(74)m .	(82)m	-	-			
(83)m= 244.5		630.87	844	999.45	1015.28		850.29	9 704.46	488.57	295.78	207.31		(83)	
Total gains –		and solar	(84)m =	· ,	· ,									
(84)m= 714.49	899.98	1082.09	1268.3	1395.27	1383.93	1320.94	1209.1	5 1077.99	889.26	727.72	663.13		(84)	
7. Mean inte	ernal temp	perature	(heating	season	)									
Temperatur	e during h	neating p	eriods ir	n the livi	ng area	from Tal	ole 9, T	h1 (°C)				21	(85)	
Utilisation fa	actor for g	ains for I	iving are	ea, h1,m	(see Ta	able 9a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	J Sep	Oct	Nov	Dec			
(86)m= 1	0.99	0.98	0.94	0.85	0.68	0.52	0.58	0.83	0.97	1	1		(86)	
Mean intern	al temper	ature in	living an	ea T1 (fo	ullow ste	$\frac{1}{2}$ and $\frac{1}{2}$ and $\frac{1}{2}$	7 in Tal	nle 9c)						
(87)m= 19.43		19.98	20.4	20.74	20.93	20.98	20.97		20.36	19.82	19.4		(87)	
			oriodo i		l du allina	l from To								
Temperatur (88)m= 19.76		19.77	19.78	19.78	19.8	19.8	19.8	19.79	19.78	19.78	19.77		(88)	
						1		10.70	13.70	13.70	13.77		(00)	
Utilisation fa		r i		r – –	r È	T	Г					l	(00)	
(89)m= 1	0.99	0.98	0.92	0.79	0.58	0.39	0.45	0.75	0.96	0.99	1		(89)	
Mean intern	al temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	o 7 in Tabl	le 9c)					
(90)m= 17.7	18.01	18.5	19.1	19.54	19.75	19.79	19.79		19.06	18.27	17.66		(90)	
								1	fLA = Livir	ng area ÷ (	4) =	0.15	(91)	
Mean intern	al temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 –	fLA) × T2						
(92)m= 17.96	18.26	18.72	19.3	19.72	19.93	19.97	19.97	19.84	19.26	18.51	17.92		(92)	
Apply adjus	tment to t	he mean	interna	l temper	ature fro	m Table	e 4e, w	here appro	opriate					
(93)m= 17.96	18.26	18.72	19.3	19.72	19.93	19.97	19.97	19.84	19.26	18.51	17.92		(93)	
8. Space he	ating req	uirement												
Set Ti to the			•		ied at st	ep 11 of	Table	9b, so tha	ıt Ti,m=(	76)m an	d re-calc	culate		
the utilisatio		<u> </u>						0	0.1		Du	l		
Jan Utilication fo	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation fa	0.99	0.97	0.91	0.79	0.59	0.41	0.47	0.75	0.95	0.99	1		(94)	
Useful gains					0.00	0.41	0.47	0.10	0.00	0.00			()	
(95)m= 711.17	1	<u> </u>	, ,	1100.22	819.09	539.26	564.72	2 809.96	842.25	720.47	660.86		(95)	
Monthly ave														
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)	
Heat loss ra	te for me	an intern	al temp	erature,	Lm,W:	 =[(39)m	x [(93)	m— (96)m	]	<u>I</u>	1	I		
	8 2228.16			1	862.97	545.81	576.3		1417.6	1876.56	2269.52		(97)	
Space heati	ng require	ement fo	r each n	nonth, k	Nh/mon	th = 0.02	24 x [(9	7)m – (95	)m] x (4	1)m	•			
(98)m= 1170.2	4 899.84	732.74	396.18	158.88	0	0	0	0	428.06	832.39	1196.84			
												-		

								Tota	l per year	(kWh/year	<sup>.</sup> ) = Sum(9	8)15,912 =	5815.16	(98)
Space	e heatin	g require	ement ir	n kWh/m²	/year								48.78	(99)
9a. En	ergy reo	quiremer	nts – Ind	lividual h	eating s	ystems i	ncluding	micro-C	CHP)					_
•	e heati	•												-
	•			econdar		mentary			(22.1)				0	(201)
				nain syst				(202) = 1 -					1	(202)
			-	main sys				(204) = (2	02) × [1 –	(203)] =			1	(204)
				ting syste									93.4	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	n, %	-					0	(208)
_	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space		ř ·	<u>```</u>		i		0	0	0	429.00	022.20	1106.04	1	
( )		899.84	732.74	396.18	158.88	0	0	0	0	428.06	832.39	1196.84		
(211)m	$1 = \{[(98) \\ 1252.94 ]$	i	4)] } x ^ 784.51	100 ÷ (20 424.17	)6) 170.11	0	0	0	0	458.31	891.21	1281.41	1	(211)
	1202.94	903.43	764.51	424.17	170.11	0	0			ar) = Sum(2)			6226.08	(211)
Snac	a haatin	a fuel (s	econdar	ry), kWh/	month				(	,	- 7 715,1012	2	0220.00	
•		01)] } x 1		• /	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
		•		-				Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	Ē	0	(215)
	heating													
Output	from w 217.56		ter (calc 201.32	ulated a	bove) 174.7	153.87	147.42	164.34	166.11	187.07	197.89	212.3		
Efficier		ater hea		100.4	174.7	155.07	147.42	104.34	100.11	107.07	197.09	212.3	80.3	(216)
(217)m=	-	88.45	88.01	86.98	84.81	80.3	80.3	80.3	80.3	87.07	88.27	88.72		(217)
· · ·		ı heating,	kWh/m	onth										
(219)m	n = (64)	<u>m x 100</u>	) ÷ (217	)m	1	1	1	1	1	1	1	1	1	
(219)m=	245.41	216.79	228.74	207.41	205.99	191.62	183.58	204.65	206.86	214.85	224.2	239.3		٦
<b>A</b> nn 1 1 0								TULA	I = Sum(2		Nhhaar		2569.39	(219)
	I totals		ed, main	system	1					ĸ	Wh/year	-	kWh/year 6226.08	٦
•	-	fuel use											2569.39	-
	•			electric	kaan-ha	+							2000.00	
				electric	Keep-110	L							1	(000.)
		ng pump										30		(230c)
boiler	with a	fan-assis	sted flue									45		(230e)
Total e	lectricit	y for the	above,	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electri	city for I	ighting											447.42	(232)
12a. (	CO2 em	nissions ·	– Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHF	)					
							ergy				ion fac	tor	Emissions	
-		<i>.</i>					/h/year			kg CO			kg CO2/yea	-
Space	heating	) (main s	ystem 1	)		(21)	1) x			0.2	16	=	1344.83	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	554.99	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1899.82	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	232.21	(268)
Total CO2, kg/year	sum	of (265)(271) =		2170.96	(272)

TER =

18.21 (273)

				User D	etails:						
Assessor Name:	Mitchell Fi	nn			Strom	a Num	ber:		STRO	029125	
Software Name:	Stroma FS	AP 201	2		Softwa	are Ver	rsion:		Versic	on: 1.0.3.11	
			Р	roperty .	Address	: House	2				
Address :	House 2, Se	outh of 2	7a West	t End La	ne, Lond	don, NW	6 4QJ				
1. Overall dwelling dimer	nsions:										
0				<b></b>	a(m²)		Av. Hei	• • •	1	Volume(m <sup>3</sup> )	٦
Ground floor				4	1.61	(1a) x	2	.45	(2a) =	101.94	(3a)
First floor				4	1.61	(1b) x	2	.75	(2b) =	114.43	(3b)
Second floor				2	5.43	(1c) x	2	2.9	(2c) =	73.75	(3c)
Total floor area TFA = (1a	)+(1b)+(1c)+	(1d)+(1e	)+(1r	n) <u>1</u>	08.65	(4)			_		_
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	290.12	(5)
2. Ventilation rate:											
	main heating		econdar leating	у	other		total			m <sup>3</sup> per hour	
Number of chimneys	0	+	0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0	+	0	+	0	] = [	0	× 2	20 =	0	(6b)
Number of intermittent far	IS					- Ē	4	x ^	0 =	40	(7a)
Number of passive vents						Ē	0	x ^	0 =	0	(7b)
Number of flueless gas fir	es					Γ	0	x 4	40 =	0	(7c)
									Air ob		_
		(0	-) · (Ch.) · (7	<b>(</b> , <b>)</b> , ( <b>7</b> , <b>)</b> , (	7-)	-				hanges per hou	-
Infiltration due to chimney If a pressurisation test has be						continue fr	40		÷ (5) =	0.14	(8)
Number of storeys in th			a, procee	u io ( <i>11)</i> , (	Julei Wise (	Jonunue II	0111 (9) 10 (	10)		0	(9)
Additional infiltration		- /						[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel o	r timber f	frame or	0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall are pre			ponding to	the great	er wall are	a (after					_
deducting areas of opening If suspended wooden fl			ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente		•	,	,	,,					0	(13)
Percentage of windows	and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, o	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabilit	ty value, then	(18) = [(1	7) ÷ 20]+(8	8), otherwi	ise (18) = (	(16)				0.39	(18)
Air permeability value applies		on test has	s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides sheltered	ł				(20) 1	[0 075 v (4	0)1			0	(19)
Shelter factor					(20) = 1 -		[9]] =			1	(20)
Infiltration rate incorporati	-				(21) = (18	) x (20) =				0.39	(21)
Infiltration rate modified for				11	۸	0.00	0	Nev	Dee	1	
	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind spe			0.0	2.0	0.7	4	4.0	4 5	4 7	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	J	

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
~	0.49	0.48	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46		
		c <i>tive air</i> al ventila	-	rate for t	he appli	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)), othe	rwise (23b)	) = (23a)			0	(23b)
				iency in %									0	(23c)
a) If	balance	d mecha	anical ve	entilation	with he	at recove	erv (MVF	HR) (24a	a)m = (22	2b)m + (2	23b) × [1	– (23c)	-	(200)
, (24a)m=		0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mecha	anical ve	ntilation	without	heat rec	overy (N	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)
,				tilation o hen (24o	•	•			outside b) m + 0.	5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous m = (22t	•	•			oft 2b)m² x	0.5]				
(24d)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.58	0.59	0.6	0.6		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.58	0.59	0.6	0.6		(25)
3. He	at losse	s and he	at loss r	paramete	er:									
ELEN		Gros area	S	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·l		A X k kJ/K
Doors						2.2	x	1	= [	2.2				(26)
Windo	ws Type	e 1				10	x1/	/[1/( 1.4 )+	0.04] =	13.26				(27)
Windov	ws Type	92				11.67	· x1/	/[1/( 1.4 )+	0.04] =	15.47				(27)
Rooflig	ghts					2.73	x1/	/[1/(1.7) +	0.04] =	4.641				(27b)
Floor						41.61	x	0.13	=	5.4093				(28)
Walls		55.6	9	23.8	7	31.82	<u>x</u>	0.18	] = [	5.73				(29)
Roof		41.6	1	2.73	;	38.88	3 X	0.13	] = [	5.05				(30)
Total a	rea of e	lements	, m²			138.9	1							(31)
				effective wi nternal wal			ated using	formula 1	/[(1/U-valu	e)+0.04] a	ns given in	paragraph	n 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				51.47	(33)
Heat c	apacity	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	0	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	∩ kJ/m²K			Indica	tive Value:	Medium		250	(35)
can be ι	ised inste	ad of a de	tailed calc	ulation.				ecisely the	e indicative	values of	TMP in Ta	able 1f		
	-			culated u	• •	•	<						18.46	(36)
	of therma abric he		are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			60.00	(37)
			alculated	monthly							25)m x (5)		69.92	(37)
	Jan	Feb	Mar	Apr	, May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

Heat transfer coefficient, W/K       (39)m = (37) + (38)m         Average = Sum(39)112 / 12= 126.51         Heat loss parameter (HLP), W/m <sup>2</sup> K         (40)m = (39)m ÷ (4)         (40)m = (39)m ÷ (4)         (40)m = (39)m ÷ (4)         Average = Sum(40) <sub>112</sub> /12= 1.16         Number of days in month (Table 1a)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec	](39) ](40) (41) (42) (43)
Average = Sum(39) <sub>112</sub> /12=       126.51         Heat loss parameter (HLP), W/m <sup>2</sup> K       (40)m = (39)m $\div$ (4)         (40)m = (39)m $\div$ (4)         (40)m = (1.19       1.18       1.16       1.16       1.14       1.14       1.15       1.16       1.17       1.18         Average = Sum(40) <sub>112</sub> /12=       1.16         Number of days in month (Table 1a)	(40) (41) (42)
Heat loss parameter (HLP), W/m²K       (40)m = $(39)m \div (4)$ (40)m =       1.19       1.18       1.16       1.14       1.14       1.15       1.16       1.17       1.18         Average = Sum(40) <sub>112</sub> /12 =         Number of days in month (Table 1a)	(40) (41) (42)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(41)
Average = Sum(40) <sub>112</sub> /12= 1.16 Number of days in month (Table 1a)	(41)
Number of days in month (Table 1a)	(41)
Jan Feb Mar Ang May Jun Jul Aug Sen Oct Nov Dec	(42)
Jail Teb Ivial Api Iviay Juli Juli Aug Jep Oct Ivov Dec	(42)
(41)m= 31 28 31 30 31 30 31 31 30 31 30 31 30 31	
4. Water heating energy requirement: kWh/year:	
Assumed occupancy, N 2.81 if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1	(13)
Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ 100.85	(43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	
Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	
(44)m= 110.94 106.91 102.87 98.84 94.8 90.77 90.77 94.8 98.84 102.87 106.91 110.94	
$Total = Sum(44)_{112} = 1210.25$	(44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)	
(45)m= 164.52 143.89 148.48 129.45 124.21 107.18 99.32 113.97 115.33 134.41 146.72 159.33	
$Total = Sum(45)_{112} = 1586.82$ If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)
	(40)
(46)m=         24.68         21.58         22.27         19.42         18.63         16.08         14.9         17.1         17.3         20.16         22.01         23.9           Water storage loss:	(46)
Storage volume (litres) including any solar or WWHRS storage within same vessel	(47)
If community heating and no tank in dwelling, enter 110 litres in (47)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	
Water storage loss:	(10)
a) If manufacturer's declared loss factor is known (kWh/day):	(48)
Temperature factor from Table 2b       0         Energy lost from water storage, kWh/year       (48) x (49) =       0	(49)
Energy lost from water storage, kWn/year $(48) \times (49) = 0$ b) If manufacturer's declared cylinder loss factor is not known:	(50)
Hot water storage loss factor from Table 2 (kWh/litre/day)	(51)
If community heating see section 4.3	
Volume factor from Table 2a     0       Temperature factor from Table 2b     0	(52) (53)
Energy lost from water storage, kWn/year $(47) \times (51) \times (52) \times (53) = 0$ Enter (50) or (54) in (55) 0	(54) (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m$	( = <del>-</del> /
(56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(56)
If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$ , else $(57)m = (56)m$ where (H11) is from Appendix H	
(57)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(57)

Drimor		loop (or		m Table								0		(58)
	•	•	,	om Table		50m - 0	(59) · 26	65 × (41)	m			0	I	(00)
						,	. ,	ng and a		r thermo	stat)			
(59)m=		0	0		0		0		0	0	0	0		(59)
									-	-	-	-	I	
	r		· · · · · · · · · · · · · · · · · · ·	month (	, 	, , 	· · · ·	, 					1	(04)
(61)m=	50.96	46.03	50.96	48.74	48.31	44.76	46.25	48.31	48.74	50.96	49.32	50.96		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	215.48	189.92	199.44	178.19	172.52	151.95	145.58	162.28	164.08	185.37	196.04	210.29		(62)
Solar DI	HW input o	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	y) (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)
Output	t from w	ater hea	ter											
(64)m=	215.48	189.92	199.44	178.19	172.52	151.95	145.58	162.28	164.08	185.37	196.04	210.29		
								Outp	out from wa	ater heate	r (annual)₁	12	2171.12	(64)
Heat g	ains fro	m water	heating	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	« [(46)m	+ (57)m	+ (59)m	]	
(65)m=	67.44	59.35	62.11	55.23	53.38	46.83	44.59	49.97	50.53	57.43	61.11	65.72	_	(65)
inclu	ude (57)	n in calo	culation	of (65)m	only if c	vlinder i	s in the o	dwellina	or hot w	ater is fr	om com	munity h	eating	
	. ,			5 and 5a	-	<b>,.</b>						,	g	
Metab		Feb	<u>5), Wat</u> Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m-	Jan 140.32	140.32	140.32	Apr 140.32	140.32	140.32	140.32	Aug 140.32	140.32	140.32	140.32	140.32		(66)
(66)m=										140.32	140.32	140.32	l	(00)
-	<u> </u>	È	· · · ·	·	· · ·		· · · ·	lso see	· · · · · ·				I	(07)
(67)m=	24.04	21.35	17.36	13.14	9.82	8.29	8.96	11.65	15.64	19.85	23.17	24.7	l	(67)
Applia		· · ·	ulated in	n Append	dix L, eq	i	13 or L1	3a), also	see Ta	i	1	1	1	
(68)m=	269.6	272.4	265.35	250.34	231.4	213.59	201.69	198.9	205.95	220.95	239.9	257.71		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	), also se	e Table	5	-	-		
(69)m=	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03		(69)
Pumps	s and fai	ns gains	(Table \$	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatic	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26		(71)
Water	heating	gains (T	able 5)	1			1	1	1	1	1			
(72)m=	90.65	88.32	83.48	76.7	71.74	65.04	59.93	67.17	70.19	77.19	84.88	88.33		(72)
		gains =						I n + (68)m -	l + (69)m + (			m	I	
(73)m=	452.38	450.16	434.29	408.29	381.06	355.02	338.68	345.81	359.87	386.1	416.05	438.84		(73)
	lar gains		I			000.02			000.07		1 10.00	+00.04		()
			usina sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	e applicat	le orientat	ion.		
-		Access F	-	Area		Flu			a		FF		Gains	

Unentation.	Table 6d	ſ	m²		Table 6a		g_ Table 6b		Table 6c		(W)	
Northeast 0.9	0.77	x	11.67	x	11.28	x	0.63	x	0.7	=	40.24	(75)
Northeast 0.9	0.77	x	11.67	x	22.97	×	0.63	x	0.7	=	81.91	(75)

_		_				_						_
Northeast 0.9x	0.77	x	11.67	x	41.38	x	0.63	×	0.7	=	147.58	(75)
Northeast 0.9x	0.77	x	11.67	x	67.96	x	0.63	x	0.7	=	242.36	(75)
Northeast 0.9x	0.77	x	11.67	x	91.35	x	0.63	x	0.7	=	325.79	(75)
Northeast 0.9x	0.77	x	11.67	x	97.38	x	0.63	×	0.7	=	347.32	(75)
Northeast 0.9x	0.77	x	11.67	x	91.1	x	0.63	×	0.7	=	324.91	(75)
Northeast 0.9x	0.77	x	11.67	x	72.63	x	0.63	x	0.7	=	259.02	(75)
Northeast 0.9x	0.77	x	11.67	x	50.42	x	0.63	x	0.7	=	179.83	(75)
Northeast 0.9x	0.77	x	11.67	x	28.07	x	0.63	x	0.7	=	100.1	(75)
Northeast 0.9x	0.77	x	11.67	x	14.2	x	0.63	x	0.7	=	50.63	(75)
Northeast 0.9x	0.77	x	11.67	x	9.21	x	0.63	x	0.7	=	32.86	(75)
Southwest <sub>0.9x</sub>	0.77	x	10	×	36.79	1	0.63	×	0.7	=	112.45	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	62.67	1	0.63	×	0.7	=	191.54	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	85.75	1	0.63	×	0.7	=	262.07	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	106.25	1	0.63		0.7	=	324.72	(79)
Southwest <sub>0.9x</sub>	0.77	×	10	x	119.01	1	0.63	x	0.7	=	363.71	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	118.15	1	0.63	- ×	0.7	=	361.08	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	113.91	1	0.63	- ×	0.7	=	348.12	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	104.39	1	0.63	x	0.7	=	319.03	(79)
Southwest <sub>0.9x</sub>	0.77	] x	10	×	92.85	ĺ	0.63		0.7	=     =	283.77	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	69.27	1	0.63	x	0.7		211.69	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	44.07	1	0.63		0.7	=	134.69	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	31.49	1	0.63	ا × آ	0.7	=	96.23	(79)
Rooflights 0.9x	1	x	2.73	×	26	) x	0.63		0.7	=	28.17	(82)
Rooflights 0.9x	1	x	2.73	x	54	] x	0.63	i x	0.7	=	58.51	(82)
Rooflights 0.9x	1	x	2.73	x	96	] x	0.63	ا × آ	0.7	=	104.02	(82)
Rooflights 0.9x	1	x	2.73	x	150	x	0.63	x	0.7		162.53	(82)
Rooflights 0.9x	1	x	2.73	x	192	] x	0.63	×	0.7		208.04	(82)
Rooflights 0.9x	1	] x	2.73	×	200	] ×	0.63		0.7	=	216.71	(82)
Rooflights 0.9x	1	X	2.73	x	189	x	0.63	x	0.7	=     =	204.79	(82)
Rooflights 0.9x	1	x	2.73	x	157	] x	0.63	×	0.7		170.12	(82)
Rooflights 0.9x	1	] x	2.73	×	115	] x	0.63		0.7	=	124.61	(82)
Rooflights 0.9x	1	x	2.73	x	66	x	0.63	x	0.7	=	71.51	(82)
Rooflights 0.9x	1	x	2.73	x	33	] x	0.63	i x	0.7		35.76	(82)
Rooflights 0.9x	1	] x	2.73	x	21	] x	0.63		0.7	=	22.75	(82)
L		4		1		J		I		I		
Solar gains in v	vatts, calcul	ated	for each mon	th		(83)m	n = Sum(74)m	.(82)m				
(83)m= 180.86	331.96 513	3.67	729.61 897.5	4 9	25.11 877.82	748	.17 588.2	383.31	221.08	151.85		(83)
Total gains – in	ternal and s	solar	(84)m = (73)n	n + (	83)m, watts	•						
(84)m= 633.24	782.12 947	7.96	1137.9 1278.	6 12	280.13 1216.51	1093	3.98 948.07	769.4	637.12	590.68		(84)
7. Mean interr	nal temperat	ture (	heating sease	on)	·	-	· ·					
Temperature of			Ŭ	- í	area from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation fact	or for gains	for li	ving area, h1,	m (s	ee Table 9a)		·			I		
Jan	ĭ	/lar	Apr Ma	-r`	Jun Jul	A	ug Sep	Oct	Nov	Dec		
	-		-	-								

(86)m=	1	0.99	0.98	0.93	0.8	0.6	0.45	0.51	0.79	0.97	1	1	L	(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	19.69	19.88	20.2	20.59	20.87	20.97	21	20.99	20.9	20.51	20.03	19.66		(87)
Temp	erature	during h	neating p	beriods ir	n rest of	dwelling	from Ta	able 9, Ti	h2 (°C)					
(88)m=	19.93	19.93	19.93	19.95	19.95	19.97	19.97	19.97	19.96	19.95	19.95	19.94	l	(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	0.91	0.74	0.51	0.34	0.4	0.71	0.96	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.18	18.47	18.92	19.48	19.83	19.95	19.96	19.96	19.89	19.39	18.69	18.15		(90)
					-		-		f	LA = Livin	g area ÷ (4	4) =	0.18	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA x T1	+ (1 – fL	.A) × T2			-		
(92)m=	18.46	18.73	19.16	19.69	20.02	20.14	20.15	20.15	20.07	19.6	18.93	18.43		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.46	18.73	19.16	19.69	20.02	20.14	20.15	20.15	20.07	19.6	18.93	18.43		(93)
		ting requ												
				mperatui using Ta		ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
ine ui	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		tor for g			Ividy	Jun	001	Aug	Ocp	000	1100	Dee		
(94)m=	1	0.99	0.97	0.9	0.74	0.53	0.36	0.42	0.72	0.95	0.99	1		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	ـــــــــــــــــــــــــــــــــــــ							<u>.                                    </u>		
(95)m=	630.93	774.33	918.95	1022.4	948.02	674.17	439.98	461.68	684.06	729.87	631.89	589.13		(95)
Month	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	I	(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
(97)m=		1784.52			1049.15	688.4	441.68	465.24	746.73	1134.63	1501.89	1817.39		(97)
•		ř – –	r	or each n	i	· · · · · · · · · · · · · · · · · · ·		<u> </u>	,	<u> </u>	<u>,                                     </u>		l	
(98)m=	894.47	678.85	527.39	246.57	75.24	0	0	0	0	301.14	626.4	913.82		-
								Tota	l per year	(kWh/year	<sup>.</sup> ) = Sum(9	8)15,912 =	4263.88	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								39.24	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
	e heatir	0										1		_
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [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	ז, %					Ī	0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space				alculate					· ·	L		J	, -	
	894.47	678.85	527.39	246.57	75.24	0	0	0	0	301.14	626.4	913.82		
(211)m	n = {[(98	)m x (20	94)] } x 1	00 ÷ (20	)6)									(211)
	957.67	726.82	564.66	264	80.56	0	0	0	0	322.42	670.66	978.4		
								Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	4565.18	(211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (20	<b>U</b> (			monun									
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
		•					Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,101</sub>	2	0	(215)
Water heating													_
Output from w		1			454.05	445.50	400.00	404.00	405.07	400.04		1	
215.48	189.92	199.44	178.19	172.52	151.95	145.58	162.28	164.08	185.37	196.04	210.29		
Efficiency of w	r	· · · · · ·	05 07	02 12	00.2	00.2	00.2	00.2	06.07	07 77	00.22	80.3	(216)
(217)m= 88.25	87.98	87.38	85.87	83.12	80.3	80.3	80.3	80.3	86.27	87.77	88.32		(217)
Fuel for water (219)m = (64)	•												
(219)m= 244.18	215.86	228.23	207.51	207.56	189.22	181.29	202.1	204.33	214.88	223.35	238.09		
							Tota	I = Sum(2'	19a) <sub>112</sub> =			2556.61	(219)
Annual totals									k\	Wh/yea	r	kWh/year	_
Space heating	fuel use	ed, main	system	1								4565.18	
Water heating	fuel use	ed										2556.61	
Electricity for p	oumps, fa	ans and	electric	keep-ho	t								
central heatir	ng pump	:									30		(230c)
boiler with a	fan-assis	sted flue									45		(230e)
Total electricit	y for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for I	ighting											424.47	(232)
12a. CO2 em	nissions -	– Individ	lual heati	ng syste	ems inclu	uding mi	cro-CHP	)					
						<b>ergy</b> /h/year			<b>Emiss</b> kg CO2	<b>ion fac</b> 2/kWh	tor	<b>Emissions</b> kg CO2/yea	
Space heating	) (main s	ystem 1	)		(211	1) x			0.2	16	=	986.08	(261)
Space heating	(second	dary)			(218	5) x			0.5	19	=	0	(263)
Water heating					(219	9) x			0.2	16	=	552.23	(264)
Space and wa	iter heati	ng			(267	1) + (262) -	+ (263) + (	264) =				1538.31	(265)
Electricity for p	oumps, fa	ans and	electric	keep-ho	t (23 <sup>-</sup>	1) x			0.5	19	=	38.93	(267)
	•			-									

Total CO2, kg/year

TER =

16.54 (273)

1797.53

(272)

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

				User D	etails:						
Assessor Name:		Strom	a Num	STRO	O029125						
Software Name:		Softwa	are Ver	Versio	ion: 1.0.3.11						
			Р	roperty .	Address	House	3				
Address :	House 3, So	outh of 2	7a West	t End La	ne, Lono	don, NW	6 4QJ				
1. Overall dwelling dimer	nsions:										
Ground floor					a(m²)		Av. Hei	• • •		Volume(m <sup>3</sup> )	-
				4		(1a) x	2.	45	(2a) =	101.7	(3a)
First floor				4	1.51	(1b) x	2.	75	(2b) =	114.15	(3b)
Second floor				2	4.07	(1c) x	2	.9	(2c) =	69.8	(3c)
Total floor area TFA = (1a	ı)+(1b)+(1c)+	(1d)+(1e	)+(1r	n) <u>1</u>	07.09	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	285.65	(5)
2. Ventilation rate:										<u>, , , , , , , , , , , , , , , , , , , </u>	
	main heating		econdar eating	У	other	_	total			m <sup>3</sup> per hour	
Number of chimneys	0	+	0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0	] + [	0	+	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent far	าร					- Γ	4	x ^	0 =	40	(7a)
Number of passive vents						Γ	0	x ^	0 =	0	(7b)
Number of flueless gas fir	es					Γ	0	x 4	40 =	0	(7c)
									Air ob	ongoo nor ho	
		(0			- \	-			1	anges per ho	-
Infiltration due to chimney If a pressurisation test has be						continuo fr	40		÷ (5) =	0.14	(8)
Number of storeys in th			u, procee	<i>u i</i> 0 ( <i>11)</i> , (	Juliel Wise (	,onunue m	0111 (9) 10 (	10)		0	(9)
Additional infiltration	o di oni g (	-)						[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or	r timber f	rame or	0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening			ponding to	the great	er wall are	a (after					
If suspended wooden fl			ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent			,	,						0	(13)
Percentage of windows	and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	- (15) =		0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area										5	(17)
If based on air permeabili	ty value, then	(18) = [(1	7) ÷ 20]+(8	3), otherwi	se (18) = (	16)				0.39	(18)
Air permeability value applies		on test has	s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			-
Number of sides sheltered Shelter factor					(20) = 1 -	[0 075 x (1	9)1 =			0	(19)
Infiltration rate incorporati		(21) = (18	1	(20)							
Infiltration rate modified for	-		I		<u>,-</u> .) = (10	, (_0) =				0.39	(21)
	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe					1					I	
	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
					I						

Wind Fa	actor (22	2a)m =	(22)m ÷ '	4		_							_	
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted	d infiltra	tion rate	e (allowir	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.5	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46		
	<i>te effect</i> chanical		change h	ate for t	he appli	cable ca	se						0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a						a) × Fmv (e	equation (	N5)), other	wise (23b	) = (23a)			0	(23b)
								n Table 4h)					0	(23c)
a) If b	alanced	l mecha	anical ve	ntilation	with he	at recove	ery (MV	HR) (24a	ı)m = (22	2b)m + (1	23b) × [′	1 – (23c)	-	()
, (24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If b	alanced	Imecha	anical ve	ntilation	without	heat rec	covery (I	MV) (24b	)m = (22	2b)m + (2	23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,					•	•		on from o				•		
וו (24c)m=	0	< 0.5 ×	(230),	0 0	z) = (230)			c) = (22b)	0 nn + 0.	5 × (230	0	0	1	(24c)
· · ·	÷	•	÷	•	÷	, ,	Ť	on from l		0	0	0	J	(240)
,					•			0.5 + [(22		0.5]				
(24d)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(24d)
Effect	tive air c	hange	rate - en	ter (24a	) or (24t	o) or (24	c) or (24	ld) in box	(25)					
(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(25)
3. Heat	t losses	and he	eat loss p	aramet	ər:									
ELEMI	ENT	Gros area		Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²⊷		A X k kJ/K
Doors						2.2	x	1	=	2.2				(26)
Window	/s Type	1	Windows Type 1						-	4.05				(27)
Window	Windows Type 2					3.73	X	/[1/( 1.4 )+	0.04] =	4.95				
Windows Type 3						8.54	=	/[1/( 1.4 )+ /[1/( 1.4 )+	- I	4.95				(27)
							x1		0.04] =					(27) (27)
Roofligh	/s Type 3					8.54	x1	/[1/( 1.4 )+	0.04] = 0.04] =	11.32	5			
Roofligh Floor	/s Type 3					8.54 9.97	x1 x1 97 x1	/[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] =	11.32 13.22	╡╷			(27)
-	/s Type 3		4	24.44	4	8.54 9.97 2.3316	x1 x1 97 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + (	0.04] = [ 0.04] = [ 0.04] = [	11.32 13.22 3.96388	╡╷			(27) (27b)
Floor	/s Type 3	3		24.44		8.54 9.97 2.3316 41.51	x1 x1 97 x1 . x 6 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13	0.04] = [ 0.04] = [ 0.04] = [ = ]	11.32 13.22 3.96388 5.39629	╡╷			(27) (27b) (28)
Floor Walls	vs Type : nts	3 134. 41.5	51			8.54 9.97 2.3316 41.51 109.9	x1 x1 97 x1 x 6 x 3 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.18	0.04] = [ 0.04] = [ 0.04] = [ ] = [	11.32 13.22 3.96388 5.39629 19.79	╡╷			(27) (27b) (28) (29)
Floor Walls Roof Total are	rs Type ants ea of ele	3 134. 41.5 ements oof windo	i1 , m²	2.33	ndow U-va	8.54 9.97 2.3316 41.51 109.9 39.18 217.4	x1 97 x1 6 x 3 x 2	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.18	0.04] = [ 0.04] = [ 0.04] = [ = [ = [	11.32 13.22 3.96388 5.39629 19.79 5.09	9 [ ] [ ] [	paragraph		(27) (27b) (28) (29) (30)
Floor Walls Roof Total are * for windo	ea of ele ows and re the areas	3 134. 41.5 ements oof windo	, m² ows, use ef	2.33 ffective wi ternal walk	ndow U-va	8.54 9.97 2.3316 41.51 109.9 39.18 217.4	x1 97 x1 6 x 3 x 2	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.18 0.13	$\begin{array}{c} 0.04] = \\ 0.04] = \\ \\ 0.04] = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	11.32 13.22 3.96388 5.39629 19.79 5.09	9 [ ] [ ] [	paragraph	3.2 65.68	(27) (27b) (28) (29) (30) (31)
Floor Walls Roof Total are * for windo ** include Fabric h	ea of ele lows and re the areas	3 134. 41.5 ements oof winder oof winder oof winder on both s, W/K =	, m <sup>2</sup> ows, use ef sides of int = S (A x I	2.33 ffective wi ternal walk	ndow U-va	8.54 9.97 2.3316 41.51 109.9 39.18 217.4	x1 97 x1 6 x 3 x 2	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.18 0.13 g formula 1/	$\begin{array}{c} 0.04] = \\ 0.04] = \\ \\ 0.04] = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	11.32 13.22 3.96388 5.39629 19.79 5.09	9 [ ]			(27) (27b) (28) (29) (30) (31)
Floor Walls Roof Total are * <i>for windo</i> ** <i>include</i> Fabric h Heat cap	ea of ele ows and ro the areas neat loss pacity C	3 134. 41.5 ements oof windo on both s, W/K = cm = S(	, m <sup>2</sup> ows, use ef sides of int = S (A x I	2.33 ffective wi ternal walk	ndow U-va	8.54 9.97 2.3316 41.51 109.9 39.18 217.4 alue calcul titions	x1 97 x1 5 x 6 x 3 x 2 2 2	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.18 0.13 g formula 1/	$\begin{array}{c} 0.04] = \\ 0.04] = \\ \\ 0.04] = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	11.32 13.22 3.96388 5.39629 19.79 5.09	9 9 1 1 1 1 1 1 1 1 1 1 1 1 1		65.68	(27) (27b) (28) (29) (30) (31) (33)
Floor Walls Roof Total are * for windo ** include Fabric h Heat cap Thermal For design	ea of ele ows and ro the areas pacity C I mass p n assessn	3 134. 41.5 ements oof winde on both S, W/K = Cm = S( parame nents who	, m <sup>2</sup> ows, use ef sides of int = S (A x I (A x k ) ter (TMP	2.33 ffective winternal walk ternal walk U) P = Cm ÷	ndow U-va Is and part - TFA) ir	8.54 9.97 2.3316 41.51 109.9 39.18 217.4 alue calcul titions	x1 97 x1 x 6 x 3 x 2 ated using	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.18 0.13 g formula 1/	$\begin{array}{c} 0.04] = \\ 0.04] = \\ \\ 0.04] = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	11.32 13.22 3.96388 5.39629 19.79 5.09 <i>(a)</i> +0.04] a (30) + (32 tive Value	9 [ ]	(32e) =	65.68 0	(27) (27b) (28) (29) (30) (31) (31) (33) (34)
Floor Walls Roof Total are * for windo ** include Fabric h Heat cap Thermal For design can be use	ea of ele ows and ro the areas pacity C I mass p n assessn sed instead	$\begin{bmatrix} 134.\\ 41.5 \end{bmatrix}$ ements oof windo on both s, W/K = Cm = S( barame nents who d of a det	, m <sup>2</sup> ows, use eff sides of int = S (A x I (A x k ) ter (TMP ere the det	2.33	ndow U-va ls and part - TFA) ir construct	8.54 9.97 2.3316 41.51 109.9 39.18 217.4 alue calcul titions	x1 97 x1 97 x1 6 x 3 x 2 2 ated using t known p	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.13 0.13 g formula 1/ (26)(30)	$\begin{array}{c} 0.04] = \\ 0.04] = \\ \\ 0.04] = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	11.32 13.22 3.96388 5.39629 19.79 5.09 <i>(a)</i> +0.04] a (30) + (32 tive Value	9 [ ]	(32e) =	65.68 0	(27) (27b) (28) (29) (30) (31) (31) (33) (34)
Floor Walls Roof Total are * for windo * include Fabric h Heat cap Thermal For design can be use Thermal	ea of ele ows and ro the areas pacity C I mass p n assessn sed instead I bridges of thermal	3 $134.$ $41.5$ ements oof winde on both $W/K =$ $S, W/K =$	, m <sup>2</sup> ows, use ef sides of int = S (A x I (A x k) ter (TMP ere the det tailed calcu	2.33 ffective winternal walk ternal walk U) $P = Cm \div$ tails of the ilation. culated to	ndow U-va ls and part - TFA) ir construct using Ap	8.54 9.97 2.3316 41.51 109.9 39.18 217.4 alue calcul titions	x1 97 x1 97 x1 6 x 3 x 2 2 ated using t known p	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.7) + ( 0.13 0.13 0.13 g formula 1/ (26)(30)	0.04] = [ $0.04] = [0.04$	11.32 13.22 3.96388 5.39629 19.79 5.09 <i>(a)</i> +0.04] a (30) + (32 tive Value	9 [ ]	(32e) =	65.68 0 250	(27) (27b) (28) (29) (30) (31) (31) (33) (34) (35) (36)

Ventila	tion hea	t loss ca	alculated	d monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	58.79	58.34	57.89	55.81	55.42	53.6	53.6	53.27	54.3	55.42	56.21	57.03		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	152.52	152.07	151.63	149.54	149.15	147.34	147.34	147	148.04	149.15	149.94	150.77		
				•							Sum(39)1.	12 /12=	149.54	(39)
	oss para		i ,	<b></b>					. ,	= (39)m ÷				
(40)m=	1.42	1.42	1.42	1.4	1.39	1.38	1.38	1.37	1.38	1.39	1.4	1.41		
Numbe	er of day	rs in moi	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	ater heat	ing enei	rgy requ	irement:								kWh/ye	ear:	
A			NI .											(10)
	A > 13.9			(1 - exp	(-0.0003	849 x (TF	- A -13.9	)2)] + 0.(	)013 x ( <sup>-</sup>	TFA -13.		.8		(42)
if TF	A £ 13.9	9, N = 1									,			
								(25 x N) to achieve		se target o		0.61		(43)
		-		r day (all w		-	-		a water at	se largel o	1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate				ach month	,			-	000	•••				
(44)m=	110.67	106.65	102.62	98.6	94.57	90.55	90.55	94.57	98.6	102.62	106.65	110.67		
			Į	ļ			Į	ļ			m(44) <sub>112</sub> =		1207.31	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x E	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m=	164.12	143.54	148.12	129.14	123.91	106.92	99.08	113.7	115.05	134.09	146.36	158.94		_
lf instan	taneous w	ater heati	na at noini	t of use (no	hot water	storage)	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	-	1582.98	(45)
			• ·	19.37		• • •			17.26	20.11	21.95	22.04		(46)
	storage		22.22	19.37	10.09	10.04	14.00	17.05	17.20	20.11	21.90	23.04		(40)
	-		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	eating a	ind no ta	ank in dw	velling, e	nter 110	litres in	(47)						
			hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage					. (1) A (1	(1-)							
,				oss facto	or is kno	wn (kvvr	n/day):					0		(48)
	erature fa											0		(49)
•••			-	e, kWh/ye cylinder l		or is not		(48) x (49)	) =			0		(50)
				rom Tabl								0		(51)
	munity h	-			,							-		
	e factor											0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
			-	e, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
	(50) or (											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 cylinder contai	ns dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5 <sup>-</sup>	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)
Primary circu	it loss (ar	nnual) fro	om Table	e 3	-		-	-			0		(58)
Primary circu	it loss ca	culated	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss c	alculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 50.96	46.03	50.96	48.62	48.19	44.65	46.14	48.19	48.62	50.96	49.32	50.96		(61)
Total heat re	quired 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= 215.08	3 189.57	199.08	177.76	172.1	151.58	145.22	161.89	163.68	185.04	195.68	209.9		(62)
Solar DHW inpu	t calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add addition	al 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)
Output from	water hea	ter		-		-	-			-			
<mark>(64)</mark> m= 215.08	3 189.57	199.08	177.76	172.1	151.58	145.22	161.89	163.68	185.04	195.68	209.9		_
							Outp	out from w	ater heate	r (annual)₁	12	2166.58	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m= 67.31	59.23	61.99	55.09	53.25	46.72	44.48	49.85	50.41	57.32	60.99	65.59		(65)
include (57	)m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal g	gains (see	e Table 5	and 5a	):									
Metabolic ga	ins (Table	e 5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 139.8 <sup>-</sup>	139.81	139.81	139.81	139.81	139.81	139.81	139.81	139.81	139.81	139.81	139.81		(66)
Lighting gain	s (calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				-	
(67)m= 23.83	21.17	17.21	13.03	9.74	8.22	8.89	11.55	15.5	19.69	22.98	24.49		(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		_	-	
(68)m= 267.3 <sup>4</sup>	270.08	263.09	248.21	229.43	211.77	199.98	197.2	204.19	219.07	237.86	255.51		(68)
Cooking gain	s (calcula	-	-	L, equa	tion L15	or L15a)	), also se	e Table	5				
(69)m= 36.98	36.98	36.98	36.98	36.98	36.98	36.98	36.98	36.98	36.98	36.98	36.98		(69)
Pumps and fa		•											
	ans gains	(Table S	ōa)										
(70)m= 3	ans gains	(Table 5	5a) 3	3	3	3	3	3	3	3	3		(70)
(70)m= 3 Losses e.g. e	3	3	3			3	3	3		3	3	]	(70)
	3 evaporatio	3 on (nega	3	es) (Tab		3 -111.85	3 -111.85	3		3	3 -111.85		(70) (71)
Losses e.g. e (71)m= -111.8	3 evaporatio 5 -111.85	3 on (nega -111.85	3 tive valu	es) (Tab	le 5)	I	[	I	3	I		]	
Losses e.g. e	3 evaporatic 5 -111.85 g gains (1	3 on (nega -111.85	3 tive valu	es) (Tab	le 5)	I	[	I	3	I		]	
Losses e.g. e (71)m= -111.8 Water heatin	3 evaporatio 5 -111.85 g gains (7 88.15	3 on (nega -111.85 Table 5) 83.32	3 ti <b>ve valu</b> -111.85	es) (Tab -111.85	ole 5) -111.85 64.88	-111.85 59.78	-111.85 67.01	-111.85 70.02	3	-111.85 84.72	-111.85 88.16	]	(71)
Losses e.g. e (71)m= -111.89 Water heatin (72)m= 90.47	3 evaporatio 5 -111.85 g gains (1 88.15 al gains =	3 on (nega -111.85 Table 5) 83.32	3 ti <b>ve valu</b> -111.85	es) (Tab -111.85	ole 5) -111.85 64.88	-111.85 59.78	-111.85 67.01	-111.85 70.02	3 -111.85 77.05	-111.85 84.72	-111.85 88.16	   	(71)
Losses e.g. e (71)m= -111.8 Water heatin (72)m= 90.47 Total interna	3 evaporatio 5 -111.85 g gains (T 88.15 al gains = 5 447.34	3 on (nega -111.85 Table 5) 83.32	3 tive valu -111.85 76.52	es) (Tab -111.85 71.57	le 5) -111.85 64.88 (66)	-111.85 59.78 m + (67)m	-111.85 67.01 a + (68)m -	-111.85 70.02 + (69)m + (	3 -111.85 77.05 (70)m + (7	-111.85 84.72 1)m + (72)	-111.85 88.16 m		(71) (72)
Losses e.g. e (71)m= -111.8 Water heatin (72)m= 90.47 Total interna (73)m= 449.5	3 evaporatio 5 -111.85 g gains (1 88.15 al gains = 5 447.34 ns:	3 on (nega -111.85 Table 5) 83.32 431.57	3 tive valu -111.85 76.52 405.7	es) (Tab -111.85 71.57 378.68	et 5) -111.85 64.88 (66) 352.82	-111.85 59.78 m + (67)m 336.59	-111.85 67.01 + (68)m - 343.7	-111.85 70.02 + (69)m + 1 357.66	3 -111.85 77.05 (70)m + (7 383.75	-111.85 84.72 1)m + (72) 413.49	-111.85 88.16 m 436.1		(71) (72)

Northeast 0.9x	0.77	] ×	9.97	×	11.28	×	0.63	x	0.7	=	34.38	(75)
Northeast 0.9x	0.77	] ×	9.97	x	22.97	x	0.63	x	0.7	=	69.98	(75)
Northeast 0.9x	0.77	] ×	9.97	x	41.38	x	0.63	x	0.7	=	126.08	(75)
Northeast 0.9x	0.77	」 】 ×	9.97	x	67.96	   x	0.63	x	0.7	=	207.06	(75)
Northeast 0.9x	0.77	」 】 ×	9.97	x	91.35	l X	0.63	x	0.7	=	278.33	](75)
Northeast 0.9x	0.77	」 】 ×	9.97	x	97.38	x	0.63	x	0.7	=	296.73	](75)
Northeast 0.9x	0.77	] ×	9.97	x	91.1	x	0.63	x	0.7	=	277.58	(75)
Northeast 0.9x	0.77	] ×	9.97	x	72.63	×	0.63	x	0.7	=	221.29	(75)
Northeast 0.9x	0.77	] ×	9.97	x	50.42	×	0.63	x	0.7	=	153.63	(75)
Northeast 0.9x	0.77	X	9.97	x	28.07	×	0.63	x	0.7	=	85.52	(75)
Northeast 0.9x	0.77	×	9.97	×	14.2	×	0.63	x	0.7	=	43.26	(75)
Northeast 0.9x	0.77	×	9.97	x	9.21	×	0.63	x	0.7	=	28.08	(75)
Southwest <sub>0.9x</sub>	0.77	x	8.54	x	36.79		0.63	x	0.7	=	96.03	(79)
Southwest <sub>0.9x</sub>	0.77	×	8.54	×	62.67		0.63	x	0.7	=	163.57	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.54	x	85.75		0.63	x	0.7	=	223.81	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.54	x	106.25		0.63	x	0.7	=	277.31	(79)
Southwest <sub>0.9x</sub>	0.77	×	8.54	x	119.01		0.63	x	0.7	=	310.61	(79)
Southwest <sub>0.9x</sub>	0.77	×	8.54	×	118.15		0.63	x	0.7	=	308.36	(79)
Southwest <sub>0.9x</sub>	0.77	×	8.54	x	113.91		0.63	x	0.7	=	297.3	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.54	x	104.39		0.63	x	0.7	=	272.45	(79)
Southwest <sub>0.9x</sub>	0.77	×	8.54	x	92.85		0.63	x	0.7	=	242.34	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.54	x	69.27		0.63	x	0.7	=	180.78	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.54	x	44.07		0.63	x	0.7	=	115.02	(79)
Southwest <sub>0.9x</sub>	0.77	×	8.54	×	31.49		0.63	x	0.7	=	82.18	(79)
Northwest 0.9x	0.77	x	3.73	x	11.28	x	0.63	x	0.7	=	12.86	(81)
Northwest 0.9x	0.77	×	3.73	x	22.97	×	0.63	x	0.7	=	26.18	(81)
Northwest 0.9x	0.77	×	3.73	x	41.38	×	0.63	x	0.7	=	47.17	(81)
Northwest 0.9x	0.77	×	3.73	x	67.96	x	0.63	x	0.7	=	77.47	(81)
Northwest 0.9x	0.77	×	3.73	x	91.35	×	0.63	x	0.7	=	104.13	(81)
Northwest 0.9x	0.77	×	3.73	x	97.38	×	0.63	x	0.7	=	111.01	(81)
Northwest 0.9x	0.77	×	3.73	x	91.1	×	0.63	x	0.7	=	103.85	(81)
Northwest 0.9x	0.77	×	3.73	x	72.63	×	0.63	x	0.7	=	82.79	(81)
Northwest 0.9x	0.77	×	3.73	x	50.42	×	0.63	x	0.7	=	57.48	(81)
Northwest 0.9x	0.77	×	3.73	x	28.07	×	0.63	x	0.7	=	31.99	(81)
Northwest 0.9x	0.77	×	3.73	x	14.2	×	0.63	x	0.7	=	16.18	(81)
Northwest 0.9x	0.77	×	3.73	x	9.21	×	0.63	x	0.7	=	10.5	(81)
Rooflights 0.9x	1	×	2.33	×	26	×	0.63	x	0.7	=	24.06	(82)
Rooflights 0.9x	1	×	2.33	×	54	×	0.63	x	0.7	=	49.97	(82)
Rooflights 0.9x	1	×	2.33	×	96	×	0.63	x	0.7	=	88.84	(82)
Rooflights 0.9x	1	×	2.33	×	150	×	0.63	x	0.7	=	138.82	(82)
Rooflights 0.9x	1	×	2.33	×	192	×	0.63	X	0.7	=	177.69	(82)

															_		
Rooflights 0.4.       1       X       2.33       X       157       X       0.63       X       0.7       =       164.3       (82)         Rooflights 0.4.       1       X       2.33       X       116       X       0.63       X       0.7       =       106.43       (82)         Rooflights 0.4.       1       X       2.33       X       0.66       X       0.63       X       0.7       =       01.66       620       620       0.7       =       01.64       620       620       620       61.68       627       =       0.63       X       0.63       X       0.63       X       0.7       =       01.64       620       620       620       61.68       627       61.68       627       =       01.64       620       620       620       620       620       620       620       620       620       620       640       670.3       641.0       633       640.63       620       620       620       640       670.3       641.0       633       626.53       670.65       670.65       670.65       670.65       670.65       670.65       670.65       670.65       670.65       670.65       670.65	Rooflights 0.9x	1	×	2.3	33	x	200		x	0.63	×	0.7	=	185.09	(82)		
Rootights 0.9,       1       ×       2.33       ×       116       ×       0.63       ×       0.7       =       106.43       1(2)         Rootights 0.9,       1       ×       2.33       ×       66       ×       0.63       ×       0.7       =       106.43       1(2)         Rootights 0.9,       1       ×       2.33       ×       0.63       ×       0.7       =       106.43       1(2)         Rootights 0.9,       1       ×       2.33       ×       0.63       ×       0.7       =       106.43       1(2)         Rootights 0.9,       1       ×       2.33       ×       0.63       ×       0.7       =       106.43       1(2)         Rootights 0.9,       1       ×       0.037       101.18       303.44       70.63       870.70       101.70       100.83       100.11       100.23       1085.53       11.51       104.19       (8)         Colar gains in watts, calculated for each month       (83)m = sum(7A)m(82)m       (80)m       (73)m       103.70       101.10       103.10       101.10       101.10       101.10       101.10       101.10       101.10       101.10       101.10       101.10	Rooflights 0.9x	1	x	2.3	33	x	189		x	0.63	x	0.7	=	174.91	(82)		
Rooflights 0.9.       1       x       2.33       x       0.05       x       0.07       =       0.1.0       92         Rooflights 0.9.       1       x       2.33       x       0.33       x       0.07       =       0.1.0       92         Rooflights 0.9.       1       x       2.33       x       0.11       x       0.05       x       0.07       =       0.1.0       93.54       (62)         Rooflights 0.9.       1       x       2.33       x       0.11       x       0.05       x       0.07       =       0.1.0       93.54       (62)         Rooflights 0.9.       1       x       2.33       x       0.11       83.04       721.83       569.67       50.02       1.0.01       (63)         Cold gains - internal and solar (8/m = (73)m + (83)m, varts       (83)       1.10       (64)       (77)       (78)	Rooflights 0.9x	1	×	2.3	33	x	157		x	0.63	x	0.7	=	145.3	(82)		
Rootlights 0.6x       1       ×       2.33       ×       0.63       ×       0.7       =       30.54       (R2)         Rootlights 0.6x       1       ×       2.33       ×       1       ×       0.63       ×       0.7       =       30.54       (R2)         Rootlights 0.6x       1       ×       2.33       ×       0.71       19.43       462)         Solar gains - internal and solar (84)m = (73)m + (83)m, watts       (R3)m = Sum(74)m - (82)m       (R4)m = (73,m + (83)m + (83)m, watts       (R4)m = (81,m + (82,m + (10,m +	Rooflights 0.9x	1	×	2.3	33	x	115		x	0.63	x	0.7	=	106.43	(82)		
Rootights 0.0x       1       x       2.33       x       21       x       0.63       x       0.7       =       19.43       (d2)         Solar gains in wats, calculated for each month       (B3)m=       197.33       300.71       48.69       700.66       870.75       901.19       853.64       721.83       500.87       369.38       206       140.19       (63)         Total gains - internal and solar (84)m = (73)m + (83)m, watts       (64)m=       (64)m=       (65)       117.53       743.13       618.49       576.3       (64) <b>Comperature during heating periods</b> in the living area from Table 9, Th1 (°C)       21       (65)         Ulisation factor for gains for living area, 11.m (see Table 9a)         (67)m=       19.48       19.82       0.83       0.8       0.83       0.8       0.93       1       1       (66)         (67)m=       19.48       19.42       0.82       0.87       0.88       1       1       (66)         (67)m       19.58       19.67       19.76       19.76       19.76       (87)         (69)m=       1       1       0.99       0.85       0.89       0.78       0.97       0.99       1	Rooflights 0.9x	1	x	2.3	3	x	66		x	0.63	x	0.7	=	61.08	(82)		
Solar gains in watts, calculated for each month       (83)m = 83m(74)m(82)m         (83)m = 167.33       309.71       485.9       700.66       870.75       801.19       883.64       721.83       559.87       359.82       206       140.19       (83)m         (84)m =       616.88       757.04       917.47       1106.35       1249.43       1254.01       1190.23       1065.53       917.53       743.13       618.49       576.3       (84)         (84)m =       616.88       757.04       917.47       1106.35       1249.43       1254.01       1190.23       1065.53       917.53       743.13       618.49       576.3       (84)         (80)m =       11       106.35       1249.43       1254.01       1190.23       1065.3       917.53       743.13       618.49       576.3       (84)         (80)m =       1       1       0.93       0.85       0.68       0.63       0.85       0.98       1       1       (65)         (80)m =       1       1       0.99       0.35       0.82       0.33       0.8       0.85       0.98       1       1       (66)         (97)m =       19.39       19.57       19.77       19.78       19.77	Rooflights 0.9x	1	x	2.3	33	x	33		x	0.63	x	0.7	=	30.54	(82)		
(83)m-       (77.3)       308.71       48.5       70.06       87.77.5       901.19       853.64       721.83       558.87       359.38       205       140.19       (83)         Total gains - internal and solar (84)m = (73)m + (83)m, watts       (84)m-       (71.83       778.13       618.49       576.3       (84)m         7. Mean internal temperature (heating periods in the living area from Table 9, Th1 (*C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)       1       0.96       0.85       0.86       0.88       1       1       (86)         Mean internal temperature in living area for May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       (87)         (86)m=       1       1       0.99       0.85       0.83       0.6       0.85       0.81       1       (86)         Mean internal temperature in living area for May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       (87)         (89)m=       19.32       19.51       19.77       19.77       19.77       19.76       19.76       19.76       19.76       19.76       19.76       19.76       19.76       19.76       19.76       19.76	Rooflights 0.9x	1	x	2.3	3	x	21		x	0.63	×	0.7	=	19.43	(82)		
(83)m-       (77.3)       308.71       48.5       70.06       87.77.5       901.19       853.64       721.83       558.87       359.38       205       140.19       (83)         Total gains - internal and solar (84)m = (73)m + (83)m, watts       (84)m-       (71.83       778.13       618.49       576.3       (84)m         7. Mean internal temperature (heating periods in the living area from Table 9, Th1 (*C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)       1       0.96       0.85       0.86       0.88       1       1       (86)         Mean internal temperature in living area for May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       (87)         (86)m=       1       1       0.99       0.85       0.83       0.6       0.85       0.81       1       (86)         Mean internal temperature in living area for May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       (87)         (89)m=       19.32       19.51       19.77       19.77       19.77       19.76       19.76       19.76       19.76       19.76       19.76       19.76       19.76       19.76       19.76       19.76	_					-											
Total gains – internal and solar (84)m = (73)m + (83)m, waits (84)m = $\frac{1}{3128}$ (85)m = $\frac{1}{1}$ (85)m = $\frac{1}{1}$ (85)m = $\frac{1}{1}$ (86)m = $\frac{1}{1}$ (100 signs for living area, h1,m (see Table 9a) = 0.85 0.88 0.85 0.88 1 1 1 (86) (86)m = $\frac{1}{1}$ 1 0.99 0.95 0.85 0.68 0.53 0.6 0.85 0.38 1 1 1 (86) (87)m = 19.33 10.58 19.92 20.36 20.73 20.33 20.38 20.97 20.8 20.31 19.77 19.36 (87) = 19.78 19.75 19.77 19.77 19.75 19.77 19.76 (87)m = 19.37 19.75 19.77 19.77 19.77 19.78 19.78 19.78 19.77 19.76 19.76 (88) (89)m = 1 0.99 0.98 0.93 0.8 0.58 0.39 0.46 0.78 0.97 0.98 1 1 (89) (89)m = 1 0.99 0.98 0.93 0.8 0.58 0.39 0.46 0.78 0.97 0.98 1 1 (89) (89)m = 1 0.99 0.98 0.93 0.8 0.58 0.39 0.46 0.78 0.97 0.98 1 (89) (89)m = 1 0.99 0.98 0.93 0.8 0.58 0.39 0.46 0.78 0.97 0.98 1 (89) (80)m = 17.62 17.9 18.39 19.03 19.51 19.74 19.78 19.77 19.76 19.75 (18.77 19.76 (90) (17.62 17.9 18.28 19.28 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (90) (17.62 17.9 18.28 19.28 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (91) (91) (12.8 19.72 19.75 19.22 18.48 17.92 (92) (19.94 19.22 18.48 17.92 (93) (19.51 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (93) (19.51 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (93) (19.51 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (93) (19.51 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (93) (19.51 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (93) (19.51 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (93) (19.51 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (93) (19.51 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (93) (19.51 19.51 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (93) (19.51 19.51 19.74 19.96 20 2 0 19.84 19.22 18.48 17.92 (93) (19.51 19.51 19.74 19.96 20 2 0 19.84 19	Solar <u>g</u> ains in	watts, ca	alculated	for eacl	h month				(83)m = 8	Sum(74)m .	(82)m		-				
(#4)       # 16.8.8       757.04       917.47       1106.35       1249.43       1254.01       1190.23       1065.53       917.53       743.13       618.49       676.3       (#4)         Temperature during heating periods in the living area from Table 9. Th1 (°C)       21       (#5)         Utilisation factor for gains for living area, h1, m (see Table 9a)         (#6)       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (#6)       me       1       0.99       0.95       0.85       0.68       0.53       0.6       0.85       0.88       1       1       (#6)         Mean intermal temperature in living area T1 (follow steps 3 to 7 in Table 9c)       (#7)       19.75       19.77       19.78       19.78       19.78       19.77       19.76       19.76       (#8)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)       (#9)       1       0.99       0.98       0.89       0.8       0.39       0.46       0.78       0.97       19.76       19.76       (#8)         Utilisation factor for gains for rest of dwelling T2 (follow steps 3 to 7 in Table 9c)       (#9)       1       (#9)       1       1	(83)m= 167.33	309.71	485.9	700.65	870.75	90	01.19 85	53.64	721.83	559.87	359.38	205	140.19		(83)		
7. Mean internal temperature (neating season)         Temperature during heating periods in the living area from Table 9, Th1 (*C)       21         Utilisation factor for gains for living area, h1,m (see Table 9a)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (86)me       1       1       0.99       0.95       0.85       0.68       0.53       0.68       0.85       0.88       1       (86)         Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)       (67)me       19.39       19.58       19.32       20.38       20.31       19.77       19.36       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C)       (89)me       1       0.99       0.88       0.83       0.58       0.39       0.46       0.78       0.97       0.99       1       (90)         (8)me       1       0.99       0.88       0.83       0.58       0.39       0.46       0.78       0.97       0.99       1       (90)         (80)me       1       0.99       0.88       0.83       0.8       0.79       0.99       1       (91)         Mean internal temperature (fo	Total gains – i	nternal a	nd solar	(84)m =	= (73)m ·	+ (8	33)m , wa	atts									
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)       Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (86)m       1       1       0.99       0.95       0.85       0.68       0.53       0.6       0.98       1       1         (86)m       1       1       0.99       0.95       0.85       0.68       0.53       0.6       0.98       1       1         (87)m       19.39       19.58       19.92       20.38       20.97       20.8       20.31       19.77       19.76       19.76         (87)m       19.74       19.75       19.77       19.77       19.77       19.76       19.76       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)       (89)m       1       0.99       0.98       0.93       0.8       0.58       0.39       0.46       0.78       0.97       0.99       1       (89)         Mean internal temperature in the rest of dwelling 12 (follow steps 3 to 7 in Table 9c)       (90)       LL = Living area +(4) =       0.19       (91) <tr< td=""><td>(84)m= 616.88</td><td>757.04</td><td>917.47</td><td>1106.35</td><td>1249.43</td><td>12</td><td>54.01 119</td><td>90.23</td><td>1065.53</td><td>917.53</td><td>743.13</td><td>618.49</td><td>576.3</td><td></td><td>(84)</td></tr<>	(84)m= 616.88	757.04	917.47	1106.35	1249.43	12	54.01 119	90.23	1065.53	917.53	743.13	618.49	576.3		(84)		
Utilisation factor for gains for living area, h1,m (see Table 9a)         (a) $\overline{Feb}$ Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (a)       1       0.99       0.95       0.88       0.68       0.53       0.6       0.85       0.98       1       1         (b)       1       0.99       0.95       0.88       0.68       0.53       0.6       0.85       0.98       1       1       (66)         (87)       19.35       19.58       19.92       20.36       20.37       20.8       20.31       19.77       19.36       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)       (88)       (88)       Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)       (89)       (89)       (89)       (80)       (80)       (80)       (81)       (81)       (82)       (86)       (82)       (81)       (81)       (82)       (83)       (81)       (81)       (81)       (81)       (81)       (81)       (82)       (82)       (82)       (81)       (81)       (82)       (82)       (82)       (81)       (81)       (81)       (82)	7. Mean inter	nal temp	erature	(heating	season	)											
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$															(85)		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Utilisation factor for gains for living area, h1,m (see Table 9a)																
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)           (87)ma         19.39         19.39         10.36         20.36         20.36         20.37         20.98         20.91         10.77         19.77         19.77         19.77         19.77         19.77         19.77         19.77         19.77         19.77         19.77         19.77         19.77         19.76         19.77         19.76         19.77         19.76         19.77         19.76         19.77         19.76         19.76         (89)           Utilisation factor for gains for rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)           (1.7.2         17.9         18.39         19.74         19.76         10.75         (90)           (1.7.2         17.9         18.22         18.68         19.74         19.76         20 <th 2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2<="" colspan="2" td=""><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>,</td><td>Jun .</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td><td></td><td></td></th>	<td>Jan</td> <td>Feb</td> <td>Mar</td> <td>Apr</td> <td>May</td> <td>,</td> <td>Jun .</td> <td>Jul</td> <td>Aug</td> <td>Sep</td> <td>Oct</td> <td>Nov</td> <td>Dec</td> <td></td> <td></td>		Jan	Feb	Mar	Apr	May	,	Jun .	Jul	Aug	Sep	Oct	Nov	Dec		
(87)m=       19.39       19.58       19.92       20.36       20.73       20.93       20.97       20.8       20.31       19.77       19.36       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (89)m=       19.74       19.75       19.77       19.77       19.78       19.78       19.78       19.77       19.76       19.76       19.76       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)       (89)me       1       0.99       0.98       0.93       0.8       0.58       0.39       0.46       0.78       0.97       0.99       1       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)       (90)       (90)       IfLA = Living area ÷ (4) =       0.19       (91)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2       (92)       Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)       (93)       (93)       (93)       (93)       (93)       (94)       19.22       18.48       17.92       (92)       Apply adjustment to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a       (94)       (94)	(86)m= 1	1	0.99	0.95	0.85	C	0.68 0	).53	0.6	0.85	0.98	1	1		(86)		
(87)m=       19.39       19.58       19.92       20.36       20.73       20.93       20.97       20.8       20.31       19.77       19.36       (87)         Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (89)m=       19.74       19.75       19.77       19.77       19.78       19.78       19.78       19.77       19.76       19.76       19.76       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)       (89)me       1       0.99       0.98       0.93       0.8       0.58       0.39       0.46       0.78       0.97       0.99       1       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)       (90)       (90)       IfLA = Living area ÷ (4) =       0.19       (91)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2       (92)       Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)       (93)       (93)       (93)       (93)       (93)       (94)       19.22       18.48       17.92       (92)       Apply adjustment to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a       (94)       (94)	Mean interna	l temper	ature in	living are	ea T1 (fo	Sllo	w steps :	3 to 7	ín Tab	le 9c)		-					
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)         (88)me       19.74       19.75       19.77       19.78       19.78       19.78       19.78       19.77       19.76       19.77       19.78       19.77       19.78       19.77       19.78       19.77       19.78       19.77       19.78       19.77       19.80       0.97       0.99       1       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)       Ita.819       17.59       (90)       Ita.819       17.59       (90)       Ita.819       17.59       (92)       Apply adjustment to the mean internal temperature from Table 4c, where appropriate       (93)       8       Space heating requirement       Stat.81       19.22       18.48       17.92       (93)       Space heating requirement       Stat.81       19.22       18.48 <t< td=""><td></td><td><u> </u></td><td></td><td></td><td>· · ·</td><td></td><td>i</td><td></td><td></td><td><u> </u></td><td>20.31</td><td>19.77</td><td>19.36</td><td></td><td>(87)</td></t<>		<u> </u>			· · ·		i			<u> </u>	20.31	19.77	19.36		(87)		
(88)me       19.74       19.75       19.77       19.77       19.78       19.78       19.77       19.76       19.77       19.71       19.82       18.97       19.71       19.71       19.71       19.71       19.71       19.71       18.19       17.59       19.91       11.51       18.74       19.78       19.77       19.82       18.49       17.92       (92)       Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)       8.376       17.85       18.79       19.74 </td <td></td> <td></td> <td></td> <td>oriodo ir</td> <td>reat of</td> <td></td> <td></td> <td>I</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>				oriodo ir	reat of			I									
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       1       0.99       0.98       0.93       0.8       0.58       0.39       0.46       0.78       0.97       0.99       1       (89)         Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)       (90)       ft.2       17.9       18.39       19.03       19.51       19.74       19.78       19.77       19.62       18.97       18.19       17.59       (90)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2         (92)m=       17.95       18.22       18.68       19.24       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)       (93)       8. Space heating requirement       (94)       1       9.98       0.20       20       19.84       19.22       18.48       17.92       (93)         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec       Utilisation factor for gains, hm:         (94)m=       1       0.99       0.97       0.92       0.8       0.6       0.42       0.48       0.78       0.96		<u> </u>	<u> </u>				<u> </u>				10 77	10.76	10.76		(88)		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		<u> </u>								19.70	19.11	19.70	19.70		(00)		
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=       17.62       17.9       18.39       19.03       19.51       19.74       19.78       19.77       19.62       18.97       18.19       17.59       (90)         ILA = Living area $\div$ (4) =       0.19       (91)       (92)       (92)       (92)       (92)       (93)       (94)       (94)       (92)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2       (92)       (92)       (92)       (93)       (93)       (93)       (93)       (94)       (92)       (94)       (92)       (92)       (93)       (93)       (94)<		<u> </u>	1				<u> </u>		,					l	(00)		
(90)m=       17.62       17.9       18.39       19.03       19.51       19.74       19.78       19.77       19.62       18.97       18.19       17.59       (90)         ILA = Living area ÷ (4) =       0.19       (91)       ILA = Living area ÷ (4) =       0.19       (91)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2       (92)m=       17.95       18.22       18.68       19.28       19.74       19.96       20       19.84       19.22       18.48       17.92       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)m=       17.95       18.22       18.68       19.28       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (93)         8. Space heating requirement       Sep To to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a       [94]m=       1       0.99       0.97       0.92       0.8       0.6       0.42       0.48       0.78       0.96       0.99       1       (94)         Useful gains, hmGm, W = (94)m x (84)m       [95]m=       614.41       74.94       893.57       1018.1       993.48       747.23       494.41       <	(89)m= 1	0.99	0.98	0.93	0.8		0.58 0	0.39	0.46	0.78	0.97	0.99	1		(89)		
fLA = Living area $\div$ (4) =       (91)         Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2         (92)m =       17.95       18.22       18.68       19.28       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)m =       17.95       18.22       18.68       19.28       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (93)         8. Space heating requirement       (93)m =       17.95       18.22       18.68       19.28       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (93)         8. Space heating requirement       Sep To the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:       (94)m =       1       0.99       0.97       0.92       0.8       0.6       0.42       0.48       0.78       0.99       1       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)m =       614.41       749.84       893.57       1018.1       93.48       747.23       494.41       515.89	Mean interna	l tempera	ature in	the rest	of dwelli	ng	T2 (follo	w ste	ps 3 to	7 in Tabl	e 9c)			L			
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2       (92)m=       17.95       18.22       18.68       19.28       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)m=       17.95       18.22       18.68       19.28       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (93) <b>Set</b> Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Utilisation factor for gains, hm:       (94)m=       1       0.99       0.97       0.92       0.8       0.6       0.42       0.48       0.78       0.96       0.99       1       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)m=       614.41       749.84       893.57       1018.1       993.48       747.23       494.41       515.89       716.14       712.15       613.49       574.56       (95)       Monthly average external temperature from Table 8	(90)m= 17.62	17.9	18.39	19.03	19.51	1	9.74 19	9.78	19.77						(90)		
(92)m=       17.95       18.22       18.68       19.28       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (92)         Apply adjustment to the mean internal temperature from Table 4e, where appropriate       (93)m=       17.95       18.22       18.68       19.28       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (93) <b>8.5pace heating requirement</b> Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Utilisation factor for gains, hm:       (94)m=       1       0.99       0.97       0.92       0.8       0.6       0.42       0.48       0.78       0.96       0.99       1       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)m=       614.41       749.84       893.57       1018.1       993.48       747.23       494.41       515.89       716.14       712.15       613.49       574.56       (95)         Monthly average external temperature from Table 8										f	LA = Livi	ng area ÷ (4	4) =	0.19	(91)		
Apply adjustment to the mean internal temperature from Table 4e, where appropriate         (93)m=       17.95       18.22       18.68       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (93)         8. Space heating requirement         Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Utilisation factor for gains, hm:       (94)m=       1       0.99       0.97       0.92       0.8       0.6       0.42       0.48       0.78       0.96       0.99       1       (94)          614.41       749.84       893.57       1018.1       993.48       747.23       494.41       515.89       716.14       712.15       613.49       574.56       (95)         Monthly average external temperature from Table 8       (96)m=       4.3       4.9       6.5       8.9       11.7       14.6       16.6       16.4       14.1       10.6       7.1       4.2       (96)          external itemperature, Lm , W =[(	Mean interna	l tempera	ature (fo	r the wh	ole dwe	lling	g) = fLA :	<b>×</b> T1 ·	+ (1 – fl	_A) × T2							
(93)m=       17.95       18.22       18.68       19.28       19.74       19.96       20       20       19.84       19.22       18.48       17.92       (93)         8. Space heating requirement         Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a       Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Utilisation factor for gains, hm:         (94)m=       1       0.99       0.97       0.92       0.8       0.6       0.42       0.48       0.78       0.96       0.99       1       (94)          614.41       749.84       893.57       1018.1       993.48       747.23       494.41       515.89       716.14       712.15       613.49       574.56       (95)          614.41       749.84       893.57       1018.1       993.48       747.23       494.41       515.89       716.14       712.15       613.49       574.56       (95)          64.3       4.9       6.5       8.9       11.7       14.6       16.6       16.4	(92)m= 17.95	18.22	18.68	19.28	19.74	1	9.96	20	20	19.84	19.22	18.48	17.92		(92)		
8. Space heating requirement         Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Utilisation factor for gains, hm:       (94)m=       1       0.99       0.97       0.92       0.8       0.6       0.42       0.48       0.78       0.96       0.99       1       (94)         Useful gains, hmGm , W = (94)m x (84)m         (95)m=       614.41       749.84       893.57       1018.1       993.48       747.23       494.41       515.89       716.14       712.15       613.49       574.56       (95)         Monthly average external temperature from Table 8       (96)m=       4.3       4.9       6.5       8.9       11.7       14.6       16.6       16.4       14.1       10.6       7.1       4.2       (96)          2081.44       2025.33       1846.35       1552.57       119.21       789.59       501.13       528.61       849.6       1285.66       1706.64       2068.09       (97)          requirement for each	Apply adjustr	nent to th	ne mean	internal	temper	atu	re from T	Table	4e, wh	ere appro	opriate	-					
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Utilisation factor for gains, hm:       (94)m=       1       0.99       0.97       0.92       0.8       0.6       0.42       0.48       0.78       0.96       0.99       1       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)m=       614.41       749.84       893.57       1018.1       993.48       747.23       494.41       515.89       716.14       712.15       613.49       574.56       (95)         Monthly average external temperature from Table 8       (96)m=       4.3       4.9       6.5       8.9       11.7       14.6       16.6       16.4       14.1       10.6       7.1       4.2       (96)         Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m]       (97)m=       2081.44       2025.33       1846.35       1552.57       1199.21       789.59       501.13       528.61       849.6       1285.66       1706.64       2068.09       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m -	<mark>(93)</mark> m= 17.95	18.22	18.68	19.28	19.74	1	9.96	20	20	19.84	19.22	18.48	17.92		(93)		
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m = 1 0.99 0.97 0.92 0.8 0.6 0.42 0.48 0.78 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m = 614.41 749.84 893.57 1018.1 993.48 747.23 494.41 515.89 716.14 712.15 613.49 574.56 (95) Monthly average external temperature from Table 8 (96)m = 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m = 2081.44 2025.33 1846.35 1552.57 1199.21 789.59 501.13 528.61 849.6 1285.66 1706.64 2068.09 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m																	
JanFebMarAprMayJunJulAugSepOctNovDecUtilisation factor for gains, hm: $(94)m = 1$ 0.990.970.920.80.60.420.480.780.960.991(94)Useful gains, hmGm, W = (94)m x (84)m $(95)m = 614.41$ 749.84893.571018.1993.48747.23494.41515.89716.14712.15613.49574.56(95)Monthly average external temperature from Table 8 $(96)m = 4.3$ 4.96.58.911.714.616.616.414.110.67.14.2(96)Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ] $(97)m = 2081.44$ 2025.331846.351552.571199.21789.59501.13528.61849.61285.661706.642068.09(97)Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m				•		ed	at step 1	11 of	Table 9	b, so tha	t Ti,m=	(76)m an	d re-calo	culate			
Utilisation factor for gains, hm: $(94)m = 1$ $0.99$ $0.97$ $0.92$ $0.8$ $0.6$ $0.42$ $0.48$ $0.78$ $0.96$ $0.99$ $1$ $(94)$ Useful gains, hmGm, W = $(94)m \times (84)m$ $(95)m = 614.41$ $749.84$ $893.57$ $1018.1$ $993.48$ $747.23$ $494.41$ $515.89$ $716.14$ $712.15$ $613.49$ $574.56$ $(95)$ Monthly average external temperature from Table 8 $(96)m = 4.3$ $4.9$ $6.5$ $8.9$ $11.7$ $14.6$ $16.6$ $16.4$ $14.1$ $10.6$ $7.1$ $4.2$ $(96)$ Heat loss rate for mean internal temperature, Lm , W = $[(39)m \times [(93)m - (96)m]$ $(97)m = 2081.44$ $2025.33$ $1846.35$ $1552.57$ $119.21$ $789.59$ $501.13$ $528.61$ $849.6$ $1285.66$ $1706.64$ $2068.09$ $(97)$ Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$							lun	1	Aug	Son	Oct	Nov	Dee				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					iviay	<u> </u>		Jui	Aug	Sep	001	INOV	Dec				
Useful gains, hmGm , W = (94)m x (84)m         (95)m= $614.41$ 749.84       893.57       1018.1       993.48       747.23       494.41       515.89       716.14       712.15       613.49       574.56       (95)         Monthly average external temperature from Table 8         (96)m= $4.3$ 4.9       6.5       8.9       11.7       14.6       16.6       16.4       14.1       10.6       7.1       4.2       (96)         Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m]         (97)m=       2081.44       2025.33       1846.35       1552.57       1199.21       789.59       501.13       528.61       849.6       1285.66       1706.64       2068.09       (97)         Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$		<u> </u>			0.8		0.6 0	.42	0.48	0.78	0.96	0.99	1		(94)		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$																	
Monthly average external temperature from Table 8 $(96)m =$ 4.3       4.9       6.5       8.9       11.7       14.6       16.6       16.4       14.1       10.6       7.1       4.2       (96)         Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m ]       (97)m =       2081.44       2025.33       1846.35       1552.57       1199.21       789.59       501.13       528.61       849.6       1285.66       1706.64       2068.09       (97)         Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (96)m =       (97)m =       <		r 1	, i	<i>,</i> ,	·	74	47.23 49	94.41	515.89	716.14	712.15	613.49	574.56		(95)		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	. ,	age exte	rnal tem					I		I		1		I			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		<u> </u>				<u> </u>		6.6	16.4	14.1	10.6	7.1	4.2		(96)		
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m	Heat loss rate	e for mea	an intern	al tempe	erature,	Lm	, W =[(3	9)m >	k [(93)m	n– (96)m	]	•		I			
	(97)m= 2081.44	2025.33	1846.35	1552.57	1199.21	78	39.59 50	)1.13	528.61	849.6	1285.66	1706.64	2068.09		(97)		
(98)m= 1091.47 857.13 708.87 384.82 153.07 0 0 0 0 426.69 787.07 1111.18	Space heatin	g require	ement fo	r each m	nonth, k	<i>Nh</i>	/month =	= 0.02	4 x [(97	')m – (95	)m] x (4	1)m					
	(98)m= 1091.47	857.13	708.87	384.82	153.07		0	0	0	0	426.69	787.07	1111.18				

								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	5520.3	(98)
Space	e heating	g require	ement in	n kWh/m²	²/year								51.55	(99)
9a. En	ergy req	uiremer	nts – Ind	lividual h	eating s	ystems i	ncluding	j micro-C	CHP)					
•	e heatir	•			, .							I		
	-			secondar		mentary	' system		(201)				0	(201)
	-			nain syst	. ,			(202) = 1		(000)]			1	(202)
			U U	main sys				(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
				ting syste			. 0/						93.4	(206)
Efficie			· · ·	lementar		 I	· · · · ·			r	r		0	(208)
0	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	er
Space	e neating 1091.47	g require 857.13	ement (c	calculate 384.82	d above) 153.07	)	0	0	0	426.69	787.07	1111.18		
(011)~						0	0	0	0	420.09	101.01	1111.10		(014)
(211)11	$1 = \{[(90)]$	917.7	758.96	100 ÷ (20 412.01	163.88	0	0	0	0	456.84	842.69	1189.7		(211)
	1100.0		100.00	112.01	100.00	Ů	Ů	-	-		211) <sub>15.1012</sub>		5910.38	(211)
Spac	e heatin	a fuel (s	econdar	ry), kWh/	month									
•			00 ÷ (20	• /										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	Ē	0	(215)
	heating													
Output	215.08	ater hea 189.57	ter (calc 199.08	ulated a	bove) 172.1	151.58	145.22	161.89	163.68	185.04	195.68	209.9		
Efficie	ncy of w			111.10	172.1	101.00	140.22	101.00	100.00	100.04	100.00	200.0	80.3	(216)
(217)m=		88.39	87.97	86.94	84.76	80.3	80.3	80.3	80.3	87.09	88.19	88.63	00.0	(217)
		heating,	ı kWh/m	onth										
(219)m	<u>1 = (64)</u>	<u>m x 100</u>	) ÷ (217)	)m		<b></b>	<b></b>						1	
(219)m=	242.85	214.48	226.3	204.45	203.05	188.76	180.85	201.61	203.83	212.48	221.88	236.83		<b>—</b>
A								TOLA	I = Sum(2		Allehree		2537.37	(219)
	al totals heating	fuel use	ed, main	system	1					K	Wh/year	-	<b>kWh/yea</b> 5910.38	r T
Water	heating	fuel use	ed	•									2537.37	╡
	Ū			electric	keen-ho	t								
	al heatin	•		olootilo		·						20		(230c
		•••••										30		
			sted flue									45	1	(230e
Total e	electricity	for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electri	city for li	ghting											420.86	(232)
12a. (	CO2 em	issions -	– Individ	dual heati	ing syste	ems inclu	uding mi	cro-CHF	)					
							<b>ergy</b> /h/year			Emiss kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/ye	
Space	heating	(main s	system 1	)		(21	1) x			0.2	16	=	1276.64	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	548.07	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1824.71	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	218.42	(268)
Total CO2, kg/year	sum	of (265)(271) =		2082.06	(272)

TER =

19.44 (273)

				User D	etails:						
Assessor Name:	Mitchell Fir	าท			Strom	a Num	ber:		STRO	029125	
Software Name:	Stroma FS	AP 201	2		Softwa	are Vei	rsion:		Versic	on: 1.0.3.11	
			Р	roperty .	Address	: House	1 After F	Reducing	g Energy	Demand	
Address :	House 1, So	outh of 2	7a West	t End La	ne, Lono	don, NW	6 4QJ				
1. Overall dwelling dime	ensions:										
				-	a(m²)	I	Av. Hei	ight(m)	1	Volume(m <sup>3</sup> )	1
Ground floor				4	7.13	(1a) x	2	.45	(2a) =	115.47	(3a)
First floor				4	7.13	(1b) x	2	.75	(2b) =	129.61	(3b)
Second floor				2	4.95	(1c) x	2	2.9	(2c) =	72.36	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e	)+(1r	n) <u>1</u>	19.21	(4)			_		-
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	317.43	(5)
2. Ventilation rate:											_
	main heating		econdar eating	у	other		total			m <sup>3</sup> per hour	
Number of chimneys			0	+ [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0		0	<u>-</u> ] + [	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins					ц Ц	2	x	0 =	20	(7a)
Number of passive vents	i					Γ	0	x ^	0 =	0	(7b)
Number of flueless gas fi	res					Г	0	x 4	40 =	0	(7c)
						_					-
									Air ch	anges per hou	Ir
Infiltration due to chimne	•						20		÷ (5) =	0.06	(8)
If a pressurisation test has b			ed, procee	d to (17), d	otherwise o	continue fr	om (9) to (	(16)			1
Number of storeys in the Additional infiltration	ne aweiling (ns	5)						[(0)]	11/0 1	0	(9)
Structural infiltration: 0	25 for steel o	r timbor f	frame or	0 35 for	masonr	w constr	uction	[(9)-	1]x0.1 =	0	(10) (11)
if both types of wall are p							uction			0	]('')
deducting areas of opening			-	-							-
If suspended wooden f			ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en										0	(13)
Percentage of windows	s and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2		1			0	(15)
Infiltration rate					(8) + (10)					0	(16)
Air permeability value,	• • •			•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeabil										0.31	(18)
Air permeability value applie		on test has	s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			1
Number of sides sheltere Shelter factor	ea D				(20) = 1 -	[0.075 x (1	9)] =			0	(19) (20)
Infiltration rate incorporat	ting shalter for	tor			(21) = (18)						1
Infiltration rate modified f	•		I		<u>,-</u> .) = (10)	, (=0) =				0.31	(21)
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			Jun		l nug				200	l	
Monthly average wind sp (22)m= 5.1 5	4.9 4.4	e 7 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
		ч. <b>0</b>	0.0	0.0	0.7	T I	5	4.5	٦.1		

Wind F	actor (22	2a)m =	(22)m ÷ -	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Adjuste	ed infiltra	tion rat	e (allowir	ng for sh	elter an	d wind s	speed) =	(21a) x	(22a)m					
	0.4	0.39	0.38	0.34	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37	]	
	ate effect		-	ate for t	he appli	cable ca	se	•				•	• r	
	echanical			N - (0	ol.) (00-					) (00-)			0	(23a)
	aust air hea									) = (23a)			0	(23b)
	anced with		-	-	-								0	(23c)
	balanced		<u> </u>				<u> </u>	<u> </u>	ŕ	<u>,                                     </u>	<u> </u>	1	) ÷ 100] 1	<i>(</i> <b>-</b> , , )
(24a)m=		0	0	0	0	0	0	0	0	0	0	0		(24a)
	balanced	d mecha	anical ve	ntilation	without	heat rec	covery (I	MV) (24b	)m = (22	2b)m + (2	23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,	whole ho if (22b)m				•	•				5 x (23h	))			
(24c)m=	r í r	0		0	0				0		0	0	1	(24c)
	natural v				-		-			Ů			J	~ /
	if (22b)m									0.5]				
(24d)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	]	(24d)
Effe	ctive air c	change	rate - en	ter (24a	) or (24b	) or (24	c) or (24	d) in boy	(25)				4	
(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	]	(25)
							1		I	1	1	1	1	
3. He	at losses	and he	eat loss p	aramete	er:									
		0.000		Onenin	~~		~~					بريامير	-	
ELEN	IENT	Gros area		Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²•		A X k kJ/K
ELEN Doors	IENT			•	-		n²							
Doors	<b>IENT</b> ws Type	area		•	-	A ,r	m²	W/m2	K	(W/				kJ/K
Doors Windov		area 1		•	-	A ,r 2.15	m <sup>2</sup> x 5 x <sup>1</sup>	W/m2	K =   0.04] =	(W/ 2.15				kJ/K (26)
Doors Windov Windov	ws Type	area 1 2		•	-	A ,r 2.15 19.95	m <sup>2</sup> x 5 x <sup>1</sup> 1 x <sup>1</sup>	W/m2 1 /[1/( 1.4 )+	K 0.04] = 0.04] =	(W/ 2.15 26.45				kJ/K (26) (27)
Doors Windov Windov	ws Type ws Type ws Type	area 1 2		•	-	A ,r 2.15 19.95 10	m <sup>2</sup> x 5 x1 7 x1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+	K 0.04] = 0.04] = 0.04] =	(W/ 2.15 26.45 13.26				kJ/K (26) (27) (27)
Doors Window Window Window	ws Type ws Type ws Type	area 1 2		•	-	A ,r 2.15 19.95 10 14.07	n <sup>2</sup> x 5 x <sup>1</sup> 7 x <sup>1</sup> 7 x <sup>1</sup>	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K 0.04] = 0.04] = 0.04] =	(W/I 2.15 26.45 13.26 18.65	ĸ)			kJ/K (26) (27) (27) (27)
Doors Window Window Window Rooflig	ws Type ws Type ws Type	area 1 2	(m²)	•	2	A ,r 2.15 19.95 10 14.07 2.73	m <sup>2</sup> x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x <sup>1</sup> x <sup>2</sup>	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/l 2.15 26.45 13.26 18.65 3.822	ĸ)			kJ/K (26) (27) (27) (27) (27b)
Doors Window Window Window Rooflig Floor	ws Type ws Type ws Type	area 1 2 3	(m²) 49	. m	7	A ,r 2.15 19.95 10 14.07 2.73 47.13	m <sup>2</sup> x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + 0.13	K 0.04] =   0.04] =   0.04] =   0.04] =   0.04] =	(W// 2.15 26.45 13.26 18.65 3.822 6.1269	ĸ)			kJ/K (26) (27) (27) (27) (27b) (28)
Doors Window Window Rooflig Floor Walls Roof	ws Type ws Type ws Type	area 1 2 3 <u>145.</u> 47.1	(m²) 49 3	46.17	7	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32	m <sup>2</sup> x 5 x <sup>1</sup> 7 x <sup>1</sup> 7 x <sup>1</sup> 3 x 2 x 2 x x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + 0.13 0.18	K 0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88	ĸ)			kJ/K (26) (27) (27) (27) (27b) (28) (29)
Doors Window Window Rooflig Floor Walls Roof Total a * for win	ws Type ws Type ws Type ghts area of ele dows and r	area 1 2 3 145 47.1 ements roof winde	(m²) 49 3 , m² ows, use ef	46.17 2.73	2 7  ndow U-va	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7	m <sup>2</sup> x 5 x1 7 x1 7 x1 3 x 2 x 5	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	K 0.04] =   0.04] =   0.04] =   0.04] =   =   =   =	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77	K)	kJ/m²-	к ] [ ] [	kJ/K (26) (27) (27) (27) (27b) (28) (29) (30)
Doors Window Window Rooflig Floor Walls Roof Total a * for wind ** includ	ws Type ws Type ws Type ghts area of ele dows and r le the areas	area 1 2 3 145. 47.1 ements roof winde	(m²) 49 3 , m² ows, use et sides of int	46.17 2.73 ffective win ternal wall	2 7  ndow U-va	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7	m <sup>2</sup> x 5 x1 7 x1 7 x1 3 x 2 x 5	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ [0.13] 0.13 0.13 g formula 1	K 0.04] =   0.04] =   0.04] =   0.04] =   1 =   1 =   2   2   2   2   3   4   4   5   5   5   5   5   5   5   5	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31)
Doors Window Window Rooflig Floor Walls Roof Total a * for wind ** includ Fabric	ws Type ws Type ws Type ghts area of ele dows and r le the areas heat loss	area 1 2 3 <u>145.</u> 47.1 ements roof winde s on both s, W/K =	(m <sup>2</sup> ) 49 3 , m <sup>2</sup> ows, use el sides of int = S (A x 1	46.17 2.73 ffective win ternal wall	2 7  ndow U-va	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7	m <sup>2</sup> x 5 x1 7 x1 7 x1 3 x 2 x 5	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	$K =   \\ 0.04 =   \\ 0.04 =   \\ 0.04 =   \\ 0.04 =   \\ =   \\ =   \\ =   \\ (1/U-value) + (32) =   \\$	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77	K)	kJ/m²•	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31) (33)
Doors Window Window Rooflig Floor Walls Roof Total a * for wind ** includ Fabric Heat ca	ws Type ws Type ws Type ghts area of ele dows and r de the areas heat loss apacity C	area 1 2 3 145 47.1 ements roof windus s on both s, W/K = Cm = S(	(m <sup>2</sup> ) <u>3</u> , m <sup>2</sup> ows, use el sides of int = S (A x k (A x k )	46.17 2.73 ffective winternal walk U)	7 7 ndow U-va I's and part	A ,r 2.15 19.95 10 2.73 47.13 99.32 44.4 239.7 alue calcul itions	m <sup>2</sup> 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 )+ [0.13] 0.13 0.13 g formula 1	$K =   \\ 0.04 =   \\ 0.04 =   \\ 0.04 =   \\ 0.04 =   \\ 0.04 =   \\ =   \\   \\   \\   \\   \\   \\   \\   \\$	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77 <i>ie)+0.04] e</i>	K)	kJ/m²•	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31) (31) (33) (34)
Doors Window Window Rooflig Floor Walls Roof Total a * for wind ** includ Fabric Heat ca Therma	ws Type ws Type ws Type ghts hrea of ele dows and r le the areas heat loss apacity C al mass p	area 1 2 3 145 47.1 ements roof winde s on both s, W/K = Cm = S(	(m <sup>2</sup> ) 49 3 , m <sup>2</sup> ows, use eff sides of int = S (A x I (A x k ) ter (TMP	46.17 2.73 ffective win ternal walk U) P = Cm ÷	z ndow U-va ls and part	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7 alue calcul itions	m <sup>2</sup> x x 5 x1 7 x1 7 x1 3 x 2 x 5 x 5 ated using	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ [0.13] 0.13 0.13 g formula 1 (26)(30)	$K =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ =   \\ =   \\   =   \\   =   \\   =   \\   =   \\   =   \\   (1/U-valu) + (32) = \\ ((28). \\ Indical + (32) =   \\ ((28). \\   ($	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77 <i>(ve)+0.04] a</i>	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31) (33)
Doors Window Window Rooflig Floor Walls Roof Total a * for win ** includ Fabric Heat ca Therma For desig	ws Type ws Type ws Type ghts area of ele dows and r de the areas heat loss apacity C	area 1 2 3 145. 47.1 ements roof winder s on both s, W/K = Cm = S( parame ments wh	(m <sup>2</sup> ) 49 3 , m <sup>2</sup> ows, use et sides of int = S (A x I (A x k ) ter (TMP ere the det	$\frac{46.17}{2.73}$ ffective winternal walk U) $f = Cm \div$ ails of the	z ndow U-va ls and part	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7 alue calcul itions	m <sup>2</sup> x x 5 x1 7 x1 7 x1 3 x 2 x 5 x 5 ated using	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ [0.13] 0.13 0.13 g formula 1 (26)(30)	$K =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ =   \\ =   \\   =   \\   =   \\   =   \\   =   \\   =   \\   (1/U-valu) + (32) = \\ ((28). \\ Indical + (32) =   \\ ((28). \\   ($	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77 <i>(ve)+0.04] a</i>	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31) (31) (33) (34)
Doors Window Window Rooflig Floor Walls Roof Total a * for wind ** includ Fabric Heat ca For designed	ws Type ws Type ws Type ghts area of ele dows and r le the areas heat loss apacity C al mass p	area 1 2 3 145 47.1 ements roof winder s on both s, W/K = Cm = S(p) parameter ments which do f a deal	(m <sup>2</sup> ) 49 3 , m <sup>2</sup> ows, use et sides of int = S (A x I (A x k ) ter (TMP ere the det tailed calcu	$\frac{46.17}{2.73}$ ffective winternal walk ternal walk U) $P = Cm \div$ ails of the valuation.	7 ndow U-va ls and part - TFA) in constructi	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7 alue calcul itions kJ/m <sup>2</sup> K	m <sup>2</sup> x 5 x1 7 x1 7 x1 3 x 2 x 5 2 2 x 5 5 2 x 1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ [0.13] 0.13 0.13 g formula 1 (26)(30)	$K =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ =   \\ =   \\   =   \\   =   \\   =   \\   =   \\   =   \\   (1/U-valu) + (32) = \\ ((28). \\ Indical + (32) =   \\ ((28). \\   ($	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77 <i>(ve)+0.04] a</i>	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (27b) (28) (29) (30) (31) (31) (31) (34) (35)
Doors Window Window Rooflig Floor Walls Roof Total a * for win ** includ Fabric Heat ca Fabric Heat ca for desig can be u Therma if details	ws Type ws Type ws Type ghts area of ele dows and r le the areas heat loss apacity C al mass p ign assessr used instea	area 1 2 3 145 47.1 ements roof winde s on both s, W/K = Cm = S( parame ments wh d of a dea s : S (L bridging	(m <sup>2</sup> ) 49 3 , m <sup>2</sup> ows, use el sides of int = S (A x I (A x k ) ter (TMP ere the det tailed calcu x Y) calc	$\frac{46.17}{2.73}$ ffective winternal walk ternal walk U) $P = Cm \div$ values of the plation. culated to the second s	z ndow U-va 's and part - TFA) in constructi using Ap	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7 alue calcul itions kJ/m²K fon are not pendix H	m <sup>2</sup> x 5 x1 7 x1 7 x1 3 x 2 x 5 2 2 x 5 5 2 x 1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ [0.13] 0.13 0.13 g formula 1 (26)(30)	$K =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ =   \\ =   \\ =   \\   =   \\   =   \\   \\$	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77 <i>(ve)+0.04] a</i>	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (27b) (28) (29) (30) (31) (31) (31) (34) (35)

Ventila	ation he	at loss ca	alculated	d monthly	у		_		(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	60.72	60.39	60.08	58.59	58.31	57.01	57.01	56.77	57.51	58.31	58.87	59.46		(38)
Heat t	ransfer	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	193.8	193.47	193.15	191.66	191.38	190.08	190.08	189.84	190.59	191.38	191.95	192.54		
							-	•		-	Sum(39)1.	12 /12=	191.66	(39)
	<u> </u>	ameter (I	<u> </u>	1				1	· · ·	= (39)m ÷				
(40)m=	1.63	1.62	1.62	1.61	1.61	1.59	1.59	1.59	1.6	1.61	1.61	1.62		
Numb	er of dag	ys in mo	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12 /12=	1.61	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
		-	•	•				•	-					
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
A			NI									]		(40)
		upancy, 9, N = 1		(1 - exp	(-0.0003	849 x (TF		)2)] + 0.(	)013 x (	TFA -13.		86		(42)
	A £ 13.				,	,		, ,,	,		,			
								(25 x N) to achieve		se target o		2.13		(43)
		litres per				-	-	lo acilieve	a water us	se largel o	1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat		in litres per			,			U U		000				
(44)m=	112.34	108.26	104.17	100.09	96	91.92	91.92	96	100.09	104.17	108.26	112.34		
<b>( )</b>											m(44) <sub>112</sub> =		1225.56	(44)
Energy	content o	f hot water	used - ca	lculated me	onthly = 4.	190 x Vd,r	m x nm x D	DTm / 3600						
(45)m=	166.6	145.71	150.36	131.09	125.78	108.54	100.58	115.42	116.79	136.11	148.58	161.34		
										Total = Su	m(45) <sub>112</sub> =	=	1606.9	(45)
lf instan	taneous v	vater heati	ng at poin	t of use (no	hot water	r storage),	enter 0 in	boxes (46	) to (61)					
· · ·	24.99	21.86	22.55	19.66	18.87	16.28	15.09	17.31	17.52	20.42	22.29	24.2		(46)
	storage		) includir		alar ar M	/\//HBS	storada	within sa	ame ves	ما				(47)
-		neating a		• •			-			501		0		(47)
	•	-			-			ombi boil	ers) ente	er '0' in (	47)			
	storage			- (						(				
a) If m	nanufac	turer's d	eclared l	loss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	e 2b								0		(49)
		om water	•					(48) x (49)	) =			0		(50)
		turer's d		-										
		age loss			ie 2 (kvv	n/litre/da	ay)					0		(51)
	-	from Ta		011 4.5								0		(52)
		actor fro		e 2b								0		(52)
		om water			ear			(47) x (51)	) x (52) x (	53) =		0		(54)
-		(54) in (5	-	, <b>,</b>				x / x=*)		,		0		(55)
	. ,	loss cal		for each	month			((56)m = (	55) × (41)	m	L			
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
· /		-		-	-	_	-	I	-	-				

If cylinder contai	ns dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circu	it loss (ar	nual) fro	om Table	e 3							0		(58)
Primary circu	•				59)m = (	(58) ÷ 36	65 × (41)	m					
(modified b	by factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)		L	
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss c	alculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 29.17	26.34	29.15	28.19	29.1	28.14	29.06	29.09	28.16	29.13	28.21	29.16		(61)
Total heat re	quired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	1
(62)m= 195.77	7 172.05	179.51	159.27	154.89	136.68	129.64	144.5	144.96	165.24	176.79	190.51		(62)
Solar DHW inpu	t calculated	using App	endix G or	Appendix	KH (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add addition	al lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	G)		-			
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
<mark>(64)</mark> m= 195.77	7 172.05	179.51	159.27	154.89	136.68	129.64	144.5	144.96	165.24	176.79	190.51		_
							Outp	out from w	ater heate	r (annual)₁	12	1949.81	(64)
Heat gains fr	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	« [(46)m	+ (57)m	+ (59)m	]	
<mark>(65)</mark> m= 62.69	55.03	57.28	50.63	49.1	43.12	40.71	45.65	45.88	52.54	56.45	60.94		(65)
include (57	)m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal g	gains (see	e Table 5	and 5a	):									
Metabolic ga	ins (Table	e 5), Wat	ts	-	-	-	_	-	-	-			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 143.0 <sup>°</sup>	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01		(66)
Lighting gain	s (calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 25.33	22.5	18.3	13.85	10.36	8.74	9.45	12.28	16.48	20.93	24.43	26.04		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m= 284.18	3 287.13	279.7	263.88	243.91	225.14	212.6	209.65	217.08	232.9	252.87	271.64		(68)
Cooking gain	s (calcula	ated in A	ppendix	L, equat	tion L15	or L15a)	), also se	e Table	5				
(69)m= 37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3		(69)
Pumps and fa	ans gains	(Table 5	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	on (nega	tive valu	es) (Tab	ole 5)		•		•				
(71)m= -114.4	1 -114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41		(71)
Water heatin	g gains (1	Fable 5)											
(72)m= 84.26	81.9	76.99	70.32	65.99	59.9	54.71	61.35	63.72	70.62	78.41	81.91		(72)
Total interna	al gains =				(66)	m + (67)m	n + (68)m +	⊦ (69)m + i	(70)m + (7	1)m + (72)	m		
(73)m= 462.68	3 460.43	443.89	416.96	389.16	362.68	345.67	352.19	366.18	393.35	424.61	448.49		(73)
6. Solar gai	าร:												
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	ie applicat	le orientat	ion.		
Orientation:			Area		Flu		_	g	_	FF		Gains	
	Table 6d		m²		Ta	ole 6a	Т	able 6b	T	able 6c		(W)	

Northeast 0.9x	0.77	] ×	14.07	×	11.28	) ×	0.76	x	0.7	=	58.53	(75)
Northeast 0.9x	0.77	] ^ ] x	14.07	x x	22.97	x l	0.76	x	0.7	=	119.13	](75)
Northeast 0.9x	0.77	) ^   x	14.07	x l	41.38	^   x	0.76	x	0.7	=	214.64	(75)
Northeast 0.9x	0.77	] x	14.07	l x	67.96	x	0.76	x	0.7	=	352.51	(75)
Northeast 0.9x	0.77	」 】 ×	14.07	   x	91.35	]   x	0.76	x	0.7	=	473.84	(75)
Northeast 0.9x	0.77	]   x	14.07	×	97.38	   x	0.76	x	0.7	=	505.16	(75)
Northeast 0.9x	0.77	] x	14.07	x	91.1	」 】 ×	0.76	x	0.7	=	472.57	(75)
Northeast 0.9x	0.77	] x	14.07	x	72.63	x	0.76	x	0.7	=	376.74	(75)
Northeast 0.9x	0.77	x	14.07	x	50.42	x	0.76	x	0.7	=	261.55	(75)
Northeast 0.9x	0.77	x	14.07	×	28.07	×	0.76	x	0.7	=	145.59	(75)
Northeast 0.9x	0.77	x	14.07	×	14.2	×	0.76	x	0.7	=	73.64	(75)
Northeast 0.9x	0.77	x	14.07	×	9.21	×	0.76	x	0.7	=	47.8	(75)
Southeast 0.9x	0.77	x	19.95	×	36.79	×	0.76	x	0.7	=	270.62	(77)
Southeast 0.9x	0.77	x	19.95	×	62.67	×	0.76	x	0.7	=	460.97	(77)
Southeast 0.9x	0.77	x	19.95	×	85.75	×	0.76	x	0.7	=	630.72	(77)
Southeast 0.9x	0.77	x	19.95	×	106.25	×	0.76	x	0.7	=	781.49	(77)
Southeast 0.9x	0.77	x	19.95	×	119.01	x	0.76	x	0.7	=	875.33	(77)
Southeast 0.9x	0.77	x	19.95	×	118.15	x	0.76	x	0.7	=	869	(77)
Southeast 0.9x	0.77	x	19.95	×	113.91	x	0.76	x	0.7	=	837.81	(77)
Southeast 0.9x	0.77	x	19.95	×	104.39	x	0.76	x	0.7	=	767.8	(77)
Southeast 0.9x	0.77	x	19.95	×	92.85	×	0.76	x	0.7	=	682.93	(77)
Southeast 0.9x	0.77	x	19.95	×	69.27	x	0.76	x	0.7	=	509.47	(77)
Southeast 0.9x	0.77	x	19.95	×	44.07	×	0.76	x	0.7	=	324.14	(77)
Southeast 0.9x	0.77	x	19.95	×	31.49	x	0.76	x	0.7	=	231.6	(77)
Southwest <sub>0.9x</sub>	0.77	x	10	×	36.79		0.76	x	0.7	=	135.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	62.67	]	0.76	x	0.7	=	231.06	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	85.75	]	0.76	x	0.7	] =	316.15	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	106.25		0.76	x	0.7	=	391.72	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	119.01		0.76	x	0.7	=	438.76	(79)
Southwest0.9x	0.77	x	10	×	118.15		0.76	x	0.7	=	435.59	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	113.91	ļ	0.76	x	0.7	=	419.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	104.39	ļ	0.76	x	0.7	=	384.86	(79)
Southwest0.9x	0.77	x	10	×	92.85		0.76	x	0.7	=	342.32	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	69.27		0.76	x	0.7	=	255.37	(79)
Southwest <sub>0.9x</sub>	0.77	×	10	×	44.07	]	0.76	x	0.7	=	162.48	(79)
Southwest <sub>0.9x</sub>	0.77	×	10	×	31.49	]	0.76	X	0.7	=	116.09	(79)
Rooflights 0.9x	1	×	2.73	×	26	x	0.76	x	0.7	=	33.99	(82)
Rooflights 0.9x	1	×	2.73	×	54	×	0.76	x	0.7	=	70.58	(82)
Rooflights 0.9x	1	×	2.73	×	96	×	0.76	x	0.7	=	125.48	(82)
Rooflights 0.9x	1	×	2.73	×	150	×	0.76	x	0.7	=	196.07	(82)
Rooflights 0.9x	1	x	2.73	×	192	×	0.76	x	0.7	=	250.97	(82)

Rooflights 0.9x	1 ×	2.7	73	x	200		x	0.76	×	0.7	=	261.42	(82)
Rooflights 0.9x	1 ×	2.7	73	x	189		x	0.76	x	0.7	=	247.05	(82)
Rooflights 0.9x	1 ×	2.7	73	x	157		x	0.76	x	0.7	=	205.22	(82)
Rooflights 0.9x	1 ×	2.7	73	x	115		x	0.76	x	0.7	=	150.32	(82)
Rooflights 0.9x	1 ×	2.7	73	x	66		x	0.76	x	0.7	=	86.27	(82)
Rooflights 0.9x	1 ×	2.7	73	x	33		x	0.76	x	0.7	=	43.14	(82)
Rooflights 0.9x	1 ×	2.7	73	x	21		x	0.76	x	0.7	=	27.45	(82)
Solar gains in watte	, calculate	d for eac	h month	-		(	(83)m = S	Sum(74)m .	(82)m				
(83)m= 498.78 881		1721.79			71.18 197		1734.62	1437.12	996.7	603.4	422.93		(83)
Total gains – interr		· ,	· ,	<u>`</u>								1	
(84)m= 961.46 1342	.18 1730.89	2138.75	2428.06	24	33.86 232	23.05	2086.81	1803.31	1390.06	1028.01	871.42		(84)
7. Mean internal to	emperature	(heating	season	)									
Temperature during heating periods in the living area from Table 9, Th1 (°C)21Utilisation factor for gains for living area, h1,m (see Table 9a)21													
Jan F	eb Mar	Apr	May		Jun J	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.99 0.9	8 0.93	0.83	0.66		0.48 0.	.36	0.41	0.66	0.91	0.98	1		(86)
(86)m=         0.99         0.98         0.93         0.83         0.66         0.48         0.36         0.41         0.66         0.91         0.98         1         (86)           Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)         0.91         0.98         1         (86)													
(87)m= 19.35 19.	69 20.14	20.6	20.87	2	0.97 20	).99	20.99	20.9	20.47	19.8	19.28		(87)
Temperature duri	na heatina i	periods i	n rest of	dw	ellina fror	m Tal	ble 9. T	h2 (°C)		•			
(88)m= 19.59 19	<u> </u>	19.61	19.61	<b>—</b>		9.62	19.62	19.61	19.61	19.61	19.6	]	(88)
Utilisation factor for	r gains for	rost of d	wolling	<u>г</u> h2			0.2)					1	
(89)m = 0.99 0.9	<u> </u>	0.78	0.58	<b>1</b>	<u> </u>	.25	9 <i>a)</i> 0.29	0.55	0.87	0.98	0.99	1	(89)
								I		0.00	0.00	J	()
Mean internal terr		1	r	<u> </u>	<u> </u>			1		40.40	47.07	1	(90)
(90)m= 17.46 17.	96 18.59	19.19	19.5		19.6 19	9.62	19.62	19.55	19.06	18.12 ng area ÷ (4	17.37	0.45	
								'		ig alca ÷ (-	•) -	0.15	(91)
Mean internal tem	· · · · · · · · · · · · · · · · · · ·	1	1	<u> </u>	1			<u> </u>		1		1	()
(92)m= 17.75 18.		19.41	19.71			9.83	19.82	19.76	19.28	18.38	17.66	]	(92)
Apply adjustment		1	I	T	1			1		40.00	47.00	1	(93)
(93)m= 17.75 18.		19.41	19.71		9.81 19	9.83	19.82	19.76	19.28	18.38	17.66		(93)
8. Space heating Set Ti to the mean			re obtair	bod	at stop 1	1 of <sup>-</sup>	Tabla 0	h so tha	t Ti m-	(76)m an	d re-cal	sulato	
the utilisation factor		•		ieu	at step 1	1 01	I able 9	D, 50 IIIA	t 11,111=	(70)m an	u le-cal	Julate	
Jan F	b Mar	Apr	May		Jun J	Jul	Aug	Sep	Oct	Nov	Dec	]	
Utilisation factor for	r gains, hn	י ו:								•			
(94)m= 0.99 0.9	6 0.9	0.77	0.59		0.4 0.	.26	0.31	0.56	0.86	0.97	0.99		(94)
Useful gains, hm(	im , W = (9	4)m x (8	4)m										
. ,	.83 1555.47					0.68	645.44	1014.89	1194.52	997.05	862.83		(95)
Monthly average		ri	1	-						1		1	()
(96)m= 4.3 4.1		8.9	11.7			6.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for		· · · ·	1	1		<u> </u>	- ,	<u> </u>	-	0404 57	0504 7	I	(07)
(97)m= 2606.02 2577		2014.22				3.17	650.15				2591.74	J	(97)
Space heating red (98)m= 1233.36 866		263.66	78.83	vvn T		0.02	4 x [(97 0	)m – (95 0	)mJ x (4 346.87	1)m 840.61	1286.31	1	
	014.12	203.00	10.03	L	·	U	U		340.8/	040.01	1200.31	J	

								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	5530.59	(98)
Space	e heating	g require	ement ir	n kWh/m²	/year								46.39	(99)
9a. En	ergy req	uiremer	nts – Ind	lividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
•	e heatin	-												_
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	y system						0	(201)
Fracti	on of sp	ace hea	at from n	nain syst	em(s)			(202) = 1 ·	- (201) =				1	(202)
Fracti	on of tot	al heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	nain spa	ace heat	ting syste	em 1								93.7	(206)
Efficie	ency of s	econda	ry/suppl	ementar	y heating	g system	n, %	-	-				0	(208)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	i		<u>```</u>	calculate	Í								I	
	1233.36	866.82	614.12	263.66	78.83	0	0	0	0	346.87	840.61	1286.31		
(211)m			1	100 ÷ (20									l	(211)
	1316.29	925.1	655.42	281.38	84.13	0	0	0 Tota		370.19 ar) =Sum(2	897.13	1372.8	5000.44	
0		- <b>f</b>		····)				TULA			<b>11)</b> <sub>15,1012</sub>		5902.44	(211)
•	e neatinę )m x (20			'y), kWh/ )8)	month									
(215)m=		0	00.(20	0	0	0	0	0	0	0	0	0		
	LI		!	1			!	Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water	heating													
Output			I IIII	ulated a			1						l	
<b>-</b> <i>tt</i> :-:	195.77	172.05	179.51	159.27	154.89	136.68	129.64	144.5	144.96	165.24	176.79	190.51		
EIIICIEr (217)m=	ncy of wa	90.07	89.84	89.27	88.21	87	87	87	87	89.47	90.03	90.21	87	(216)
```	or water				00.21	07	07	07	07	09.47	90.03	90.21	]	(217)
	n = (64)	•					_	-	-	-	-			
(219)m=	217.11	191.03	199.82	178.42	175.58	157.1	149.01	166.1	166.62	184.68	196.36	211.2		_
								Tota	I = Sum(2				2193.02	(219)
	l totals	fuelue	nd main	system	1					k	Wh/year	, 	kWh/yea	r T
•	-			system	1								5902.44	4
	heating												2193.02	
Electric	city for p	umps, f	ans and	electric	keep-hot	t								
centra	al heatin	g pump	:									30		(230c)
boiler	with a fa	an-assis	sted flue									45		(230e)
Total e	lectricity	for the	above,	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electric	city for li	ghting											447.42	(232)
12a. (	CO2 em	issions ·	– Individ	lual heati	ing sys <u>te</u>	ems inclu	uding mi	cro-CHF	)					
							ergy /h/year			<b>Emiss</b> kg CO2	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/ye	
Space	heating	(main s	ystem 1	)		(21	1) x			0.2	16	=	1274.93	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	473.69	(264)
Space and water heating	(261) + (262) + (263) +	(264) =		1748.62	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	232.21	(268)
Total CO2, kg/year		sum of (265)(271) =		2019.76	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		16.94	(273)
EI rating (section 14)				84	(274)

				User D	etails:						
Assessor Name:	Mitchell Fir	าท			Strom	a Num	ber:		STRO	029125	
Software Name:	Stroma FS	AP 201	2		Softwa	are Vei	rsion:		Versio	on: 1.0.3.11	
			Р	roperty <i>i</i>	Address	: House	2 After F	Reducing	g Energy	Demand	
Address :	House 2, So	outh of 2	7a West	End La	ne, Lond	don, NW	6 4QJ				
1. Overall dwelling dimer	nsions:										
					a(m²)	I	Av. Hei	ight(m)	1	Volume(m <sup>3</sup> )	1
Ground floor				4	1.61	(1a) x	2	.45	(2a) =	101.94	(3a)
First floor				4	1.61	(1b) x	2	.75	(2b) =	114.43	(3b)
Second floor				2	5.43	(1c) x	2	2.9	(2c) =	73.75	(3c)
Total floor area TFA = (1a	)+(1b)+(1c)+(	(1d)+(1e	)+(1r	n) <u>1</u> 0	08.65	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	290.12	(5)
2. Ventilation rate:											
	main heating		econdar eating	У	other		total			m <sup>3</sup> per hour	
Number of chimneys	0	_] + [ <sup>¨</sup>	0	+	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0	T + T	0	_ + _	0	ī - Г	0	x 2	20 =	0	(6b)
Number of intermittent far	IS					- F	2	x ′	0 =	20	(7a)
Number of passive vents						Г	0	x ′	0 =	0	(7b)
Number of flueless gas fire	es					Г	0	x 4	40 =	0	(7c)
						L					1
									Air ch	anges per hou	Ir
Infiltration due to chimney							20		÷ (5) =	0.07	(8)
If a pressurisation test has be			d, procee	d to (17), d	otherwise o	continue fr	om (9) to (	(16)			1
Number of storeys in the Additional infiltration	e aweiling (ns	5)						[(0)]	1]x0.1 =	0	(9) (10)
Structural infiltration: 0.2	25 for steel or	timber f	rame or	0 35 for	r masoni	v constr	uction	[(9)-	1JXU. I =	0	(10)
if both types of wall are pre							uction			0	](''')
deducting areas of opening					N 1						1
If suspended wooden flo		·	ed) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente										0	(13)
Percentage of windows Window infiltration	and doors dr	augnt st	rippea		0.25 - [0.2	$\mathbf{v}(14) \pm 1$	001 -			0	(14)
					(8) + (10)		1	. (15) -		0	(15)
Infiltration rate		مانيم منام	:							0	(16)
Air permeability value, o	-			•		•	elle ol e	nvelope	area	5	(17)
If based on air permeabilit Air permeability value applies							is beina us	sed		0.32	(18)
Number of sides sheltered			boon don		groe an pe	iniousinty	io boing at			0	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			1	(20)
Infiltration rate incorporation	ng shelter fac	tor			(21) = (18	) x (20) =				0.32	(21)
Infiltration rate modified for	or monthly wir	nd speed									-
Jan Feb I	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Tabl	e 7									
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
Calavi	0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.37		
		<i>ctive air</i> al ventila	•	rate for t	ne appli	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
				ciency in %						, , ,			0	(200) (23c)
			-	entilation	-					2b)m + (	23b) x [1	– (23c)	_	(200)
(24a)m=	1	0		0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mecha	ı anical ve	entilation	without	heat rec	ı coverv (N	и ЛV) (24b	m = (22)	1 2b)m + (j	 23b)		ł	
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
,				ntilation of then (24)	•	•				.5 × (23t	)		I	
(24c)m=	. ,	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous m = (221		•				0.5]	1		I	
(24d)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)
Effe	ctive air	change	rate - ei	nter (24a	) or (24t	o) or (24	c) or (24	d) in box	x (25)				1	
(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN		Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
Doors						2.2	x	1	=	2.2				(26)
Window	ws Type	e 1				10	x1.	/[1/( 1.4 )+	0.04] =	13.26				(27)
Window	ws Type	e 2				11.67	, x1	/[1/( 1.4 )+	0.04] =	15.47				(27)
Rooflig	hts					2.73	x1,	/[1/(1.4) +	0.04] =	3.822	_			(27b)
Floor						41.61	x	0.13		5.4093				(28)
Walls		55.6	69	23.8	7	31.82	2 X	0.18		5.73	<b>-</b> 7			(29)
Roof		41.6	61	2.73		38.88	3 X	0.13		5.05	<b>-</b>		$\exists$	(30)
Total a	rea of e	lements	, m²			138.9	1		I					(31)
				effective wi nternal wal			ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	) + (32) =				50.74	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	0	(34)
Therm	al mass	parame	eter (TMI	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	-	sments wh ad of a de		etails of the rulation.	construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
	-	•	,	culated u	• •	•	<						26.91	(36)
			are not kr	nown (36) =	= 0.15 x (3	1)			(22) •	(26) -			:	
	abric he		alculator	d monthly						(36) =	25)m x (5)		77.65	(37)
ventild	Jan	Feb	Mar	1	May	Jun	Jul	Aua	Sep	Oct	25)m x (5) Nov	Dec	1	

(38)m=	55.79	55.48	55.18	53.76	53.5	52.26	52.26	52.04	52.74	53.5	54.03	54.59		(38)
	ansfer o	L coefficier	L ht W/K						(39)m	= (37) + (3	38)m			
(39)m=	133.43	133.13	132.83	131.41	131.15	129.91	129.91	129.69	130.39	131.15	131.68	132.24		
									<u>ا</u> ،	Average =	Sum(39)₁.	<sub>12</sub> /12=	131.41	(39)
Heat Ic	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)	_		
(40)m=	1.23	1.23	1.22	1.21	1.21	1.2	1.2	1.19	1.2	1.21	1.21	1.22		<b>-</b>
Numbe	er of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12 /12=	1.21	(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 ene	rgy requ	irement:								kWh/ye	ar:	
Accum		ipancy,	N											(40)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	-13.9	)2)] + 0.0	0013 x (	TFA -13.		81		(42)
	A £ 13.9							(05 ··· NI)	. 00		-			( ( )
								(25 x N) to achieve		se target o		0.85		(43)
not more	e that 125	litres per	person pe	r day (all w	vater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	110.94	106.91	102.87	98.84	94.8	90.77	90.77	94.8	98.84	102.87	106.91	110.94		_
Energy o	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd.r	n x nm x D	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )		Total = Su hth (see Ta	· · ·	L	1210.25	(44)
(45)m=	164.52	143.89	148.48	129.45	124.21	107.18	99.32	113.97	115.33	134.41	146.72	159.33		
(,										Total = Su			1586.82	(45)
lf instant	aneous w	ater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46	) to (61)					
(46)m=	24.68	21.58	22.27	19.42	18.63	16.08	14.9	17.1	17.3	20.16	22.01	23.9		(46)
	storage		includir	na anv si	olar or M	////HRS	storane	within sa	ame ves	مما	<b></b>	0		(47)
-				ink in dw			-			501		0		(47)
	•	-			-			ombi boil	ers) ente	er '0' in (	47)			
	storage													
				oss facto	or is kno	wn (kWł	n/day):					0		(48)
•			m Table									0		(49)
0,			•	, kWh/ye cylinder⊺		or is not		(48) x (49)	) =			0		(50)
,				om Tabl								0		(51)
			ee secti	on 4.3										
		from Ta		<b>2</b> h								0		(52)
•			m Table					(47) × (54)	) y (FQ) y (	50)		0		(53)
		(54) in (5	-	, kWh/ye	ear			(47) x (51)	) X (52) X (	53) =		0 0		(54) (55)
	. ,	. , .	,	for each	month			((56)m = (	55) × (41)	m		~		(00)
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
	_	-	-	-	-		-	-	-	-	-	m Appendi	хH	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
								I		L				

	•	it loss (ar	,									0		(58)
	•	it loss cal					. ,	. ,		r tharma	atat)			
•		y factor fi	· · · · · ·	r	i		r	r –	r -	r	<u> </u>		l	(59)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(39)
Combi	loss ca	alculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	29.17	26.34	29.15	28.18	29.1	28.14	29.06	29.08	28.16	29.12	28.21	29.16		(61)
Total h	eat rec	quired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	193.69	170.23	177.63	157.63	153.31	135.32	128.38	143.06	143.49	163.54	174.93	188.49		(62)
Solar DH	HW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	ddition	al 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)
Output	from v	vater hea	ter											
(64)m=	193.69	170.23	177.63	157.63	153.31	135.32	128.38	143.06	143.49	163.54	174.93	188.49		
		-	-		-		-	Outp	out from w	ater heate	r (annual)₁	12	1929.69	(64)
Heat g	ains fro	om water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	۲ ((46)m	+ (57)m	+ (59)m	]	
(65)m=	62	54.43	56.66	50.09	48.57	42.67	40.29	45.17	45.39	51.97	55.84	60.27		(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	
	•	, Jains (see		. ,	-	•		U						
	Ĩ	ns (Table			) -									
Melab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	140.32		140.32	140.32	140.32	140.32	140.32	140.32	140.32	140.32	140.32	140.32		(66)
		s (calcula												
(67)m=	24.04	21.35	17.36	13.14	9.82	8.29	8.96	11.65	15.64	19.85	23.17	24.7		(67)
											20111			(- )
	269.6	ains (calc	265.35	250.34	231.4	213.59	201.69	198.9	205.95	220.95	239.9	257.71		(68)
(68)m=		-									239.9	257.71		(00)
	<u> </u>	s (calcula	r	 T	· · ·		, 		1	· · · · · ·			I	(00)
(69)m=		37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03		(69)
•	r	ans gains	<u>`</u>	<u>,                                     </u>								r	I	()
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)		i		ı —		i		
(71)m=	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26		(71)
Water	heating	g gains (T	able 5)											
(72)m=	83.33	80.99	76.15	69.57	65.29	59.27	54.15	60.71	63.04	69.86	77.55	81		(72)
Total i	nterna	l gains =				(66)	m + (67)m	n + (68)m +	+ (69)m +	(70)m + (7	1)m + (72)	m		
(73)m=	445.06	442.84	426.96	401.15	374.61	349.25	332.91	339.35	352.72	378.76	408.72	431.51		(73)
6. So	lar gair	is:	•		•		•		•	•	•	•		
Solar g	ains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	e applicat	le orientat	ion.		
Orienta		Access F Table 6d		Area m²		Flu Tal	x ole 6a	Т	g_ able 6b	Т	FF able 6c		Gains (W)	

x

х

11.28

22.97

x

х

0.76

0.76

x

х

0.7

0.7

=

11.67

11.67

х

х

Northeast 0.9x

Northeast 0.9x

0.77

0.77

48.54

98.81

(75)

(75)

		-				_						_
Northeast 0.9x	0.77	x	11.67	x	41.38	x	0.76	x	0.7	=	178.03	(75)
Northeast 0.9x	0.77	x	11.67	x	67.96	x	0.76	x	0.7	=	292.38	(75)
Northeast 0.9x	0.77	x	11.67	x	91.35	x	0.76	×	0.7	=	393.01	(75)
Northeast 0.9x	0.77	x	11.67	x	97.38	x	0.76	×	0.7	=	418.99	(75)
Northeast 0.9x	0.77	x	11.67	x	91.1	x	0.76	x	0.7	=	391.96	(75)
Northeast 0.9x	0.77	x	11.67	x	72.63	x	0.76	<b>x</b>	0.7	=	312.47	(75)
Northeast 0.9x	0.77	x	11.67	x	50.42	x	0.76	x	0.7	=	216.93	(75)
Northeast 0.9x	0.77	x	11.67	x	28.07	x	0.76	x	0.7	=	120.76	(75)
Northeast 0.9x	0.77	x	11.67	x	14.2	x	0.76	<b>x</b>	0.7	=	61.08	(75)
Northeast 0.9x	0.77	x	11.67	x	9.21	x	0.76	<b>x</b>	0.7	=	39.64	(75)
Southwest <sub>0.9x</sub>	0.77	x	10	x	36.79	]	0.76	x	0.7	=	135.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	62.67	]	0.76	x	0.7	=	231.06	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	85.75	]	0.76	<b>x</b>	0.7	=	316.15	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	106.25	]	0.76	<b>x</b>	0.7	=	391.72	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	119.01	]	0.76	<b>x</b>	0.7	=	438.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	118.15	]	0.76	<b>x</b>	0.7	=	435.59	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	113.91	]	0.76	<b>x</b>	0.7	=	419.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	104.39	]	0.76	<b>x</b>	0.7	=	384.86	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	92.85	]	0.76	<b>x</b>	0.7	=	342.32	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	69.27	]	0.76	×	0.7	=	255.37	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	44.07	]	0.76	×	0.7	=	162.48	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	31.49	]	0.76	x	0.7	=	116.09	(79)
Rooflights 0.9x	1	x	2.73	x	26	x	0.76	x	0.7	=	33.99	(82)
Rooflights 0.9x	1	x	2.73	x	54	x	0.76	×	0.7	=	70.58	(82)
Rooflights 0.9x	1	x	2.73	x	96	x	0.76	×	0.7	=	125.48	(82)
Rooflights 0.9x	1	x	2.73	x	150	x	0.76	×	0.7	=	196.07	(82)
Rooflights 0.9x	1	x	2.73	x	192	x	0.76	×	0.7	=	250.97	(82)
Rooflights 0.9x	1	x	2.73	x	200	<b>x</b>	0.76	×	0.7	=	261.42	(82)
Rooflights 0.9x	1	x	2.73	x	189	x	0.76	x	0.7	=	247.05	(82)
Rooflights 0.9x	1	x	2.73	x	157	x	0.76	×	0.7	=	205.22	(82)
Rooflights 0.9x	1	x	2.73	x	115	x	0.76	x	0.7	=	150.32	(82)
Rooflights 0.9x	1	x	2.73	x	66	x	0.76	x	0.7	=	86.27	(82)
Rooflights 0.9x	1	x	2.73	x	33	x	0.76	×	0.7	=	43.14	(82)
Rooflights 0.9x	1	x	2.73	x	21	x	0.76	×	0.7	_ =	27.45	(82)
		_		-		-						_
Solar <u>g</u> ains in w	atts, calcul	ated	ì	_		<u> </u>	n = Sum(74)m	.(82)m				
、 <i>,</i>		9.66	880.17 1082.7			902	.55 709.57	462.4	266.69	183.18		(83)
Total gains – in			· · · · ·	<u> </u>	· · · · · · · · · · · · · · · · · · ·						1	
(84)m= 663.24	843.3 104	6.62	1281.32 1457.3	5 14	65.26 1391.87	1241	1.91 1062.29	841.16	675.42	614.69		(84)
7. Mean intern	al temperat	ture (	heating seaso	on)								
Temperature of	during heati	ng pe	eriods in the li	ving	area from Tat	ole 9	, Th1 (°C)				21	(85)
Utilisation factor	<u> </u>		I	-r	,		·		·, · · ·			
Jan	Feb M	lar	Apr Ma	y	Jun Jul	A	ug Sep	Oct	Nov	Dec		

(86)m=	1	0.99	0.97	0.9	0.75	0.55	0.41	0.47	0.75	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.66	19.89	20.23	20.63	20.89	20.98	21	20.99	20.92	20.52	20.01	19.63		(87)
Temp	erature	during h	eating p	periods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.9	19.9	19.9	19.91	19.91	19.92	19.92	19.93	19.92	19.91	19.91	19.91		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.97	0.87	0.69	0.47	0.31	0.37	0.67	0.94	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	18.13	18.45	18.94	19.5	19.82	19.91	19.92	19.92	19.86	19.38	18.64	18.08		(90)
									f	iLA = Livin	g area ÷ (4	4) =	0.18	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA x T1	+ (1 – fL	.A) × T2					
(92)m=	18.41	18.71	19.18	19.71	20.01	20.11	20.12	20.12	20.05	19.59	18.89	18.36		(92)
Apply	adjustn	nent to t	he mear	n interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.41	18.71	19.18	19.71	20.01	20.11	20.12	20.12	20.05	19.59	18.89	18.36		(93)
8. Sp	ace hea	ting requ	uirement	t										
				mperatui		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut			<u> </u>	using Ta	1	lun	lul	Aug	San	Oct	Nov	Dee		
l Itilioa	Jan ation fac	Feb tor for g	Mar ains hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	1	0.99	0.96	0.87	0.69	0.48	0.33	0.39	0.68	0.93	0.99	1		(94)
	l gains.			4)m x (84										
(95)m=	660.27	832.17	1003.2	rí i	1007.56	704.27	455.94	479.42	722.06	786.4	668.45	612.73		(95)
Month	nly avera	age exte	rnal terr	perature	e from Ta	able 8	I	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	]				
(97)m=	1882.59	1839	1683.96	1420.71	1090.27	715.59	457.29	482.36	776.2	1178.76	1552.61	1872.73		(97)
Space	e heatin	g require	ement fo	or each n	nonth, k	Nh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	909.41	676.59	506.48	221.95	61.54	0	0	0	0	291.92	636.59	937.44		_
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	4241.92	(98)
Space	e heatin	g require	ement in	ı kWh/m²	²/year								39.04	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
	e heatir				Ŭ		Ŭ		,					
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 ·	- (201) =				1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		ĺ	1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.7	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	
Space							Jui	_ Aug	Oep	001		Dec	KWII/ye	a
Spade	909.41	676.59	506.48	221.95	61.54	0	0	0	0	291.92	636.59	937.44		
(211)m	) = {[(98			I 100 ÷ (20										(211)
\ <u>-</u> ///	970.55	722.08	540.54	236.87	65.67	0	0	0	0	311.55	679.39	1000.47		()
		I	I	I	I	I	I		l I (kWh/yea		211) <sub>15,1012</sub>		4527.13	(211)

Space heating fuel (secondary), kWh/month

$(\Gamma(\Omega\Omega)) = \chi(\Omega)$			• ·										
$= \{[(98)m \times (20))\}$	T	<u> </u>	<u> </u>									l	
(215)m= 0	0	0	0	0	0	0		0 al (kWh/yea		0	0		
							TOLA			213) <sub>15,10</sub> 1	2-	0	(215)
Water heating	-	t (   -		h									
Output from w	170.23	ter (caic 177.63	157.63	153.31	135.32	128.38	143.06	143.49	163.54	174.93	188.49		
Efficiency of w												87	(216)
(217)m= 90.03	89.93	89.71	89.13	88.03	87	87	87	87	89.34	89.88	90.06		(217)
Fuel for water	heating,	kWh/mo	onth										
(219)m <u>= (64</u> )					· · · · ·							I	
(219)m= 215.14	189.29	198	176.86	174.16	155.54	147.56	164.43	164.94	183.06	194.63	209.3		-
							Tota	al = Sum(2				2172.92	(219)
Annual totals		منا مم ما	a) interne	4					k	Wh/yea	r	kWh/yea	r J
Space heating	) tuel use	ea, main	system	1								4527.13	
Water heating	fuel use	ed										2172.92	
Electricity for p	oumps, f	ans and	electric	keep-ho	t								
central heatir	ng pump	:									30		(230c)
boiler with a	fon occir	stad flua											(2200)
	1011-05513	sieu nue									45		(230e)
Total electricit			kWh/yea	ır			sum	of (230a)	(230g) =		45	75	(230e)
	y for the		kWh/yea	ır			sum	of (230a).	(230g) =		45	75 424.47	_
Total electricit	y for the ighting	above, I			ems inclu	uding mi			(230g) =		45		(231)
Total electricit Electricity for I	y for the ighting	above, I				uding mi i <b>ergy</b>				ion fac			(231)
Total electricit Electricity for I	y for the ighting	above, I			En					ion fac		424.47	(231) (232)
Total electricit Electricity for I	y for the ighting hissions (	above, I – Individ	ual heat		En kW	ergy			Emiss	<b>ion fac</b> 2/kWh		424.47 Emissions	(231) (232)
Total electricit Electricity for I 12a. CO2 em	y for the ighting hissions ( g (main s	above, I – Individ	ual heat		<b>En</b> kW (21	<b>ergy</b> /h/year			Emiss kg CO	ion fac 2/kWh	tor	424.47 Emissions kg CO2/ye	(231) (232) <b>S</b> ar
Total electricit Electricity for I 12a. CO2 em	y for the ighting hissions - g (main s g (second	above, I – Individ	ual heat		En kW (21	ergy /h/year 1) x			Emiss kg CO	<b>ion fac</b> 2/kWh 16	tor =	424.47 Emissions kg CO2/ye 977.86	(231) (232) <b>5</b> ar (261)
Total electricit Electricity for I 12a. CO2 em Space heating Space heating	y for the ighting hissions - g (main s g (second	above, I – Individ system 1 dary)	ual heat		En kW (21 (21)	<b>ergy</b> /h/year 1) x 5) x 9) x		)	<b>Emiss</b> kg CO. 0.2	<b>ion fac</b> 2/kWh 16	tor =	424.47 Emissions kg CO2/ye 977.86 0	(231) (232) <b>5</b> ar (261) (263)
Total electricit Electricity for I 12a. CO2 em Space heating Space heating Water heating	y for the ighting hissions ( (main s g (second hter heati	above, I – Individ system 1 dary)	ual heat	ing syste	En kW (21 (21) (21) (21)	<b>ergy</b> /h/year 1) x 5) x 9) x	cro-CHF	)	<b>Emiss</b> kg CO. 0.2	<b>ion fac</b> 2/kWh 16 19 16	tor =	424.47 Emissions kg CO2/ye 977.86 0 469.35	(231) (232) <b>5</b> ar (261) (263) (264)
Total electricit Electricity for l 12a. CO2 em Space heating Space heating Water heating Space and wa	y for the ighting hissions ( (main s g (second hter heati pumps, f	above, I – Individ system 1 dary)	ual heat	ing syste	En kW (21) (21) (21) (26) t (23)	<b>hergy</b> /h/year 1) x 5) x 9) x 1) + (262)	cro-CHF	)	Emiss kg CO. 0.2 0.5	<b>ion fac</b> 2/kWh 16 19 16	tor = = =	424.47 Emissions kg CO2/ye 977.86 0 469.35 1447.21	(231) (232) <b>5</b> ar (261) (263) (264) (265)
Total electricit Electricity for I 12a. CO2 em Space heating Space heating Water heating Space and wa Electricity for p	y for the ighting hissions (main s (second tter heati bumps, f ighting	above, I – Individ system 1 dary)	ual heat	ing syste	En kW (21) (21) (21) (26) t (23)	hergy /h/year 1) x 5) x 9) x 1) + (262) 1) x	cro-CHF	(264) =	Emiss kg CO. 0.2 0.5 0.2	<b>ion fac</b> 2/kWh 16 19 16	tor = = =	424.47 Emissions kg CO2/ye 977.86 0 469.35 1447.21 38.93	(231) (232) ar (261) (263) (264) (265) (265) (267)
Total electricit Electricity for I 12a. CO2 em Space heating Space heating Water heating Space and wa Electricity for I Electricity for I	y for the ighting hissions (main s (second ter heati bumps, f ighting /year	above, I – Individ ystem 1 dary) ing ans and	ual heat	ing syste	En kW (21) (21) (21) (26) t (23)	hergy /h/year 1) x 5) x 9) x 1) + (262) 1) x	cro-CHF	c (264) = sum c	Emiss kg CO 0.2 0.5 0.2	<b>ion fac</b> 2/kWh 16 19 16	tor = = =	424.47 Emissions kg CO2/ye 977.86 0 469.35 1447.21 38.93 220.3	(231) (232) ar (261) (263) (264) (265) (265) (267) (268)
Total electricit Electricity for I 12a. CO2 em Space heating Space heating Space and wa Electricity for I Electricity for I Total CO2, kg	y for the ighting hissions (main s (second ter heati bumps, f ighting /year 2 Emissi	above, I – Individ ystem 1 dary) ing ans and	ual heat	ing syste	En kW (21) (21) (21) (26) t (23)	hergy /h/year 1) x 5) x 9) x 1) + (262) 1) x	cro-CHF	c (264) = sum c	Emiss kg CO 0.2 0.5 0.2 0.5 0.5	<b>ion fac</b> 2/kWh 16 19 16	tor = = =	424.47 Emissions kg CO2/ye 977.86 0 469.35 1447.21 38.93 220.3 1706.44	(231) (232) ar (261) (263) (264) (265) (265) (267) (268) (272)

				User D	etails:						
Assessor Name:	Mitchell Fi	าท			Strom	a Num	ber:		STRO	029125	
Software Name:	Stroma FS	AP 201	2		Softwa	are Ver	rsion:		Versio	n: 1.0.3.11	
			Р	roperty	Address	: House	3 After F	Reducing	g Energy	Demand	
Address :	House 3, So	outh of 2	7a West	t End La	ne, Lono	don, NW	6 4QJ				
1. Overall dwelling dimer	nsions:										
				-	a(m²)	I	Av. Hei	ight(m)	1	Volume(m <sup>3</sup> )	1
Ground floor				4	1.51	(1a) x	2	.45	(2a) =	101.7	(3a)
First floor				4	1.51	(1b) x	2	.75	(2b) =	114.15	(3b)
Second floor				2	4.07	(1c) x	2	2.9	(2c) =	69.8	(3c)
Total floor area TFA = (1a	ı)+(1b)+(1c)+	(1d)+(1e	)+(1r	ר) 10	07.09	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	285.65	(5)
2. Ventilation rate:											•
	main heating		econdar eating	у	other		total			m <sup>3</sup> per hour	
Number of chimneys	0	+	0	+	0	=	0	x 4	40 =	0	(6a)
Number of open flues	0	_ + _	0	¯ + ¯	0	_ ] = [	0	x 2	20 =	0	(6b)
Number of intermittent far	IS					- Ē	2	x ′	10 =	20	(7a)
Number of passive vents						Г	0	x ^	10 =	0	(7b)
Number of flueless gas fir	es					Г	0	x 4	40 =	0	(7c)
						L					1
									Air ch	anges per hou	r
Infiltration due to chimney							20		÷ (5) =	0.07	(8)
If a pressurisation test has be			ed, procee	d to (17), d	otherwise of	continue fr	om (9) to (	(16)		Γ	1
Number of storeys in th	e dwelling (n	5)						(0)		0	(9)
Additional infiltration				0.05 (				[(9)	1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are pro						•	uction			0	(11)
deducting areas of openin				ine great	er wan are	a (allel					
If suspended wooden fl	oor, enter 0.2	(unseal	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else (	enter 0								0	(13)
Percentage of windows	and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	⊦ (15) =		0	(16)
Air permeability value, o	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ty value, then	(18) = [(1	7) ÷ 20]+(8	8), otherwi	se (18) = (	16)				0.32	(18)
Air permeability value applies	if a pressurisati	on test has	s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			
Number of sides sheltered	b									0	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			1	(20)
Infiltration rate incorporati	-				(21) = (18	) x (20) =				0.32	(21)
Infiltration rate modified fo		· ·								I	
	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe				ı —	r		r			I	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	-actor (22	2a)m =	(22)m ÷	4						_			_	
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltra	tion rate	e (allowir	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m	-		-		
Calavi	0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.38		
	<i>ate effect</i> echanical		-	ale ior l	ne appli	capie ca	Se						0	(23a)
lf exh	aust air hea	at pump ı	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (	N5)) , othei	wise (23b	) = (23a)			0	(23b)
lf bala	anced with I	heat reco	overy: effici	ency in %	allowing f	or in-use f	actor (fror	n Table 4h)	) =				0	(23c)
a) If	balanced	l mecha	anical ve	ntilation	with he	at recove	ery (MV	HR) (24a	ı)m = (2	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balanced	mecha	anical ve	ntilation	without	heat rec	covery (l	MV) (24b	)m = (22	2b)m + (2	23b)		-	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,	whole ho if (22b)m				•	•				.5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,	natural v if (22b)m									0.5]				
(24d)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	]	(24d)
Effe	ctive air c	hange	rate - en	ter (24a	) or (24t	o) or (24	c) or (24	ld) in boy	(25)	_	-	_	_	
(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
3 He	at losses	and he	at loss p	aramete	er:									
0.110														
ELEN		Gros area	S	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²⊷		A X k kJ/K
		Gros	S	Openin	gs						<)			
ELEN Doors		Gros area	S	Openin	gs	A ,r	m <sup>2</sup>		K	(W/I	<) 			kJ/K
ELEN Doors Windo	IENT	Gros area 1	S	Openin	gs	A ,r	m <sup>2</sup> x	W/m2	K =   0.04] =	(W/I 2.2	<) 			kJ/K (26)
ELEN Doors Windo <sup>r</sup> Windo <sup>r</sup>	<b>MENT</b> ws Type	Gros area 1 2	S	Openin	gs	A ,r 2.2 4.37	m <sup>2</sup> x x x1 x1	W/m2	K 0.04] = 0.04] =	(W/I 2.2 5.79	<) 			kJ/K (26) (27)
ELEN Doors Windo <sup>r</sup> Windo <sup>r</sup>	MENT ws Type ws Type : ws Type :	Gros area 1 2	S	Openin	gs	A ,r 2.2 4.37 10	m <sup>2</sup> x x1 x1 x1 x1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+	K 0.04] = 0.04] = 0.04] =	(W/I 2.2 5.79 13.26	$\diamond$			kJ/K (26) (27) (27)
ELEN Doors Windo Windo Windo	MENT ws Type ws Type : ws Type :	Gros area 1 2	S	Openin	gs	A ,r 2.2 4.37 10 11.67	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K 0.04] = 0.04] = 0.04] =	(W/I 2.2 5.79 13.26 15.47				kJ/K (26) (27) (27) (27)
ELEN Doors Windo Windo Windo Rooflig	MENT ws Type ws Type : ws Type :	Gros area 1 2	55 (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.2 4.37 10 11.67 2.73	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	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/I 2.2 5.79 13.26 15.47 3.822				kJ/K (26) (27) (27) (27) (27b)
ELEN Doors Windo Windo Windo Rooflig Floor	MENT ws Type ws Type : ws Type :	Gros area 1 2 3	3S (m <sup>2</sup> )	Openin m	gs 1 <sup>2</sup>	A ,r 2.2 4.37 10 11.67 2.73 41.51	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x x1 x x1 x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4 )+ 0.13	K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629				kJ/K (26) (27) (27) (27) (27b) (28)
ELEN Doors Windo Windo Rooflig Floor Walls Roof	MENT ws Type ws Type : ws Type :	Gros area 1 2 3 134. 41.5	4 1	Openin m	gs 1 <sup>2</sup>	A ,r 2.2 4.37 10 11.67 2.73 41.51 106.1	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x3 x1 x1 x1 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) + 0.13 0.18	K 0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629 19.11				kJ/K (26) (27) (27) (27) (27b) (28) (29)
ELEN Doors Windo Windo Rooflig Floor Walls Roof Total a * for win	MENT ws Type ws Type : ghts	Gros area 1 2 3 134. 41.5 ements oof windo	4 (m <sup>2</sup> ) (m <sup>2</sup> ) , m <sup>2</sup> pws, use et	Openin m 28.24 2.73	gs 1 <sup>2</sup> 4 3 indow U-va	A ,r 2.2 4.37 10 11.67 2.73 41.51 106.1 38.78 217.4 alue calcul	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x3 x 2	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	K 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629 19.11 5.04		kJ/m²-	к ] [ ] [	kJ/K (26) (27) (27) (27) (27b) (28) (29) (30)
ELEN Doors Windo Windo Windo Rooflig Floor Walls Roof Total a * for win ** inclua	MENT ws Type ws Type ws Type ghts	Gros area 1 2 3 <u>134.</u> 41.5 ements oof windo	4 (m <sup>2</sup> ) 1 , m <sup>2</sup> ows, use et sides of in	Openin m 28.24 2.73 ffective wi ternal wal	gs 1 <sup>2</sup> 4 3 indow U-va	A ,r 2.2 4.37 10 11.67 2.73 41.51 106.1 38.78 217.4 alue calcul	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x3 x 2	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	K 	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629 19.11 5.04		kJ/m²-	к ] [ ] [	kJ/K (26) (27) (27) (27b) (28) (29) (30) (31)
ELEN Doors Windo Windo Rooflig Floor Walls Roof Total a * for win ** inclua Fabric	MENT ws Type ws Type ws Type ghts area of ele dows and r le the areas	Gros area 1 2 3 134. 41.5 ements oof winde s on both s, W/K =	4 (m <sup>2</sup> ) (m <sup>2</sup> ) , m <sup>2</sup> ows, use en sides of ini- = S (A x	Openin m 28.24 2.73 ffective wi ternal wal	gs 1 <sup>2</sup> 4 3 indow U-va	A ,r 2.2 4.37 10 11.67 2.73 41.51 106.1 38.78 217.4 alue calcul	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x3 x 2	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ [ 0.13 0.13 0.13 g formula 1,	$K =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ =   \\ =   \\   =   \\   \\   \\ + (32) =   $	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629 19.11 5.04	9 [ ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ]	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31)
ELEN Doors Windo Windo Windo Rooflig Floor Walls Roof Total a * for win ** inclua Fabric Heat c Therm	MENT ws Type ws Type ws Type ghts area of ele dows and r le the areas heat loss apacity C al mass p	Gros area 1 2 3 134. 41.5 ements oof winde s on both s, W/K = Cm = S( parame	4 (m <sup>2</sup> )	Openin m 28.24 2.73 ffective witternal walk U) P = Cm ÷	gs 1 <sup>2</sup> 4 indow U-va is and part - TFA) ir	A ,r 2.2 4.37 10 11.67 2.73 41.51 106.1 38.76 217.4 alue calcul titions	m <sup>2</sup> x 1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x2 x1 x1 x2 x1 x1 x1 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 )+ [ 0.13 0.13 0.13 g formula 1, (26)(30)	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] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629 19.11 5.04 <i>Ie)+0.04] a</i> (30) + (32 tive Value	9 [ 9 [ 2 ] + (32a). : Medium	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31) 9 (33) (34) (34)
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Average = Sum(39),, /12=       159.89       (39)         Heat loss parameter (HLP), W/m <sup>2</sup> K       (40)m = (39)m ÷ (4)       (40)m = (39)m ÷ (4)         (40)m =       1.51       1.51       1.51       1.49       1.48       1.48       1.48       1.49       1.5       1.5         Number of days in month (Table 1a)       Average = Sum(40),, /12=       1.49       (40)         (41)m =       31       28       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31	Ventila	ation hea	at loss ca	alculated	d monthly	у		_		(38)m	= 0.33 × (	25)m x (5)				
Letter         Letter <th letter<="" td=""><td></td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td><td></td><td></td></th>	<td></td> <td>Jan</td> <td>Feb</td> <td>Mar</td> <td>Apr</td> <td>May</td> <td>Jun</td> <td>Jul</td> <td>Aug</td> <td>Sep</td> <td>Oct</td> <td>Nov</td> <td>Dec</td> <td></td> <td></td>		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(38)m=	54.98	54.68	54.38	52.97	52.71	51.49	51.49	51.26	51.96	52.71	53.24	53.8		(38)	
Average = Sum(39),, /12=       159.89       (39)         Heat loss parameter (HLP), W/m²K       (40)m = (39)m ÷ (4)       (40)m = (39)m ÷ (4)         (40)m=       1.51       1.51       1.49       1.48       1.48       1.48       1.49       1.5       1.5         Number of days in month (Table 1a)       Average = Sum(40),, /12=       1.49       (40)         (41)m=       31       28       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30 <t< td=""><td>Heat tr</td><td>ransfer o</td><td>coefficier</td><td>nt, W/K</td><td></td><td></td><td></td><td></td><td></td><td>(39)m</td><td>= (37) + (3</td><td>38)m</td><td></td><td></td><td></td></t<>	Heat tr	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
Heat loss parameter (HLP), W/m <sup>2</sup> K       (40)m = (39)m ÷ (4)         (40)m = (1.51       1.51       1.51       1.51         (40)m = (3.9)m ÷ (4)         Average = Sum(40)tr /12=       1.49         Number of days in month (Table 1a)         Average = Sum(40)tr /12=       1.49         (41)m =         31       28       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30 <th< td=""><td>(39)m=</td><td>161.89</td><td>161.59</td><td>161.29</td><td>159.89</td><td>159.63</td><td>158.4</td><td>158.4</td><td>158.18</td><td>158.87</td><td>159.63</td><td>160.16</td><td>160.71</td><td></td><td></td></th<>	(39)m=	161.89	161.59	161.29	159.89	159.63	158.4	158.4	158.18	158.87	159.63	160.16	160.71			
$ \begin{array}{c} (40) \text{m} = & \hline 1.51 & 1.51 & 1.51 & 1.49 & 1.49 & 1.48 & 1.48 & 1.48 & 1.48 & 1.48 & 1.48 & 1.5 & 1.5 \\ \hline \text{Average} = \text{Sum}(40)_{1-\text{tr}} / 12= & 1.49 & (40) \\ \hline \text{Number of days in month (Table 1a)} \\ \hline \text{Average} = \text{Sum}(40)_{1-\text{tr}} / 12= & 1.49 & (40) \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(42)m} = & \hline 15A > 13.9, \text{N} = 1 + 1.76 \text{ x} [1 - \exp(-0.000349 \text{ x} (\text{TFA} - 13.9)2)] + 0.0013 \text{ x} (\text{TFA} - 13.9) \\ \hline \text{if TFA} > 13.9, \text{N} = 1 + 1.76 \text{ x} [1 - \exp(-0.000349 \text{ x} (\text{TFA} - 13.9)2)] + 0.0013 \text{ x} (\text{TFA} - 13.9) \\ \hline \text{if TFA} > 13.9, \text{N} = 1 + 1.76 \text{ x} [1 - \exp(-0.000349 \text{ x} (\text{TFA} - 13.9)2)] + 0.0013 \text{ x} (\text{TFA} - 13.9) \\ \hline \text{if TFA} > 13.9, \text{N} = 1 \\ \hline \text{Annual average hot water usage in litres per day Vd, average = (25 \text{ x N}) + 36 \\ \hline \text{Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) \\ \hline \hline \text{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec} \\ \hline \text{Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) \\ \hline \text{(44)m} = & 110.67 & 106.65 & 102.62 & 98.6 & 94.57 & 90.55 & 90.55 & 94.57 & 98.6 & 102.62 & 106.65 & 110.67 \\ \hline \text{Total = Sum}(44)_{1-12} = & 1207.31 & (44) \\ \hline \text{Hot water usage in litres per day for each monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) \\ \hline \text{(45)m} = & 164.12 & 143.54 & 148.12 & 129.14 & 123.91 & 106.92 & 99.08 & 113.7 & 115.05 & 134.09 & 14$								-	•		-		12 /12=	159.89	(39)	
Average = Sum(40)		<u> </u>	<u>```</u>	, ·						· · ·	· ,	· · ·				
Number of days in month (Table 1a) $(41)m=$ $Jan$ FebMarAprMayJunJulAugSepOctNovDec $(41)m=$ $31$ $28$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ <td>(40)m=</td> <td>1.51</td> <td>1.51</td> <td>1.51</td> <td>1.49</td> <td>1.49</td> <td>1.48</td> <td>1.48</td> <td>1.48</td> <td></td> <td></td> <td></td> <td> </td> <td>4.40</td> <td></td>	(40)m=	1.51	1.51	1.51	1.49	1.49	1.48	1.48	1.48					4.40		
(41)m=       31       28       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31	Numbe	er of day	/s in moi	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 / 12=	1.49	_(40)	
4. Water heating energy requirement:       kWh/year:         Assumed occupancy, N       2.8       (42)         if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)       if TFA £ 13.9, N = 1       (42)         Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ 100.61       (43)         Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)       (43)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)       Total = Sum(44)       100.65       102.62       98.6       94.57       90.55       94.57       98.6       102.62       106.65       110.67         Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)       (44)       (45)m=       164.12       148.12       129.14       123.91       106.92       99.08       113.7       115.05       134.09       146.36       158.94       Total = Sum(45)       1582.98       (45)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Assumed occupancy, N [2.8] (42) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = $(25 \times N) + 36$ [100.61] (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 110.67 106.65 102.62 98.6 94.57 90.55 90.55 94.57 98.6 102.62 106.65 110.67 Total = Sum(44)_{112} = 1207.31 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 164.12 143.54 148.12 129.14 123.91 106.92 99.08 113.7 115.05 134.09 146.36 158.94 Total = Sum(45)_{112} = 1582.98 (45)	(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)	
Assumed occupancy, N [2.8] (42) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = $(25 \times N) + 36$ [100.61] (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 110.67 106.65 102.62 98.6 94.57 90.55 90.55 94.57 98.6 102.62 106.65 110.67 Total = Sum(44)_{112} = 1207.31 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 164.12 143.54 148.12 129.14 123.91 106.92 99.08 113.7 115.05 134.09 146.36 158.94 Total = Sum(45)_{112} = 1582.98 (45)																
Assumed occupancy, N [2.8] (42) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = $(25 \times N) + 36$ [100.61] (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 110.67 106.65 102.62 98.6 94.57 90.55 90.55 94.57 98.6 102.62 106.65 110.67 Total = Sum(44)_{112} = 1207.31 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 164.12 143.54 148.12 129.14 123.91 106.92 99.08 113.7 115.05 134.09 146.36 158.94 Total = Sum(45)_{112} = 1582.98 (45)	4. Wa	ater hea	tina enei	rav reau	irement:								kWh/ve	ear:		
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)         if TFA £ 13.9, N = 1         Annual average hot water usage in litres per day Vd, average = $(25 x N) + 36$ Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)       (44)m=       110.67       106.65       102.62       98.6       94.57       90.55       94.57       98.6       102.62       106.65       110.67         Total = Sum(44)112 =       1207.31       (44)         (45)m=       164.12       143.54       148.12       129.14       123.91       106.92       99.08       113.7       115.05       134.09       146.36       158.94         Total = Sum(45)112 =       1582.98       (45)																
if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) (44)m= 110.67 106.65 102.62 98.6 94.57 90.55 90.55 94.57 98.6 102.62 106.65 110.67 Total = Sum(44) <sub>1-12</sub> = 1207.31 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 164.12 143.54 148.12 129.14 123.91 106.92 99.08 113.7 115.05 134.09 146.36 158.94 Total = Sum(45) <sub>1-12</sub> = 1582.98 (45)					/ [1 - evn			-130	)2)] + 0 (	1013 v ( <sup>-</sup>	TFA -13		.8		(42)	
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target ofnot more that 125 litres per person per day (all water use, hot and cold)JanFebMarAprMayJunJulAugSepOctNovDecHot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m=110.67106.65102.6298.694.5790.5594.5798.6102.62106.65110.67Total = Sum(44)112 =1207.31(44)Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)(45)m=164.12143.54148.12129.14123.91106.9299.08113.7115.05134.09146.36158.94Total = Sum(45)112 =1582.98(45)				11.70		( 0.0000	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	A 10.5	)2)] 10.0		117 10.	.0)				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $													0.61		(43)	
Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)         (44)m=       110.67       106.65       102.62       98.6       94.57       90.55       90.55       94.57       98.6       102.62       106.65       110.67         Total = Sum(44)112 =       1207.31       (44)         (45)m=       164.12       143.54       148.12       129.14       123.91       106.92       99.08       113.7       115.05       134.09       146.36       158.94         Total = Sum(45)112 =       1582.98       (45)			-				-	-	to achieve	a water us	se target o	t				
Hot water usage in litres per day for each month Vd, $m = factor from Table 1c \times (43)$ (44) $m = 110.67 \ 106.65 \ 102.62 \ 98.6 \ 94.57 \ 90.55 \ 90.55 \ 94.57 \ 98.6 \ 102.62 \ 106.65 \ 110.67$ Total = Sum(44) <sub>112</sub> = 1207.31 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd, $m \times nm \times DTm / 3600 \ kWh/month$ (see Tables 1b, 1c, 1d) (45) $m = 164.12 \ 143.54 \ 148.12 \ 129.14 \ 123.91 \ 106.92 \ 99.08 \ 113.7 \ 115.05 \ 134.09 \ 146.36 \ 158.94$ Total = Sum(45) <sub>112</sub> = 1582.98 (45)			· · ·		1			·	<u> </u>	Son	Oct	Nov	Dee			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Hot wate				· · ·				<u> </u>	Sep		NOV	Dec			
$Total = Sum(44)_{112} = 1207.31  (44)$ $(45)m = 164.12  143.54  148.12  129.14  123.91  106.92  99.08  113.7  115.05  134.09  146.36  158.94$ $Total = Sum(45)_{112} = 1582.98  (45)$				-			<del> </del>		· ·	98.6	102 62	106 65	110.67			
Energy content of hot water used - calculated monthly = $4.190 \times Vd$ , $m \times nm \times DTm / 3600 \ kWh/month$ (see Tables 1b, 1c, 1d)         (45)m=       164.12       148.12       129.14       123.91       106.92       99.08       113.7       115.05       134.09       146.36       158.94         Total = Sum(45)	()	110.07	100.00	102.02	00.0	04.07	00.00	00.00	04.07					1207.31	(44)	
$Total = Sum(45)_{112} = 1582.98 $ (45)	Energy (	content of	hot water	used - cal	lculated m	onthly = 4.	190 x Vd,r	m x nm x E	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )							
	(45)m=	164.12	143.54	148.12	129.14	123.91	106.92	99.08	113.7	115.05	134.09	146.36	158.94			
											Total = Su	m(45) <sub>112</sub> =	-	1582.98	(45)	
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	lf instant	taneous w	ater heatii	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46	) to (61)		-				
(46)m=         24.62         21.53         22.22         19.37         18.59         16.04         14.86         17.05         17.26         20.11         21.95         23.84         (46)	· · ·			22.22	19.37	18.59	16.04	14.86	17.05	17.26	20.11	21.95	23.84		(46)	
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)		-		includir		alar or M		storago	within or		ما		0		(47)	
Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47) If community heating and no tank in dwelling, enter 110 litres in (47)	-		. ,		• •			-			501		0		(47)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)		•	-			-			. ,	ers) ente	er '0' in (	47)				
Water storage loss:					,					,	,					
a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)	a) If m	nanufact	urer's de	eclared I	loss facto	or is kno	wn (kWł	n/day):					0		(48)	
Temperature factor from Table 2b   0   (49)	Tempe	erature f	actor fro	m Table	e 2b								0		(49)	
Energy lost from water storage, kWh/year $(48) \times (49) = 0$ (50)				•					(48) x (49)	) =			0		(50)	
b) If manufacturer's declared cylinder loss factor is not known:					-										(54)	
Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3			-				n/nne/ua	ay)					0		(51)	
Volume factor from Table 2a 0 (52)		-	-		011 1.0								0		(52)	
Temperature factor from Table 2b 0 (53)					e 2b											
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54)	Energy	y lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)	
Enter (50) or (54) in (55)	Enter	(50) or	(54) in (5	55)									0		(55)	
Water storage loss calculated for each month $((56)m = (55) \times (41)m$	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 0 0 (56)	(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)	

	uns dedicate		rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (57	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circ	uit loss (ar	nnual) fro	om Table	93	-	-					0		(58)
Primary circ					59)m = (	(58) ÷ 36	65 × (41)	m					
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)		I	
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss o	calculated	for each	month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 29.1	7 26.34	29.14	28.18	29.1	28.13	29.06	29.08	28.16	29.12	28.21	29.16		(61)
Total heat re	quired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 193.2	9 169.88	177.27	157.32	153.01	135.06	128.14	142.78	143.21	163.21	174.57	188.1		(62)
Solar DHW inp	ut calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0'	' if no sola	r contribut	ion to wate	er heating)		
(add addition	nal lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix G	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ater											
(64)m= 193.2	9 169.88	177.27	157.32	153.01	135.06	128.14	142.78	143.21	163.21	174.57	188.1		-
							Outp	out from w	ater heate	r (annual)₁	12	1925.84	(64)
Heat gains f	rom water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m= 61.86	5 54.31	56.54	49.98	48.47	42.59	40.21	45.08	45.3	51.86	55.72	60.14		(65)
include (5	7)m in cal	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. Internal	gains (see	e Table 5	5 and 5a)	):									
Metabolic ga	ains (Table	e 5), Wat	ts										
Lev									-		-		
Jar	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 139.8		Mar 139.81		May 139.81	Jun 139.81	Jul 139.81	Aug 139.81	Sep 139.81	Oct 139.81	Nov 139.81	Dec 139.81		(66)
	1 139.81	139.81	Apr 139.81	139.81	139.81	139.81	139.81	139.81					(66)
(66)m= 139.8	1 139.81 ns (calcula	139.81	Apr 139.81	139.81	139.81	139.81	139.81	139.81					(66) (67)
(66)m= 139.8 Lighting gair	1 139.81 ns (calcula 3 21.17	139.81 ited in Ap 17.21	Apr 139.81 opendix 13.03	139.81 _, equat 9.74	139.81 ion L9 oi 8.22	139.81 r L9a), a 8.89	139.81 Iso see 11.55	139.81 Table 5 15.5	139.81 19.69	139.81	139.81		
(66)m= 139.8 Lighting gair (67)m= 23.83	1 139.81 ns (calcula 3 21.17 gains (calc	139.81 ited in Ap 17.21	Apr 139.81 opendix 13.03	139.81 _, equat 9.74	139.81 ion L9 oi 8.22	139.81 r L9a), a 8.89	139.81 Iso see 11.55	139.81 Table 5 15.5	139.81 19.69	139.81	139.81		
(66)m= 139.8 Lighting gair (67)m= 23.8 Appliances g	1         139.81           ns         (calcula           3         21.17           gains         (calcula           1         270.08	139.81 Ited in Ap 17.21 culated in 263.09	Apr 139.81 ppendix 13.03 Append 248.21	139.81 L, equat 9.74 Jix L, eq 229.43	139.81 ion L9 of 8.22 uation L 211.77	139.81 r L9a), a 8.89 13 or L1 199.98	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2	139.81 Table 5 15.5 see Ta 204.19	139.81 19.69 ble 5 219.07	139.81 22.98	139.81 24.49		(67)
(66)m= 139.8 Lighting gair (67)m= 23.83 Appliances ( (68)m= 267.3	1         139.81           is (calcula           3         21.17           gains (calcula           1         270.08           is (calcula	139.81 Ited in Ap 17.21 culated in 263.09	Apr 139.81 ppendix 13.03 Append 248.21	139.81 L, equat 9.74 Jix L, eq 229.43	139.81 ion L9 of 8.22 uation L 211.77	139.81 r L9a), a 8.89 13 or L1 199.98	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2	139.81 Table 5 15.5 see Ta 204.19	139.81 19.69 ble 5 219.07	139.81 22.98	139.81 24.49		(67)
(66)m= 139.8 Lighting gair (67)m= 23.8 Appliances ( (68)m= 267.3 Cooking gair	1         139.81           ns         (calcula           3         21.17           gains         (calcula           1         270.08           ns         (calcula           3         36.98	139.81 Ited in Ap 17.21 culated in 263.09 ated in A 36.98	Apr 139.81 ppendix 13.03 Append 248.21 ppendix 36.98	139.81 L, equat 9.74 Jix L, eq 229.43 L, equat	139.81 ion L9 of 8.22 uation L 211.77 tion L15	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a)	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se	139.81 Table 5 15.5 9 see Ta 204.19 9 Table	139.81 19.69 ble 5 219.07 5	139.81 22.98 237.86	139.81 24.49 255.51		(67) (68)
(66)m= 139.8 Lighting gair (67)m= 23.8 Appliances ( (68)m= 267.3 Cooking gair (69)m= 36.9	1         139.81           ns         (calcula           3         21.17           gains         (calcula           1         270.08           ns         (calcula           3         36.98	139.81 Ited in Ap 17.21 culated in 263.09 ated in A 36.98	Apr 139.81 ppendix 13.03 Append 248.21 ppendix 36.98	139.81 L, equat 9.74 Jix L, eq 229.43 L, equat	139.81 ion L9 of 8.22 uation L 211.77 tion L15	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a)	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se	139.81 Table 5 15.5 9 see Ta 204.19 9 Table	139.81 19.69 ble 5 219.07 5	139.81 22.98 237.86	139.81 24.49 255.51		(67) (68)
(66)m= 139.8 Lighting gair (67)m= 23.83 Appliances ( (68)m= 267.3 Cooking gair (69)m= 36.94 Pumps and	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       3	139.81 Ited in Ap 17.21 culated in 263.09 ated in A 36.98 c (Table \$ 3	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3	139.81 L, equat 9.74 dix L, eq 229.43 L, equat 36.98	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98	139.81 Table 5 15.5 see Ta 204.19 ee Table 36.98	139.81 19.69 ble 5 219.07 5 36.98	139.81 22.98 237.86 36.98	139.81 24.49 255.51 36.98		(67) (68) (69)
(66)m= 139.8 Lighting gair (67)m= 23.83 Appliances ( (68)m= 267.3 Cooking gair (69)m= 36.90 Pumps and (70)m= 3	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       36.98         fans       gains         3       36.98	139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         (Table 5)         3         0         (negative)	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3	139.81 L, equat 9.74 dix L, eq 229.43 L, equat 36.98	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98	139.81 Table 5 15.5 see Ta 204.19 ee Table 36.98	139.81 19.69 ble 5 219.07 5 36.98	139.81 22.98 237.86 36.98	139.81 24.49 255.51 36.98		(67) (68) (69)
(66)m= 139.8 Lighting gair (67)m= 23.8 Appliances ( (68)m= 267.3 Cooking gair (69)m= $36.9$ Pumps and (70)m= $3$ Losses e.g.	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       36.98         fans       gains         3       36.98         fans       gains         5       -111.85	139.81 ted in Ap 17.21 culated in 263.09 ated in A 36.98 c (Table 5 3 on (nega -111.85	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98 3 le 5)	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98	139.81 Table 5 15.5 9 see Ta 204.19 9 a Table 36.98	139.81 19.69 ble 5 219.07 5 36.98 3	139.81 22.98 237.86 36.98 3	139.81 24.49 255.51 36.98 3		(67) (68) (69) (70)
(66)m= 139.8 Lighting gair (67)m= 23.83 Appliances ( (68)m= 267.3 Cooking gair (69)m= 36.99 Pumps and 7 (70)m= 3 Losses e.g. (71)m= -111.8	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       3         evaporation       3         15       -111.85         ng       gains (7)	139.81 ted in Ap 17.21 culated in 263.09 ated in A 36.98 c (Table 5 3 on (nega -111.85	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98 3 le 5)	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98	139.81 Table 5 15.5 9 see Ta 204.19 9 a Table 36.98	139.81 19.69 ble 5 219.07 5 36.98 3	139.81 22.98 237.86 36.98 3	139.81 24.49 255.51 36.98 3		(67) (68) (69) (70)
(66)m=       139.8         Lighting gair       (67)m= $(67)m=$ 23.83         Appliances (       (68)m= $(68)m=$ 267.3         Cooking gair       (69)m= $(69)m=$ 36.94         Pumps and       (70)m= $(70)m=$ 3         Losses e.g.       (71)m= $(71)m=$ $-111.8$ Water heatir       (72)m= $(72)m=$ $83.18$	1       139.81         1s       (calcula         3       21.17         gains       (calcula         3       270.08         1s       (calcula         3       36.98         fans       gains         3       36.98         fans       gains         5       -111.85         ng       gains       (7)         5       80.82	139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         6 (Table 5)         75.99	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu -111.85	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab -111.85	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98 3 le 5) -111.85 59.15	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3 -111.85 54.04	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98 3	139.81 Table 5 15.5 5 see Ta 204.19 36.98 3 -111.85 62.91	139.81 19.69 ble 5 219.07 5 36.98 3 -111.85 69.71	139.81 22.98 237.86 36.98 3 -111.85 77.39	139.81 24.49 255.51 36.98 3 -111.85 80.83		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> </ul>
$(66)m=$ 139.8         Lighting gair       (67)m= $(67)m=$ 23.83         Appliances (       (68)m= $(68)m=$ 267.3         Cooking gair       (69)m= $(69)m=$ 36.98         Pumps and $\frac{1}{3}$ 1 $(70)m=$ 3         Losses e.g.       (71)m= $(71)m=$ $-111.8$ Water heating $(70)m=$	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       36.98         fans       gains         5       -111.85         ng       gains (7         5       80.82         al       gains =	139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         6 (Table 5)         75.99	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu -111.85	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab -111.85	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98 3 le 5) -111.85 59.15	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3 -111.85 54.04	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98 3 -111.85 60.58	139.81 Table 5 15.5 5 see Ta 204.19 36.98 3 -111.85 62.91	139.81 19.69 ble 5 219.07 5 36.98 3 -111.85 69.71	139.81 22.98 237.86 36.98 3 -111.85 77.39	139.81 24.49 255.51 36.98 3 -111.85 80.83		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> </ul>
(66)m=       139.8         Lighting gair       (67)m=         (67)m=       23.83         Appliances (       (68)m=         (68)m=       267.3         Cooking gair       (69)m=         (69)m=       36.94         Pumps and 7       (70)m=         (70)m=       3         Losses e.g.       (71)m=         (71)m=       -111.8         Water heatir       (72)m=         83.14       Total interm	1       139.81         1       139.81         1       21.17         gains (calcula         3       21.17         gains (calcula         1       270.08         1       270.08         1       270.08         1       270.08         1       270.08         1       270.08         1       270.08         1       270.08         1       270.08         1       270.08         1       270.08         1       270.08         3       36.98         fans gains       3         evaporation       3         15       -111.85         16       80.82         17       80.82         18       90.82         19       440.01	139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         (Table 5)         -111.85         Table 5)         75.99	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu -111.85 69.42	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab -111.85 65.15	139.81 ion L9 or 8.22 uation L 211.77 tion L15 36.98 3 le 5) -111.85 59.15 (66)	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3 -111.85 54.04 m + (67)m	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98 3 -111.85 60.58 h + (68)m +	139.81 Table 5 15.5 5 see Ta 204.19 204.19 204.19 36.98 3 -111.85 62.91 - (69)m + 1	139.81 19.69 ble 5 219.07 5 36.98 3 -111.85 69.71 (70)m + (7	139.81 22.98 237.86 36.98 3 -111.85 77.39 1)m + (72)	139.81 24.49 255.51 36.98 3 -111.85 80.83 m		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>
(66)m=       139.8         Lighting gair       (67)m=         (67)m=       23.83         Appliances (       (68)m=         (68)m=       267.3         Cooking gair       (69)m=         (69)m=       36.94         Pumps and T       (70)m=         (70)m=       3         Losses e.g.       (71)m=         (71)m=       -111.8         Water heatir       (72)m=         (72)m=       83.19         Total intern       (73)m=	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       36.98         fans       gains         5       -111.85         ng       gains         5       80.82         al       gains         3       440.01	139.81         139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         (Table 5)         -111.85         Table 5)         75.99         424.24	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu -111.85 69.42 398.61	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab -111.85 65.15 372.26	139.81 ion L9 or 8.22 uation L 211.77 tion L15 36.98 3 111.85 59.15 (66) 347.09	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3 -111.85 54.04 m + (67)m 330.85	139.81 ISO SEE <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98 -111.85 60.58 + (68)m + 337.28	139.81 Table 5 15.5 9 see Ta 204.19 9 e Table 36.98 3 -111.85 62.91 (69)m + 1 350.55	139.81 19.69 ble 5 219.07 5 36.98 3 -111.85 69.71 (70)m + (7 376.41	139.81 22.98 237.86 36.98 3 -111.85 77.39 1)m + (72) 406.16	139.81 24.49 255.51 36.98 3 -111.85 80.83 m 428.78		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>
(66)m=       139.8         Lighting gair       (67)m=         (67)m=       23.83         Appliances (       (68)m=         (68)m=       267.3         Cooking gair       (69)m=         (69)m=       36.94         Pumps and 3       (70)m=         (70)m=       3         Losses e.g.       (71)m=         (71)m=       -111.8         Water heatir       (72)m=         (73)m=       442.2         6. Solar ga	1       139.81         1       139.81         1       21.17         gains (calcula         3       21.17         gains (calcula         1       270.08         ns (calcula         3       36.98         fans gains         3       36.98         fans gains         5       -111.85         ng gains (7         5       80.82         al gains =         3       440.01         ns:       e calculated	139.81         139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         3         (Table 5)         75.99         424.24         using sola         -actor	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu -111.85 69.42 398.61	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab -111.85 65.15 372.26	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98 3 dle 5) -111.85 (66) 347.09 and associ	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3 -111.85 54.04 m + (67)m 330.85	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98 -111.85 60.58 + (68)m + 337.28 tions to co	139.81 Table 5 15.5 9 see Ta 204.19 9 e Table 36.98 3 -111.85 62.91 (69)m + 1 350.55	139.81 19.69 ble 5 219.07 5 36.98 3 -111.85 69.71 (70)m + (7 376.41 he applicab	139.81 22.98 237.86 36.98 3 -111.85 77.39 1)m + (72) 406.16	139.81 24.49 255.51 36.98 3 -111.85 80.83 m 428.78	Gains	<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>

Northeast 0.9x	0.77	] ×	11.67	×	11.28	×	0.76	x	0.7	=	48.54	(75)
Northeast 0.9x	0.77	] x	11.67	x	22.97	x	0.76	x	0.7	]   _	98.81	(75)
Northeast 0.9x	0.77	] x	11.67	×	41.38	×	0.76	x	0.7	=	178.03	(75)
Northeast 0.9x	0.77	] x	11.67	x	67.96	x	0.76	x	0.7	=	292.38	(75)
Northeast 0.9x	0.77	x	11.67	×	91.35	x	0.76	x	0.7	=	393.01	(75)
Northeast 0.9x	0.77	x	11.67	x	97.38	x	0.76	x	0.7	=	418.99	(75)
Northeast 0.9x	0.77	x	11.67	×	91.1	×	0.76	x	0.7	=	391.96	(75)
Northeast 0.9x	0.77	x	11.67	×	72.63	×	0.76	x	0.7	=	312.47	(75)
Northeast 0.9x	0.77	x	11.67	×	50.42	×	0.76	x	0.7	=	216.93	(75)
Northeast 0.9x	0.77	x	11.67	×	28.07	×	0.76	x	0.7	=	120.76	(75)
Northeast 0.9x	0.77	x	11.67	×	14.2	×	0.76	x	0.7	=	61.08	(75)
Northeast 0.9x	0.77	x	11.67	×	9.21	x	0.76	x	0.7	=	39.64	(75)
Southwest <sub>0.9x</sub>	0.77	x	10	×	36.79	]	0.76	x	0.7	=	135.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	62.67		0.76	x	0.7	=	231.06	(79)
Southwest0.9x	0.77	x	10	×	85.75		0.76	x	0.7	=	316.15	(79)
Southwest0.9x	0.77	x	10	×	106.25	]	0.76	x	0.7	=	391.72	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	119.01		0.76	x	0.7	=	438.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	118.15		0.76	x	0.7	=	435.59	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	113.91		0.76	x	0.7	=	419.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	104.39		0.76	x	0.7	=	384.86	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	92.85		0.76	x	0.7	=	342.32	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	69.27		0.76	x	0.7	=	255.37	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	44.07		0.76	x	0.7	=	162.48	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	31.49		0.76	x	0.7	=	116.09	(79)
Northwest 0.9x	0.77	x	4.37	×	11.28	x	0.76	x	0.7	=	18.18	(81)
Northwest 0.9x	0.77	x	4.37	×	22.97	×	0.76	x	0.7	=	37	(81)
Northwest 0.9x	0.77	×	4.37	×	41.38	×	0.76	x	0.7	=	66.67	(81)
Northwest 0.9x	0.77	x	4.37	×	67.96	×	0.76	x	0.7	=	109.48	(81)
Northwest 0.9x	0.77	×	4.37	×	91.35	×	0.76	x	0.7	=	147.17	(81)
Northwest 0.9x	0.77	x	4.37	×	97.38	×	0.76	x	0.7	=	156.9	(81)
Northwest 0.9x	0.77	x	4.37	X	91.1	X	0.76	x	0.7	=	146.77	(81)
Northwest 0.9x	0.77	x	4.37	×	72.63	×	0.76	x	0.7	=	117.01	(81)
Northwest 0.9x	0.77	X	4.37	×	50.42	X	0.76	X	0.7	=	81.23	(81)
Northwest 0.9x	0.77	X	4.37	×	28.07	X	0.76	X	0.7	=	45.22	(81)
Northwest 0.9x	0.77	X	4.37	×	14.2	X	0.76	X	0.7	=	22.87	(81)
Northwest 0.9x	0.77	×	4.37	×	9.21	X	0.76	X	0.7	=	14.85	(81)
Rooflights 0.9x	1	X	2.73	×	26	X	0.76	X	0.7	=	33.99	(82)
Rooflights 0.9x	1	×	2.73	×	54	×	0.76	X	0.7	=	70.58	(82)
Rooflights 0.9x	1	×	2.73	×	96	×	0.76	X	0.7	=	125.48	(82)
Rooflights 0.9x	1	×	2.73	×	150	×	0.76	X	0.7	=	196.07	(82)
Rooflights 0.9x	1	x	2.73	×	192	X	0.76	x	0.7	=	250.97	(82)

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Rooflight	s 0.9x	1	×	2.7	73	x		200	×	0.76	x	0.7	=	261.42	(82)
Rooflight	S 0.9x	1	x	2.7	<b>′</b> 3	x		189	x	0.76	x	0.7	=	247.05	(82)
Rooflight	S 0.9x	1	x	2.7	'3	x		157	×	0.76	x	0.7	=	205.22	(82)
Rooflight	S 0.9x	1	x	2.7	'3	x		115	×	0.76	x	0.7	=	150.32	(82)
Rooflight	s 0.9x	1	x	2.7	′3	x		66	×	0.76	x	0.7	=	86.27	(82)
Rooflight	s 0.9x	1	x	2.7	'3	x		33	×	0.76	x	0.7	=	43.14	(82)
Rooflight	s 0.9x	1	x	2.7	<b>′</b> 3	x		21	×	0.76	x	0.7	=	27.45	(82)
Solar ga	ains in y	watts, ca	alculated	for eac	h month	-			(83)m =	= Sum(74)m	(82)m			•	
	236.36	437.46	686.33	989.65	1229.91		272.9	1205.73	1019.	56 790.81	507.62	2 289.57	198.03		(83)
Total ga				· ,	· ,	<u>`</u>	,							1	
(84)m=	678.59	877.47	1110.57	1388.26	1602.18	16	619.99	1536.59	1356.	85 1141.36	884.03	695.73	626.81		(84)
7. Mea	n interi	nal temp	oerature	(heating	seasor	ı)									
Tempe	rature	during h	eating p	eriods ir	n the livi	ng	area f	from Tab	ole 9,	Th1 (°C)				21	(85)
Utilisat	ion fac	tor for g	ains for l	iving are	ea, h1,m	ı (s	ee Ta	ble 9a)						_	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.97	0.91	0.77	(	0.59	0.44	0.52	0.79	0.96	0.99	1		(86)
Mean i	nternal	temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	' in Ta	able 9c)					
(87)m=	19.33	19.57	19.96	20.45	20.8	2	20.95	20.99	20.9	8 20.84	20.33	19.73	19.29	]	(87)
Tempe	rature	during h	eating p	eriods ir	n rest of	dw	velling	from Ta	ble 9.	Th2 (°C)	-		-	-	
·	19.68	19.68	19.68	19.69	19.69	T	19.7	19.7	19.7		19.69	19.69	19.69	]	(88)
∟ L Itilisati	ion fac	tor for a	ains for i	rest of d	welling	<u> </u>	m (se	e Table	9a)	I				4	
(89)m=	1	0.99	0.96	0.88	0.7	T -	0.48	0.32	0.38	0.69	0.94	0.99	1	1	(89)
						 :	TO /6						1	1	
_	17.49	17.85	18.41	19.08	19.51	<u> </u>	12 (IO	19.7	19.7	to 7 in Tab / 19.58	18.95	18.09	17.44	1	(90)
(30)11-	17.45	17.00	10.41	19.00	19.51	<u> </u>	9.07	13.7	13.7			ving area ÷ (4		0.19	(91)
													-/	0.19	
		· ·	· · · ·		i	-	•	i	<u>`</u>	• fLA) × T2	1	1		1	(00)
	17.84	18.17	18.7	19.34	19.75		9.91	19.94	19.9		19.21		17.78		(92)
· · · · ·	adjustn 17.84	18.17	ne mean 18.7	19.34	19.75	1	ire fro 19.91	m Table 19.94	4e, w	/here appr 4 19.82	0priate 19.21	1	17.78	1	(93)
	I		uirement		19.75	L '	5.51	19.94	19.9	4 19.02	19.21	10.4	17.70		(00)
					re obtair	hed	l at ste	en 11 of	Table	9b, so tha	at Ti m=	=(76)m an	d re-cal	culate	
			or gains	•		icu			Tuble	00, 00 m	ac 11,111-	-(70)11 a11		Sulate	
Γ	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	g Sep	Oct	Nov	Dec		
Utilisat	ion fac	tor for g	ains, hm	:	-	ī								-	
(94)m=	0.99	0.98	0.96	0.87	0.71		0.5	0.34	0.41	0.7	0.93	0.99	1		(94)
_			, W = (94	, <u> </u>	<u>,</u>	-								1	
	674.57	863.65		1208.15			13.56	524.84	550.8	86 803.28	826.4	687.11	624.07		(95)
	<u> </u>	-	rnal tem		i	-		40.0	40.4		10.0	74	4.0	1	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4		10.6	7.1	4.2	J	(96)
Heat 10 (97)m= 2			1	· · · ·	1	-	1, VV = 41.58	=[(39)m 2 529.1	x [(93) 559.3	)m– (96)m 89 908.19	1373.9	4 1809 01	2182.94	1	(97)
						_				97)m – (95			2102.94	J	(**)
· -	1128.61	860.64	674.89	331.86	113.41	1	0	11 = 0.02		0	407.30	-	1159.8	1	
(	0.01					<u> </u>	-	Ľ	Ĺ		1.57.5			J	

								Tota	l per year	(kWh/year	<sup>.</sup> ) = Sum(9	8)15,912 =	5484.34	(98)
Spac	e heatir	ig require	ement ir	n kWh/m²	²/year								51.21	(99)
9a. En	ergy re	quiremer	nts – Ind	lividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	e heati	0			, .							1		
				econdar		mentary		(000) 4	(004)				0	(201)
				nain syst	. ,			(202) = 1 -		(000)]			1	(202)
			0	main sys				(204) = (20	02) × [1 –	(203)] =			1	(204)
	•	•		ting syste									93.7	(206)
Efficie	ency of	seconda	ry/suppl	lementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Spac	r	ř ·	<u>```</u>		í					407.00	0.07 77	4450.0		
( <b>-</b> / /)	1128.61		674.89	331.86	113.41	0	0	0	0	407.36	807.77	1159.8		
(211)n		i		100 ÷ (20 354.17	)6) 121.04			0	0	434.75	000.00	1237.78		(211)
	1204.49	916.5	720.27	304.17	121.04	0	0	0 Tota	-	434.75 ar) = Sum(2	862.08		5853.09	(211)
Snac	o hoatir	a fuel (s	ocondar	ry), kWh/	month				. (		715,1012	l	3633.09	
•		01)] } x 1		• •	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
		•		•				Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water	heating	g												_
Output				ulated a		405.00	400.44	4 40 70	4 4 2 0 4	402.04	47457	400.4		
Efficie	193.29	169.88 ater hea	177.27	157.32	153.01	135.06	128.14	142.78	143.21	163.21	174.57	188.1	87	(216)
(217)m=		90.07	89.9	89.48	88.54	87	87	87	87	89.61	90.02	90.16	07	(217)
· · ·		heating,						0.	0.		00.01			
		<u>)m x 100</u>			1	r	1			I	1			
(219)m=	214.43	188.61	197.17	175.82	172.82	155.24	147.29	164.12	164.61	182.13	193.93	208.62		-
	• · · •							lota	I = Sum(2		,		2164.79	(219)
	al totals heating		ed main	system	1					K	Wh/year		<b>kWh/year</b> 5853.09	7
•		fuel use		l oyotom	•							 		J T
	-												2164.79	
				electric	keep-ho	t								
centra	al heatii	ng pump	:									30		(230c)
boiler	with a	fan-assis	sted flue									45		(230e)
Total e	electricit	y for the	above,	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electri	city for	ighting											420.86	(232)
12a. (	CO2 en	nissions ·	– Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHP	)			-		-
							<b>ergy</b> /h/year			<b>Emiss</b> kg CO	<b>ion fac</b> 2/kWh	tor	<b>Emissions</b> kg CO2/yea	
Space	heating	g (main s	ystem 1	)		(21	1) x			0.2	16	=	1264.27	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	467.6	(264)
Space and water heating	(261) + (262) + (263)	+ (264) =		1731.86	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	218.42	(268)
Total CO2, kg/year		sum of (265)(271) =		1989.21	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		18.58	(273)
EI rating (section 14)				82	(274)

				User D	etails:						
Assessor Name:	Mitchell Finn	1			Strom	a Num	ber:		STRO	029125	
Software Name:	Stroma FSA	P 2012	2		Softwa	are Ver	sion:		Versio	on: 1.0.3.11	
			Р	roperty <i>i</i>	Address:	House	1 After F	Renewak	ole Energ	ду	
Address :	House 1, Sou	th of 27	7a West	End La	ne, Lonc	lon, NW	6 4QJ				
1. Overall dwelling dimens	ions:										
				a(m²)		Av. Hei	ight(m)	<b>1</b> I	Volume(m <sup>3</sup> )	٦	
Ground floor				4	7.13	(1a) x	2.	.45	(2a) =	115.47	(3a)
First floor				4	7.13	(1b) x	2.	.75	(2b) =	129.61	(3b)
Second floor				2	4.95	(1c) x	2	9	(2c) =	72.36	(3c)
Total floor area TFA = (1a)-	-(1b)+(1c)+(1	d)+(1e)	+(1r	) 1'	19.21	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	317.43	(5)
2. Ventilation rate:											-
	main heating		condar eating	У	other		total			m <sup>3</sup> per hour	
Number of chimneys	0	+	0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+	0	_ ] + [_	0	] = [	0	x	20 =	0	(6b)
Number of intermittent fans	<u> </u>						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)
											-
									Air ch	anges per hou	ur 
Infiltration due to chimneys,							20		÷ (5) =	0.06	(8)
If a pressurisation test has been		intendeo	d, procee	d to (17), c	otherwise c	continue fr	om (9) to (	16)		-	٦
Number of storeys in the Additional infiltration	dweiling (ns)							[(0)]	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.25	for steel or ti	mher fr	ame or	0 35 for	. masoni	v constr	uction	[(3)	1]x0.1 =	0	(10)
if both types of wall are pres							dottori			0	
deducting areas of openings											-
If suspended wooden floo			ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, enter										0	(13)
Percentage of windows a	nd doors drau	ught str	ipped		0.05 10.0					0	(14)
Window infiltration					0.25 - [0.2			(4.5)		0	(15)
Infiltration rate	-						2) + (13) +			0	(16)
Air permeability value, q5	•			•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeability Air permeability value applies if							is hoing us	od		0.31	(18)
Number of sides sheltered	a pressurisation	lest nas	been don	e or a deg	liee all pei	meaning	is being us	SEU		0	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			1	(13)
Infiltration rate incorporating	shelter facto	r			(21) = (18)	) x (20) =				0.31	](21)
Infiltration rate modified for										0.01	
Jan Feb M	<u> </u>	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spee	·	i								1	
working average wind spee		1									

Wind F	actor (22	2a)m =	(22)m ÷ -	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Adjuste	ed infiltra	tion rat	e (allowir	ng for sh	elter an	d wind s	speed) =	(21a) x	(22a)m					
	0.4	0.39	0.38	0.34	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37	]	
	ate effect		-	ate for t	he appli	cable ca	se	•				•	• r	
	echanical			N - (0	ol.) (00-					) (00-)			0	(23a)
	aust air hea									) = (23a)			0	(23b)
	anced with		-	-	-								0	(23c)
	balanced		<u> </u>				<u> </u>	<u> </u>	ŕ	<u>,                                     </u>	<u> </u>	1	) ÷ 100] 1	<i>(</i> <b>-</b> , , )
(24a)m=		0	0	0	0	0	0	0	0	0	0	0		(24a)
	balanced	d mecha	anical ve	ntilation	without	heat rec	covery (I	MV) (24b	)m = (22	2b)m + (2	23b)		,	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,	whole ho if (22b)m				•	•				5 x (23h	))			
(24c)m=	r í r	0		0	0				0		0	0	1	(24c)
	natural v				-		-			Ů			J	~ /
	if (22b)m									0.5]				
(24d)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	]	(24d)
Effe	ctive air c	change	rate - en	ter (24a	) or (24b	) or (24	c) or (24	d) in boy	(25)				4	
(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	]	(25)
							1		I	1	1	1	1	
3. He	at losses	and he	eat loss p	aramete	er:									
		0.000		Onenin	~~		~~					بريامير	-	
ELEN	IENT	Gros area		Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²•		A X k kJ/K
ELEN Doors	IENT			•	-		n²							
Doors	<b>IENT</b> ws Type	area		•	-	A ,r	m²	W/m2	K	(W/				kJ/K
Doors Windov		area 1		•	-	A ,r 2.15	m <sup>2</sup> x 5 x <sup>1</sup>	W/m2	K =   0.04] =	(W/ 2.15				kJ/K (26)
Doors Windov Windov	ws Type	area 1 2		•	-	A ,r 2.15 19.95	m <sup>2</sup> x 5 x <sup>1</sup> 1 x <sup>1</sup>	W/m2 1 /[1/( 1.4 )+	K 0.04] = 0.04] =	(W/ 2.15 26.45				kJ/K (26) (27)
Doors Windov Windov	ws Type ws Type ws Type	area 1 2		•	-	A ,r 2.15 19.95 10	m <sup>2</sup> x 5 x1 7 x1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+	K 0.04] = 0.04] = 0.04] =	(W/ 2.15 26.45 13.26				kJ/K (26) (27) (27)
Doors Window Window Window	ws Type ws Type ws Type	area 1 2		•	-	A ,r 2.15 19.95 10 14.07	n <sup>2</sup> x 5 x <sup>1</sup> 7 x <sup>1</sup> 7 x <sup>1</sup>	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K 0.04] = 0.04] = 0.04] =	(W/I 2.15 26.45 13.26 18.65	ĸ)			kJ/K (26) (27) (27) (27)
Doors Window Window Window Rooflig	ws Type ws Type ws Type	area 1 2	(m²)	•	2	A ,r 2.15 19.95 10 14.07 2.73	m <sup>2</sup> x 5 x <sup>1</sup> 7 x <sup>1</sup> 7 x <sup>1</sup> 3 x	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/l 2.15 26.45 13.26 18.65 3.822	ĸ)			kJ/K (26) (27) (27) (27) (27b)
Doors Window Window Window Rooflig Floor	ws Type ws Type ws Type	area 1 2 3	(m²) 49	. m	7	A ,r 2.15 19.95 10 14.07 2.73 47.13	m <sup>2</sup> x x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup> x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + 0.13	K 0.04] =   0.04] =   0.04] =   0.04] =   0.04] =	(W// 2.15 26.45 13.26 18.65 3.822 6.1269	ĸ)			kJ/K (26) (27) (27) (27) (27b) (28)
Doors Window Window Rooflig Floor Walls Roof	ws Type ws Type ws Type	area 1 2 3 <u>145.</u> 47.1	(m²) 49 3	46.17	7	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32	m <sup>2</sup> x 5 x <sup>1</sup> 7 x <sup>1</sup> 7 x <sup>1</sup> 3 x 2 x 2 x x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4) + 0.13 0.18	K 0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =   =	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88	ĸ)			kJ/K (26) (27) (27) (27) (27b) (28) (29)
Doors Window Window Rooflig Floor Walls Roof Total a * for win	ws Type ws Type ws Type ghts area of ele dows and r	area 1 2 3 145 47.1 ements roof winde	(m²) 49 3 , m² ows, use ef	46.17 2.73	2 7  ndow U-va	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7	m <sup>2</sup> x 5 x1 7 x1 7 x1 3 x 2 x 5	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	K 0.04] =   0.04] =   0.04] =   0.04] =   =   =   =	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77	K)	kJ/m²-	к ] [ ] [	kJ/K (26) (27) (27) (27) (27b) (28) (29) (30)
Doors Window Window Rooflig Floor Walls Roof Total a * for wind ** includ	ws Type ws Type ws Type ghts area of ele dows and r le the areas	area 1 2 3 145. 47.1 ements roof winde	(m²) 49 3 , m² ows, use et sides of int	46.17 2.73 ffective win ternal wall	2 7  ndow U-va	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7	m <sup>2</sup> x 5 x1 7 x1 7 x1 3 x 2 x 5	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ [0.13] 0.13 0.13 g formula 1	K 	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31)
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Doors Window Window Rooflig Floor Walls Roof Total a * for win ** includ Fabric Heat ca Therma For desig	ws Type ws Type ws Type ghts area of ele dows and r de the areas heat loss apacity C	area 1 2 3 145. 47.1 ements roof winder s on both s, W/K = Cm = S( parame ments wh	(m <sup>2</sup> ) 49 3 , m <sup>2</sup> ows, use et sides of int = S (A x I (A x k ) ter (TMP ere the det	$\frac{46.17}{2.73}$ ffective winternal walk ternal walk U) $P = Cm \div$ ails of the	z ndow U-va ls and part	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7 alue calcul itions	m <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ [0.13] 0.13 0.13 g formula 1 (26)(30)	$K =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ =   \\ =   \\   =   \\   =   \\   =   \\   =   \\   =   \\   (1/U-valu) + (32) = \\ ((28). \\ Indical + (32) =   \\ ((28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   ($	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77 <i>(ve)+0.04] a</i>	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31) (31) (33) (34)
Doors Window Window Rooflig Floor Walls Roof Total a * for wind ** includ Fabric Heat ca For designed	ws Type ws Type ws Type ghts area of ele dows and r le the areas heat loss apacity C al mass p	area 1 2 3 145 47.1 ements roof winder s on both s, W/K = Cm = S(p) parameter ments which do f a deal	(m <sup>2</sup> ) 49 3 , m <sup>2</sup> ows, use et sides of int = S (A x I (A x k ) ter (TMP ere the det tailed calcu	$\frac{46.17}{2.73}$ ffective winternal walk ternal walk U) $P = Cm \div$ ails of the valuation.	7 ndow U-va ls and part - TFA) in constructi	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7 alue calcul itions kJ/m <sup>2</sup> K	m <sup>2</sup> x 5 x1 7 x1 7 x1 3 x 2 x 5 2 2 x 5 5 2 x 1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ [0.13] 0.13 0.13 g formula 1 (26)(30)	$K =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ =   \\ =   \\   =   \\   =   \\   =   \\   =   \\   =   \\   (1/U-valu) + (32) = \\ ((28). \\ Indical + (32) =   \\ ((28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   (28). \\   ($	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77 <i>(ve)+0.04] a</i>	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (27b) (28) (29) (30) (31) (31) (31) (34) (35)
Doors Window Window Rooflig Floor Walls Roof Total a * for win ** includ Fabric Heat ca Fabric Heat ca for desig can be u Therma if details	ws Type ws Type ws Type ghts area of ele dows and r le the areas heat loss apacity C al mass p ign assessr used instea	area 1 2 3 145 47.1 ements roof winde s on both s, W/K = Cm = S( parame ments wh d of a dea s : S (L bridging	(m <sup>2</sup> ) 49 3 , m <sup>2</sup> ows, use el sides of int = S (A x I (A x k ) ter (TMP ere the det tailed calcu x Y) calc	$\frac{46.17}{2.73}$ ffective winternal walk ternal walk U) $P = Cm \div$ values of the plation. culated to the second s	z ndow U-va 's and part - TFA) in constructi using Ap	A ,r 2.15 19.95 10 14.07 2.73 47.13 99.32 44.4 239.7 alue calcul itions kJ/m²K fon are not pendix H	m <sup>2</sup> x 5 x1 7 x1 7 x1 3 x 2 x 5 2 2 x 5 5 2 x 1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ [0.13] 0.13 0.13 g formula 1 (26)(30)	$K =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ =   \\ =   \\ =   \\   =   \\   =   \\   \\$	(W// 2.15 26.45 13.26 18.65 3.822 6.1269 17.88 5.77 <i>(ve)+0.04] a</i>	K)	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (27b) (28) (29) (30) (31) (31) (31) (34) (35)

Ventila	ation he	at loss ca	alculated	d monthly	у		_		(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	60.72	60.39	60.08	58.59	58.31	57.01	57.01	56.77	57.51	58.31	58.87	59.46		(38)
Heat t	ransfer	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	193.8	193.47	193.15	191.66	191.38	190.08	190.08	189.84	190.59	191.38	191.95	192.54		
							-	•		-	Sum(39)1.	12 /12=	191.66	(39)
	<u> </u>	ameter (I	<u> </u>	1				1	· · ·	= (39)m ÷				
(40)m=	1.63	1.62	1.62	1.61	1.61	1.59	1.59	1.59	1.6	1.61	1.61	1.62		
Numb	er of dag	ys in mo	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12 /12=	1.61	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
		-	•	•				•	-					
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
A			NI									]		(40)
		upancy, 9, N = 1		(1 - exp	(-0.0003	849 x (TF		)2)] + 0.(	)013 x (	TFA -13.		86		(42)
	A £ 13.				,	,		, ,,	,		,			
								(25 x N) to achieve		se target o		2.13		(43)
		litres per				-	-	lo acilieve	a water us	se largel o	1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat		in litres per			,			U U		000				
(44)m=	112.34	108.26	104.17	100.09	96	91.92	91.92	96	100.09	104.17	108.26	112.34		
<b>( )</b>											m(44) <sub>112</sub> =		1225.56	(44)
Energy	content o	f hot water	used - ca	lculated me	onthly = 4.	190 x Vd,r	m x nm x D	OTm / 3600						
(45)m=	166.6	145.71	150.36	131.09	125.78	108.54	100.58	115.42	116.79	136.11	148.58	161.34		
										Total = Su	m(45) <sub>112</sub> =	=	1606.9	(45)
lf instan	taneous v	vater heati	ng at poin	t of use (no	hot water	r storage),	enter 0 in	boxes (46	) to (61)					
· · ·	24.99	21.86	22.55	19.66	18.87	16.28	15.09	17.31	17.52	20.42	22.29	24.2		(46)
	storage		) includir		alar ar M	/\//HBS	storada	within sa	ame ves	ما				(47)
-		neating a		• •			-			501		0		(47)
	•	-			-			ombi boil	ers) ente	er '0' in (	47)			
	storage			- (						(				
a) If m	nanufac	turer's d	eclared l	loss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	e 2b								0		(49)
		om water	•					(48) x (49)	) =			0		(50)
		turer's d		-										
		age loss			ie 2 (kvv	n/litre/da	ay)					0		(51)
	-	from Ta		011 4.5								0		(52)
		actor fro		e 2b								0		(52)
		om water			ear			(47) x (51)	) x (52) x (	53) =		0		(54)
-		(54) in (5	-	, <b>,</b>				x / x=*)		,		0		(55)
	. ,	loss cal	•	for each	month			((56)m = (	55) × (41)	m	L			
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
· /		-		-	-	_	-	I	-	-				

If cylinder contai	ns dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circu	it loss (ar	nual) fro	om Table	e 3							0		(58)
Primary circu	•				59)m = (	(58) ÷ 36	65 × (41)	m					
(modified b	by factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)		L	
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss c	alculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 29.17	26.34	29.15	28.19	29.1	28.14	29.06	29.09	28.16	29.13	28.21	29.16		(61)
Total heat re	quired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	1
(62)m= 195.77	7 172.05	179.51	159.27	154.89	136.68	129.64	144.5	144.96	165.24	176.79	190.51		(62)
Solar DHW inpu	t calculated	using App	endix G or	Appendix	KH (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add addition	al lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (	G)		-			
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
<mark>(64)</mark> m= 195.77	7 172.05	179.51	159.27	154.89	136.68	129.64	144.5	144.96	165.24	176.79	190.51		_
							Outp	out from w	ater heate	r (annual)₁	12	1949.81	(64)
Heat gains fr	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	« [(46)m	+ (57)m	+ (59)m	]	
<mark>(65)</mark> m= 62.69	55.03	57.28	50.63	49.1	43.12	40.71	45.65	45.88	52.54	56.45	60.94		(65)
include (57	)m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal g	gains (see	e Table 5	and 5a	):									
Metabolic ga	ins (Table	e 5), Wat	ts	-	-	-	_	-	_	-			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 143.0 <sup>°</sup>	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01	143.01		(66)
Lighting gain	s (calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 25.33	22.5	18.3	13.85	10.36	8.74	9.45	12.28	16.48	20.93	24.43	26.04		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m= 284.18	3 287.13	279.7	263.88	243.91	225.14	212.6	209.65	217.08	232.9	252.87	271.64		(68)
Cooking gain	s (calcula	ated in A	ppendix	L, equat	tion L15	or L15a)	), also se	e Table	5				
(69)m= 37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3		(69)
Pumps and fa	ans gains	(Table 5	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	on (nega	tive valu	es) (Tab	ole 5)		•		•				
(71)m= -114.4	1 -114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41	-114.41		(71)
Water heatin	g gains (1	Fable 5)											
(72)m= 84.26	81.9	76.99	70.32	65.99	59.9	54.71	61.35	63.72	70.62	78.41	81.91		(72)
Total interna	al gains =				(66)	m + (67)m	n + (68)m +	⊦ (69)m + i	(70)m + (7	1)m + (72)	m		
(73)m= 462.68	3 460.43	443.89	416.96	389.16	362.68	345.67	352.19	366.18	393.35	424.61	448.49		(73)
6. Solar gai	าร:												
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	ie applicat	le orientat	ion.		
Orientation:			Area		Flu		_	g	_	FF		Gains	
	Table 6d		m²		Ta	ole 6a	Т	able 6b	T	able 6c		(W)	

Northeast 0.9x	0.77	] ×	14.07	×	11.28	) ×	0.76	x	0.7	=	58.53	(75)
Northeast 0.9x	0.77	] ^ ] x	14.07	x x	22.97	x l	0.76	x	0.7	=	119.13	](75)
Northeast 0.9x	0.77	) ^   x	14.07	x l	41.38	^   x	0.76	x	0.7	=	214.64	(75)
Northeast 0.9x	0.77	] x	14.07	l x	67.96	x	0.76	x	0.7	=	352.51	(75)
Northeast 0.9x	0.77	」 】 ×	14.07	   x	91.35	]   x	0.76	x	0.7	=	473.84	(75)
Northeast 0.9x	0.77	]   x	14.07	×	97.38	   x	0.76	x	0.7	=	505.16	(75)
Northeast 0.9x	0.77	] x	14.07	x	91.1	」 】 ×	0.76	x	0.7	=	472.57	(75)
Northeast 0.9x	0.77	] x	14.07	x	72.63	x	0.76	x	0.7	=	376.74	(75)
Northeast 0.9x	0.77	x	14.07	x	50.42	x	0.76	x	0.7	=	261.55	(75)
Northeast 0.9x	0.77	x	14.07	×	28.07	×	0.76	x	0.7	=	145.59	(75)
Northeast 0.9x	0.77	x	14.07	×	14.2	×	0.76	x	0.7	=	73.64	(75)
Northeast 0.9x	0.77	x	14.07	×	9.21	×	0.76	x	0.7	=	47.8	(75)
Southeast 0.9x	0.77	x	19.95	×	36.79	×	0.76	x	0.7	=	270.62	(77)
Southeast 0.9x	0.77	x	19.95	×	62.67	×	0.76	x	0.7	=	460.97	(77)
Southeast 0.9x	0.77	x	19.95	×	85.75	×	0.76	x	0.7	=	630.72	(77)
Southeast 0.9x	0.77	x	19.95	×	106.25	×	0.76	x	0.7	=	781.49	(77)
Southeast 0.9x	0.77	x	19.95	×	119.01	x	0.76	x	0.7	=	875.33	(77)
Southeast 0.9x	0.77	x	19.95	×	118.15	x	0.76	x	0.7	=	869	(77)
Southeast 0.9x	0.77	x	19.95	×	113.91	x	0.76	x	0.7	=	837.81	(77)
Southeast 0.9x	0.77	x	19.95	×	104.39	x	0.76	x	0.7	=	767.8	(77)
Southeast 0.9x	0.77	x	19.95	×	92.85	×	0.76	x	0.7	=	682.93	(77)
Southeast 0.9x	0.77	x	19.95	×	69.27	x	0.76	x	0.7	=	509.47	(77)
Southeast 0.9x	0.77	x	19.95	×	44.07	×	0.76	x	0.7	=	324.14	(77)
Southeast 0.9x	0.77	x	19.95	×	31.49	x	0.76	x	0.7	=	231.6	(77)
Southwest <sub>0.9x</sub>	0.77	x	10	×	36.79		0.76	x	0.7	=	135.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	62.67	]	0.76	x	0.7	=	231.06	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	85.75	]	0.76	x	0.7	] =	316.15	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	106.25		0.76	x	0.7	=	391.72	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	119.01		0.76	x	0.7	=	438.76	(79)
Southwest0.9x	0.77	x	10	×	118.15		0.76	x	0.7	=	435.59	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	113.91	ļ	0.76	x	0.7	=	419.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	104.39	ļ	0.76	x	0.7	=	384.86	(79)
Southwest0.9x	0.77	x	10	×	92.85		0.76	x	0.7	=	342.32	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	69.27		0.76	x	0.7	=	255.37	(79)
Southwest <sub>0.9x</sub>	0.77	×	10	×	44.07	]	0.76	x	0.7	=	162.48	(79)
Southwest <sub>0.9x</sub>	0.77	×	10	×	31.49	]	0.76	X	0.7	=	116.09	(79)
Rooflights 0.9x	1	×	2.73	×	26	x	0.76	x	0.7	=	33.99	(82)
Rooflights 0.9x	1	×	2.73	×	54	×	0.76	x	0.7	=	70.58	(82)
Rooflights 0.9x	1	×	2.73	×	96	×	0.76	x	0.7	=	125.48	(82)
Rooflights 0.9x	1	×	2.73	×	150	×	0.76	x	0.7	=	196.07	(82)
Rooflights 0.9x	1	x	2.73	×	192	×	0.76	x	0.7	=	250.97	(82)

Rooflights 0.9x	1 ×	2.7	73	x	200		x	0.76	×	0.7	=	261.42	(82)
Rooflights 0.9x	1 ×	2.7	73	x	189		x	0.76	x	0.7	=	247.05	(82)
Rooflights 0.9x	1 ×	2.7	73	x	157		x	0.76	x	0.7	=	205.22	(82)
Rooflights 0.9x	1 ×	2.7	73	x	115		x	0.76	x	0.7	=	150.32	(82)
Rooflights 0.9x	1 ×	2.7	73	x	66		x	0.76	x	0.7	=	86.27	(82)
Rooflights 0.9x	1 ×	2.7	73	x	33		x	0.76	x	0.7	=	43.14	(82)
Rooflights 0.9x	1 ×	2.7	73	x	21		x	0.76	x	0.7	=	27.45	(82)
Solar gains in watte	, calculate	d for eac	h month	-		(	(83)m = S	Sum(74)m .	(82)m				
(83)m= 498.78 881		1721.79			71.18 197		1734.62	1437.12	996.7	603.4	422.93		(83)
Total gains – interr		· ,	· ,	<u>`</u>								1	
(84)m= 961.46 1342	.18 1730.89	2138.75	2428.06	24	33.86 232	23.05	2086.81	1803.31	1390.06	1028.01	871.42		(84)
7. Mean internal to	emperature	(heating	season	)									
Temperature duri	ng heating l	periods i	n the livi	ng	area from	n Tab	le 9, Th	n1 (°C)				21	(85)
Utilisation factor for	or gains for	living are	ea, h1,m	ı (s	ee Table	9a)							
Jan F	eb Mar	Apr	May		Jun J	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.99 0.9	8 0.93	0.83	0.66		0.48 0.	.36	0.41	0.66	0.91	0.98	1		(86)
Mean internal tem	perature in	living ar	ea T1 (fe	ollo	w steps 3	3 to 7	in Tabl	e 9c)					
(87)m= 19.35 19.	69 20.14	20.6	20.87	2	0.97 20	).99	20.99	20.9	20.47	19.8	19.28		(87)
Temperature duri	na heatina i	periods i	n rest of	dw	ellina fror	m Tal	ble 9. T	h2 (°C)		•			
(88)m= 19.59 19	<u> </u>	19.61	19.61	<b>—</b>		9.62	19.62	19.61	19.61	19.61	19.6	]	(88)
Utilisation factor for	r gains for	rost of d	wolling	<u>г</u> h2			0.2)					1	
(89)m = 0.99 0.9	<u> </u>	0.78	0.58	<b>1</b>	<u> </u>	.25	9 <i>a)</i> 0.29	0.55	0.87	0.98	0.99	1	(89)
								I		0.00	0.00	J	()
Mean internal terr		1	r	<u> </u>	<u> </u>			1		40.40	47.07	1	(90)
(90)m= 17.46 17.	96 18.59	19.19	19.5		19.6 19	9.62	19.62	19.55	19.06	18.12 ng area ÷ (4	17.37	0.45	
								'		ig alca ÷ (-	•) -	0.15	(91)
Mean internal tem	· · · · · · · · · · · · · · · · · · ·	1	1	<u> </u>	1			<u> </u>		1		1	()
(92)m= 17.75 18.		19.41	19.71			9.83	19.82	19.76	19.28	18.38	17.66	]	(92)
Apply adjustment		1	I	T	1			1		40.00	47.00	1	(93)
(93)m= 17.75 18.		19.41	19.71		9.81 19	9.83	19.82	19.76	19.28	18.38	17.66		(93)
8. Space heating Set Ti to the mean			re obtair	bod	at stop 1	1 of <sup>-</sup>	Tabla 0	h so tha	t Ti m-	(76)m an	d re-cal	sulato	
the utilisation factor		•		ieu	at step 1	1 01		D, 50 IIIA	t 11,111=	(70)m an	u le-cal	Julate	
Jan F	b Mar	Apr	May		Jun J	Jul	Aug	Sep	Oct	Nov	Dec	]	
Utilisation factor for	r gains, hn	י ו:								•			
(94)m= 0.99 0.9	6 0.9	0.77	0.59		0.4 0.	.26	0.31	0.56	0.86	0.97	0.99		(94)
Useful gains, hm(	im , W = (9	4)m x (8	4)m										
. ,	.83 1555.47					0.68	645.44	1014.89	1194.52	997.05	862.83		(95)
Monthly average		ri	1	-						1		1	()
(96)m= 4.3 4.1		8.9	11.7			6.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for		· · · ·	1	1		<u> </u>	- ,	<u> </u>	-	0404 57	0504 7	I	(07)
(97)m= 2606.02 2577		2014.22				3.17	650.15				2591.74	J	(97)
Space heating red (98)m= 1233.36 866		263.66	78.83	vvn T		0.02	4 x [(97 0	)m – (95 0	)mJ x (4 346.87	1)m 840.61	1286.31	1	
	014.12	203.00	10.03	L	·	U	U		340.8/	040.01	1200.31	J	

								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	5530.59	(98)
Space	e heatin	g require	ement in	n kWh/m²	²/year								46.39	(99)
9a. En	ergy red	quiremer	nts – Ind	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatii on of sr	-	at from s	econdar	v/sunnle	mentary	vsvstem						0	(201)
	-			nain syst		memary	-	(202) = 1 -	- (201) =				1	(202)
				main sys	. ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
			•	ting syste									93.7	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	า, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
Space	e heatin	g require	ement (c	calculate	d above)	)								
	1233.36	866.82	614.12	263.66	78.83	0	0	0	0	346.87	840.61	1286.31		
(211)m		í	<u> </u>	100 ÷ (20	r								I	(211)
	1316.29	925.1	655.42	281.38	84.13	0	0	0 Tota	0	370.19	897.13 211) <sub>15.1012</sub>	1372.8	5000.44	
Space	a hoatin	a fuol (c	ocondar	ry), kWh/	month			Tota	i (kwii/yee		- ' '/15,1012		5902.44	(211)
•		)1)]}x1		• /	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
				-				Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>		0	(215)
	heating	-												
Output	from w 195.77	ater hea 172.05	ter (calc 179.51	ulated a	bove) 154.89	136.68	129.64	144.5	144.96	165.24	176.79	190.51		
Efficier		ater hea		100.21	101.00	100.00	120.01	111.0	111.00	100.21	110.10	100.01	87	(216)
(217)m=	-	90.07	89.84	89.27	88.21	87	87	87	87	89.47	90.03	90.21		(217)
		heating,												
. ,	1 = (64) 217.11	<u>m x 100</u> 191.03	) ÷ (217) 199.82	)m 178.42	175.58	157.1	149.01	166.1	166.62	184.68	196.36	211.2		
(213)11-	217.11	101.00	100.02	170.42	170.00	107.1	145.01		I = Sum(2		100.00	211.2	2193.02	(219)
Annua	I totals	i									Wh/year	, ,	kWh/year	
Space	heating	fuel use	ed, main	system	1								5902.44	
Water	heating	fuel use	d										2193.02	
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								
centra	al heatir	ng pump	:									30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)
Total e	lectricit	y for the	above,	kWh/yea	ır			sum	of (230a).	(230g) =			75	(231)
Electri	city for I	ighting											447.42	(232)
Electri	city gen	erated b	y PVs										-745.28	(233)
12a. (	CO2 e <u>m</u>	nissions ·	– Individ	lual heat	ing sys <u>te</u>	ems <u>inclu</u>	uding mi	cro- <u>CH</u> P						
						Em				Emico	ion fac	tor	Emissions	
							e <b>rgy</b> /h/year			kg CO			kg CO2/yea	

Space heating (main system 1)	(211) x	0.216	=	1274.93	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	473.69	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1748.62	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	232.21	(268)
Energy saving/generation technologies					_
Item 1		0.519	=	-386.8	(269)
Total CO2, kg/year	sun	n of (265)(271) =		1632.95	(272)
Dwelling CO2 Emission Rate	(27	2) ÷ (4) =		13.7	(273)
EI rating (section 14)				87	(274)

				User D	etails:						
Assessor Name:	Mitchell Fir	าท			Strom	a Num	ber:		STRO	029125	
Software Name:	Stroma FS	AP 201	2		Softwa	are Ver	rsion:		Versic	n: 1.0.3.11	
			Р	roperty .	Address	: House	2 After F	Renewat	ole Energ	ду	
Address :	House 2, So	outh of 2	7a West	t End La	ne, Lond	don, NW	6 4QJ				
1. Overall dwelling dim	ensions:										
0				<b></b>	a(m²)		Av. Hei	• • •	1	Volume(m <sup>3</sup> )	1
Ground floor				4		(1a) x	2	.45	(2a) =	101.94	(3a)
First floor				4	1.61	(1b) x	2	.75	(2b) =	114.43	(3b)
Second floor				2	5.43	(1c) x	2	2.9	(2c) =	73.75	(3c)
Total floor area TFA = (1	la)+(1b)+(1c)+	(1d)+(1e	e)+(1r	n) 10	08.65	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	290.12	(5)
2. Ventilation rate:											
	main heating		econdar leating	У	other		total			m <sup>3</sup> per hour	
Number of chimneys	0	+	0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0	+	0	+	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans					- F	2	<b>x</b> ′	10 =	20	(7a)
Number of passive vents	5					Ē	0	x ′	10 =	0	(7b)
Number of flueless gas	fires					Г	0	× 4	40 =	0	(7c)
						L					1
									Air ch	anges per hou	Ir
Infiltration due to chimne	-						20		÷ (5) =	0.07	(8)
If a pressurisation test has			ed, procee	d to (17), d	otherwise o	continue fr	om (9) to (	(16)			1
Number of storeys in t Additional infiltration	ine aweiling (ne	5)						[(0)	11-0.1	0	(9)
Structural infiltration: (	) 25 for stool o	timbor	frama ar	0.25 for	macan	av constr	uction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are p						•	uction			0	(11)
deducting areas of open	ings); if equal user	0.35	_	-							-
If suspended wooden			ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er										0	(13)
Percentage of window	s and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2					0	(15)
Infiltration rate							2) + (13) -			0	(16)
Air permeability value	• •			•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeab	-						• • • •	1		0.32	(18)
Air permeability value appli Number of sides shelter		on test nas	s been aor	ie or a deg	gree air pe	rmeability	is being us	sea			
Shelter factor	eu				(20) = 1 -	[0.075 x (1	9)] =			0	(19) (20)
Infiltration rate incorpora	ting shelter fac	tor			(21) = (18					0.32	(21)
Infiltration rate modified	•		1			, , -/				0.32	],-,,
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s											
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
·		-		-	-	-			-	•	

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
Calavi	0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.37		
		<i>ctive air</i> al ventila	•	rate for t	ne appli	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
				ciency in %						, , ,			0	(200) (23c)
			-	entilation	-					2b)m + (	23b) x [1	– (23c)	_	(200)
(24a)m=		0		0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mecha	ı anical ve	entilation	without	heat rec	ı coverv (N	и ЛV) (24b	m = (22)	1 2b)m + (j	 23b)		ł	
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
,				ntilation of then (24)	•	•				.5 × (23t	)		I	
(24c)m=	. ,	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous m = (221		•				0.5]	1		I	
(24d)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)
Effe	ctive air	change	rate - ei	nter (24a	) or (24t	o) or (24	c) or (24	d) in box	x (25)				1	
(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN		Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
Doors						2.2	x	1	=	2.2				(26)
Window	ws Type	e 1				10	x1.	/[1/( 1.4 )+	0.04] =	13.26				(27)
Window	ws Type	e 2				11.67	, x1	/[1/( 1.4 )+	0.04] =	15.47				(27)
Rooflig	hts					2.73	x1,	/[1/(1.4) +	0.04] =	3.822	_			(27b)
Floor						41.61	x	0.13		5.4093				(28)
Walls		55.6	69	23.8	7	31.82	2 X	0.18		5.73	<b>-</b> 7			(29)
Roof		41.6	61	2.73		38.88	3 X	0.13		5.05	<b>-</b>		$\exists$	(30)
Total a	rea of e	lements	, m²			138.9	1		I					(31)
				effective wi nternal wal			ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	) + (32) =				50.74	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	0	(34)
Therm	al mass	parame	eter (TMI	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	-	sments wh ad of a de		etails of the rulation.	construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
	-	•	,	culated u	• •	•	<						26.91	(36)
			are not kr	nown (36) =	= 0.15 x (3	1)			(22) •	(26) -			:	
	abric he		alculator	d monthly						(36) =	25)m x (5)		77.65	(37)
ventila	Jan	Feb	Mar	1	May	Jun	Jul	Aua	Sep	Oct	25)m x (5) Nov	Dec	1	

(38)m=	55.79	55.48	55.18	53.76	53.5	52.26	52.26	52.04	52.74	53.5	54.03	54.59		(38)
	ansfer o	L coefficier	L ht W/K						(39)m	= (37) + (3	38)m			
(39)m=	133.43	133.13	132.83	131.41	131.15	129.91	129.91	129.69	130.39	131.15	131.68	132.24		
									<u>ا</u> ،	Average =	Sum(39)₁.	<sub>12</sub> /12=	131.41	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)	_		
(40)m=	1.23	1.23	1.22	1.21	1.21	1.2	1.2	1.19	1.2	1.21	1.21	1.22		<b>-</b>
Numbe	er of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12 /12=	1.21	(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 ene	rgy requ	irement:								kWh/ye	ar:	
Accum		ipancy,	N											(40)
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	-13.9	)2)] + 0.0	0013 x (	TFA -13.		81		(42)
	A £ 13.9							(05 ··· NI)	. 00		-			( ( )
								(25 x N) to achieve		se target o		0.85		(43)
not more	e that 125	litres per	person pe	r day (all w	vater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	110.94	106.91	102.87	98.84	94.8	90.77	90.77	94.8	98.84	102.87	106.91	110.94		_
Energy o	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd.r	n x nm x D	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )		Total = Su hth (see Ta	· · ·	L	1210.25	(44)
(45)m=	164.52	143.89	148.48	129.45	124.21	107.18	99.32	113.97	115.33	134.41	146.72	159.33		
(,										Total = Su			1586.82	(45)
lf instant	aneous w	ater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46	) to (61)					
(46)m=	24.68	21.58	22.27	19.42	18.63	16.08	14.9	17.1	17.3	20.16	22.01	23.9		(46)
	storage		includir	na anv si	olar or M	////HRS	storane	within sa	ame ves	ما	<b></b>	0		(47)
-				ink in dw			-			501		0		(47)
	•	-			-			ombi boil	ers) ente	er '0' in (	47)			
	storage													
				oss facto	or is kno	wn (kWł	n/day):					0		(48)
•			m Table									0		(49)
0,			•	, kWh/ye cylinder⊺		or is not		(48) x (49)	) =			0		(50)
,				om Tabl								0		(51)
			ee secti	on 4.3										
		from Ta		2h								0		(52)
•			m Table					(47) × (54)	) y (FQ) y (	50)		0		(53)
		(54) in (5	-	, kWh/ye	ear			(47) x (51)	) X (52) X (	53) =		0 0		(54) (55)
	. ,	. , .	,	for each	month			((56)m = (	55) × (41)	m		~		(00)
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
	_	-	-	-	-		-	-	-	-	-	m Appendi	хH	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
								I		L				

	•	it loss (ar	,									0		(58)
	•	it loss cal					. ,	. ,		r tharma	atat)			
•		y factor fi	· · · · · ·	r	i		r	r –	r -	r	<u> </u>		l	(59)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(39)
Combi	loss ca	alculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	29.17	26.34	29.15	28.18	29.1	28.14	29.06	29.08	28.16	29.12	28.21	29.16		(61)
Total h	eat rec	quired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	193.69	170.23	177.63	157.63	153.31	135.32	128.38	143.06	143.49	163.54	174.93	188.49		(62)
Solar DH	HW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	ddition	al 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)
Output	from v	vater hea	ter											
(64)m=	193.69	170.23	177.63	157.63	153.31	135.32	128.38	143.06	143.49	163.54	174.93	188.49		
		-	-		-		-	Outp	out from w	ater heate	r (annual)₁	12	1929.69	(64)
Heat g	ains fro	om water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	۲ ((46)m	+ (57)m	+ (59)m	]	
(65)m=	62	54.43	56.66	50.09	48.57	42.67	40.29	45.17	45.39	51.97	55.84	60.27		(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	
	•	, Jains (see		. ,	-	•		U						
	Ĩ	ns (Table			) -									
Melab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	140.32		140.32	140.32	140.32	140.32	140.32	140.32	140.32	140.32	140.32	140.32		(66)
		s (calcula												
(67)m=	24.04	21.35	17.36	13.14	9.82	8.29	8.96	11.65	15.64	19.85	23.17	24.7		(67)
											20111			(- )
	269.6	ains (calc	265.35	250.34	231.4	213.59	201.69	198.9	205.95	220.95	239.9	257.71		(68)
(68)m=		-									239.9	257.71		(00)
	<u> </u>	s (calcula	r	 T	· · ·		, 		1	· · · · · ·			I	(00)
(69)m=		37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03	37.03		(69)
•	r	ans gains	<u>`</u>	<u>,                                     </u>								r	I	()
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)		i		ı —		i		
(71)m=	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26	-112.26		(71)
Water	heating	g gains (T	able 5)											
(72)m=	83.33	80.99	76.15	69.57	65.29	59.27	54.15	60.71	63.04	69.86	77.55	81		(72)
Total i	nterna	l gains =				(66)	m + (67)m	n + (68)m +	+ (69)m +	(70)m + (7	1)m + (72)	m		
(73)m=	445.06	442.84	426.96	401.15	374.61	349.25	332.91	339.35	352.72	378.76	408.72	431.51		(73)
6. So	lar gair	is:	•		•		•		•	•	•	•		
Solar g	ains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	e applicat	le orientat	ion.		
Orienta		Access F Table 6d		Area m²		Flu Tal	x ole 6a	Т	g_ able 6b	Т	FF able 6c		Gains (W)	

x

х

11.28

22.97

x

х

0.76

0.76

x

х

0.7

0.7

=

11.67

11.67

х

х

Northeast 0.9x

Northeast 0.9x

0.77

0.77

48.54

98.81

(75)

(75)

		-				_						_
Northeast 0.9x	0.77	x	11.67	x	41.38	x	0.76	x	0.7	=	178.03	(75)
Northeast 0.9x	0.77	x	11.67	x	67.96	x	0.76	x	0.7	=	292.38	(75)
Northeast 0.9x	0.77	x	11.67	x	91.35	x	0.76	×	0.7	=	393.01	(75)
Northeast 0.9x	0.77	x	11.67	x	97.38	x	0.76	×	0.7	=	418.99	(75)
Northeast 0.9x	0.77	x	11.67	x	91.1	x	0.76	x	0.7	=	391.96	(75)
Northeast 0.9x	0.77	x	11.67	x	72.63	x	0.76	<b>x</b>	0.7	=	312.47	(75)
Northeast 0.9x	0.77	x	11.67	x	50.42	x	0.76	<b>x</b>	0.7	=	216.93	(75)
Northeast 0.9x	0.77	x	11.67	x	28.07	x	0.76	x	0.7	=	120.76	(75)
Northeast 0.9x	0.77	x	11.67	x	14.2	x	0.76	<b>x</b>	0.7	=	61.08	(75)
Northeast 0.9x	0.77	x	11.67	x	9.21	x	0.76	<b>x</b>	0.7	=	39.64	(75)
Southwest <sub>0.9x</sub>	0.77	x	10	x	36.79	]	0.76	x	0.7	=	135.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	62.67	]	0.76	x	0.7	=	231.06	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	85.75	]	0.76	<b>x</b>	0.7	=	316.15	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	106.25	]	0.76	<b>x</b>	0.7	=	391.72	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	119.01	]	0.76	<b>x</b>	0.7	=	438.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	118.15	]	0.76	<b>x</b>	0.7	=	435.59	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	113.91	]	0.76	<b>x</b>	0.7	=	419.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	104.39	]	0.76	<b>x</b>	0.7	=	384.86	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	92.85	]	0.76	<b>x</b>	0.7	=	342.32	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	69.27	]	0.76	×	0.7	=	255.37	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	44.07	]	0.76	×	0.7	=	162.48	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	x	31.49	]	0.76	x	0.7	=	116.09	(79)
Rooflights 0.9x	1	x	2.73	x	26	x	0.76	x	0.7	=	33.99	(82)
Rooflights 0.9x	1	x	2.73	x	54	x	0.76	×	0.7	=	70.58	(82)
Rooflights 0.9x	1	x	2.73	x	96	x	0.76	×	0.7	=	125.48	(82)
Rooflights 0.9x	1	x	2.73	x	150	x	0.76	×	0.7	=	196.07	(82)
Rooflights 0.9x	1	x	2.73	x	192	x	0.76	×	0.7	=	250.97	(82)
Rooflights 0.9x	1	x	2.73	x	200	<b>x</b>	0.76	×	0.7	=	261.42	(82)
Rooflights 0.9x	1	x	2.73	x	189	x	0.76	x	0.7	=	247.05	(82)
Rooflights 0.9x	1	x	2.73	x	157	x	0.76	×	0.7	=	205.22	(82)
Rooflights 0.9x	1	x	2.73	x	115	x	0.76	x	0.7	=	150.32	(82)
Rooflights 0.9x	1	x	2.73	x	66	x	0.76	x	0.7	=	86.27	(82)
Rooflights 0.9x	1	x	2.73	x	33	x	0.76	×	0.7	=	43.14	(82)
Rooflights 0.9x	1	x	2.73	x	21	x	0.76	×	0.7	_ =	27.45	(82)
		_		-		-						_
Solar <u>g</u> ains in w	atts, calcul	ated	ì	_		<u> </u>	n = Sum(74)m	.(82)m				
、 <i>,</i>		9.66	880.17 1082.7			902	.55 709.57	462.4	266.69	183.18		(83)
Total gains – in			· · · · ·	<u> </u>	· · · · · · · · · · · · · · · · · · ·						1	
(84)m= 663.24	843.3 104	6.62	1281.32 1457.3	5 14	65.26 1391.87	1241	1.91 1062.29	841.16	675.42	614.69		(84)
7. Mean intern	al temperat	ture (	heating seaso	on)								
Temperature of	during heati	ng pe	eriods in the li	ving	area from Tat	ole 9	, Th1 (°C)				21	(85)
Utilisation factor	<u> </u>	-	I	-r	,		·		·, · · ·			
Jan	Feb M	lar	Apr Ma	y	Jun Jul	A	ug Sep	Oct	Nov	Dec		

(86)m=	1	0.99	0.97	0.9	0.75	0.55	0.41	0.47	0.75	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.66	19.89	20.23	20.63	20.89	20.98	21	20.99	20.92	20.52	20.01	19.63		(87)
Temp	erature	during h	eating p	periods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.9	19.9	19.9	19.91	19.91	19.92	19.92	19.93	19.92	19.91	19.91	19.91		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.97	0.87	0.69	0.47	0.31	0.37	0.67	0.94	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	18.13	18.45	18.94	19.5	19.82	19.91	19.92	19.92	19.86	19.38	18.64	18.08		(90)
									f	iLA = Livin	g area ÷ (4	4) =	0.18	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA x T1	+ (1 – fL	.A) × T2					
(92)m=	18.41	18.71	19.18	19.71	20.01	20.11	20.12	20.12	20.05	19.59	18.89	18.36		(92)
Apply	adjustn	nent to t	he mear	n interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.41	18.71	19.18	19.71	20.01	20.11	20.12	20.12	20.05	19.59	18.89	18.36		(93)
8. Sp	ace hea	ting requ	uirement	t										
				mperatui		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut			<u> </u>	using Ta	1	lun	lul	Aug	San	Oct	Nov	Dee		
l Itilioa	Jan ation fac	Feb tor for g	Mar ains hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	1	0.99	0.96	0.87	0.69	0.48	0.33	0.39	0.68	0.93	0.99	1		(94)
	l gains.			4)m x (84										
(95)m=	660.27	832.17	1003.2	rí i	1007.56	704.27	455.94	479.42	722.06	786.4	668.45	612.73		(95)
Month	nly avera	age exte	rnal terr	perature	e from Ta	able 8	I	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	]				
(97)m=	1882.59	1839	1683.96	1420.71	1090.27	715.59	457.29	482.36	776.2	1178.76	1552.61	1872.73		(97)
Space	e heatin	g require	ement fo	or each n	nonth, k	Nh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	909.41	676.59	506.48	221.95	61.54	0	0	0	0	291.92	636.59	937.44		_
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	4241.92	(98)
Space	e heatin	g require	ement in	ı kWh/m²	²/year								39.04	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
	e heatir				Ŭ		Ŭ		,					
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 ·	- (201) =				1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		ĺ	1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.7	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	
Space							Jui	_ Aug	Oep			Dec	KWII/ye	a
Spade	909.41	676.59	506.48	221.95	61.54	0	0	0	0	291.92	636.59	937.44		
(211)m	) = {[(98			I 100 ÷ (20										(211)
\ <u>-</u> ///	970.55	722.08	540.54	236.87	65.67	0	0	0	0	311.55	679.39	1000.47		()
		I	I	I	I	I	I		l I (kWh/yea		211) <sub>15,1012</sub>		4527.13	(211)

Space heating fuel (secondary), kWh/month

Space heating luer			monun									
$= \{[(98)m x (201)]\} x$		1									I	
(215)m= 0 0	0	0	0	0	0	0	0	0 ar) =Sum(2	0	0		
						TULA	ii (KVVI/yea	ar) = <b>Su</b> m(2	213) <sub>15,101</sub>	Ē	0	(215)
Water heating Output from water he	ator (calc	ulated a	hove)									
193.69 170.23		157.63	153.31	135.32	128.38	143.06	143.49	163.54	174.93	188.49		
Efficiency of water he	eater										87	(216)
(217)m= 90.03 89.93	89.71	89.13	88.03	87	87	87	87	89.34	89.88	90.06		(217)
Fuel for water heating $(219)m = (64)m \times 10^{-1}$												
(219)m = 215.14 189.29		176.86	174.16	155.54	147.56	164.43	164.94	183.06	194.63	209.3		
	ł					Tota	l = Sum(2	19a) <sub>112</sub> =			2172.92	(219)
Annual totals								k	Wh/yea	•	kWh/yea	<u>r</u>
Space heating fuel us	sed, main	system	1								4527.13	
Water heating fuel us	ed										2172.92	
Electricity for pumps,	fans and	electric	keep-ho	t								
central heating pum	p:									30		(230c)
boiler with a fan-ass	isted flue									45		(230e)
Total electricity for th	e above,	kWh/yea	r			sum	of (230a)	(230g) =			75	(231)
Total electricity for th Electricity for lighting	e above,	kWh/yea	r			sum	of (230a)	(230g) =			75 424.47	(231) (232)
-		kWh/yea	r			sum	of (230a).	(230g) =				4
Electricity for lighting	by PVs	-		ems inclu	uding mi			(230g) =			424.47	(232)
Electricity for lighting Electricity generated	by PVs	-		En	uding mi <b>ergy</b> /h/year				ion fac	tor	424.47	(232) (233)
Electricity for lighting Electricity generated	by PVs s – Individ	ual heati		<b>En</b> kW	ergy			Emiss	<b>ion fac</b> 2/kWh	tor =	424.47 -745.28 Emission	(232) (233)
Electricity for lighting Electricity generated 12a. CO2 emissions	by PVs s – Individ system 1	ual heati		<b>En</b> kW (211	<b>ergy</b> /h/year			Emiss kg CO	ion fac 2/kWh		424.47 -745.28 Emission: kg CO2/ye	(232) (233) s ear
Electricity for lighting Electricity generated 12a. CO2 emissions Space heating (main	by PVs s – Individ system 1	ual heati		<b>En</b> kW (211 (215	<b>ergy</b> /h/year I) x			Emiss kg CO 0.2	<b>ion fac</b> 2/kWh 16 19		424.47 -745.28 Emissions kg CO2/ye 977.86	(232) (233) s ear (261)
Electricity for lighting Electricity generated 12a. CO2 emissions Space heating (main Space heating (second	by PVs s – Individ system 1 ndary)	ual heati		En kW (211 (215	ergy /h/year ) x 5) x 9) x		)	Emiss kg CO2 0.2	<b>ion fac</b> 2/kWh 16 19	=	424.47 -745.28 Emission: kg CO2/ye 977.86 0	(232) (233) s ear (261) (263)
Electricity for lighting Electricity generated 12a. CO2 emissions Space heating (main Space heating (secon Water heating	by PVs s – Individ system 1 ndary) tting	ual heati	ing syste	En kW (211 (215 (215 (261	ergy /h/year ) x 5) x 9) x	cro-CHF	)	Emiss kg CO2 0.2	<b>ion fac</b> 2/kWh 16 19	=	424.47 -745.28 Emission: kg CO2/ye 977.86 0 469.35	(232) (233) s ar (261) (263) (263)
Electricity for lighting Electricity generated 12a. CO2 emissions Space heating (main Space heating (secon Water heating Space and water heat	by PVs s – Individ system 1 ndary) tting	ual heati	ing syste	En kW (211 (215 (215 (261 t (231	ergy /h/year 1) x 5) x 9) x 1) + (262) ·	cro-CHF	)	Emiss kg CO2 0.2 0.5	ion fac 2/kWh 16 19 16	= =	424.47 -745.28 Emissions kg CO2/ye 977.86 0 469.35 1447.21	(232) (233) <b>S</b> ear (261) (263) (264) (265)
Electricity for lighting Electricity generated 12a. CO2 emissions Space heating (main Space heating (secon Water heating Space and water heat Electricity for pumps,	by PVs s – Individ system 1 ndary) tting fans and	ual heati ) electric	ing syste	En kW (211 (215 (215 (261 t (231	ergy /h/year 1) x 5) x 2) x 1) + (262) -	cro-CHF	)	Emiss kg CO 0.2 0.5 0.2	ion fac 2/kWh 16 19 16	= = =	424.47 -745.28 Emissions kg CO2/ye 977.86 0 469.35 1447.21 38.93	(232) (233) <b>S</b> ear (261) (263) (264) (265) (265) (267)
Electricity for lighting Electricity generated 12a. CO2 emissions Space heating (main Space heating (secon Water heating Space and water heat Electricity for pumps, Electricity for lighting Energy saving/gener	by PVs s – Individ system 1 ndary) tting fans and	ual heati ) electric	ing syste	En kW (211 (215 (215 (261 t (231	ergy /h/year 1) x 5) x 2) x 1) + (262) -	cro-CHF	(264) =	Emiss kg CO 0.2 0.5 0.2	<b>ion fac</b> 2/kWh 16 19 16 19	= = =	424.47 -745.28 Emissions kg CO2/ye 977.86 0 469.35 1447.21 38.93 220.3	(232) (233) (233) (233) (233) (261) (261) (263) (264) (265) (265) (267) (268)
Electricity for lighting Electricity generated 12a. CO2 emissions Space heating (main Space heating (secon Water heating Space and water heat Electricity for pumps, Electricity for lighting Energy saving/gener Item 1	by PVs s – Individ system 1 ndary) tting fans and ation tech	ual heati ) electric nologies	ing syste	En kW (211 (215 (215 (261 t (231	ergy /h/year 1) x 5) x 2) x 1) + (262) -	cro-CHF	(264) = sum c	Emiss kg CO 0.2 0.5 0.5 0.5	<b>ion fac</b> 2/kWh 16 19 16 19	= = =	424.47 -745.28 Emissions kg CO2/ye 977.86 0 469.35 1447.21 38.93 220.3 -386.8	(232) (233) (233) (233) (233) (261) (263) (264) (265) (265) (267) (268) (268)
Electricity for lighting Electricity generated 12a. CO2 emissions Space heating (main Space heating (secon Water heating Space and water heat Electricity for pumps, Electricity for lighting Energy saving/gener Item 1 Total CO2, kg/year	by PVs s – Individ system 1 ndary) tting fans and ation tech sion Rate	ual heati ) electric nologies	ing syste	En kW (211 (215 (215 (261 t (231	ergy /h/year 1) x 5) x 2) x 1) + (262) -	cro-CHF	(264) = sum c	Emiss kg CO 0.2 0.5 0.5 0.5 0.5	<b>ion fac</b> 2/kWh 16 19 16 19	= = =	424.47 -745.28 Emissions kg CO2/ye 977.86 0 469.35 1447.21 38.93 220.3 -386.8 1319.63	(232) (233) <b>S</b> ear (261) (263) (264) (265) (267) (267) (268) (268)

				User D	etails:						
Assessor Name:	Mitchell Fi	nn			Strom	a Num	ber:		STRO	029125	
Software Name:	Stroma FS	AP 201	2		Softwa	are Vei	rsion:		Versio	on: 1.0.3.11	
			Р	roperty .	Address	: House	3 After F	Renewat	ole Energ	ју	
Address :	House 3, So	outh of 2	7a West	t End La	ne, Lono	don, NW	6 4QJ				
1. Overall dwelling dimer	nsions:										
• • •				Area	a(m²)		Av. Hei	ight(m)		Volume(m <sup>3</sup> )	-
Ground floor				4	1.51	(1a) x	2.	.45	(2a) =	101.7	(3a)
First floor				4	1.51	(1b) x	2.	.75	(2b) =	114.15	(3b)
Second floor				2	4.07	(1c) x	2	2.9	(2c) =	69.8	(3c)
Total floor area TFA = (1a	)+(1b)+(1c)+	(1d)+(1e	e)+(1r	n) <u>1</u>	07.09	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	285.65	(5)
2. Ventilation rate:											-
	main heating		econdar leating	У	other		total			m <sup>3</sup> per hour	
Number of chimneys	0	] + [	0	+	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0	_ + _	0	ī + Г	0	<b>i</b> = [	0	x	20 =	0	(6b)
Number of intermittent far	IS					- L	2	x ′	10 =	20	(7a)
Number of passive vents						Г	0	<b>x</b> 7	10 =	0	(7b)
Number of flueless gas fir	es					Г	0	x 4	40 =	0	(7c)
						L					J
									Air ch	anges per hou	Ir
Infiltration due to chimney						Γ	20		÷ (5) =	0.07	(8)
If a pressurisation test has be			ed, procee	d to (17), o	otherwise of	continue fr	om (9) to (	(16)			-
Number of storeys in the	e dwelling (ne	5)								0	(9)
Additional infiltration								[(9)·	1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre						•	ruction			0	(11)
deducting areas of opening			ponung ic	ine great	er wall are	a (allel					
If suspended wooden flo	oor, enter 0.2	(unseal	ed) or 0	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else (	enter 0								0	(13)
Percentage of windows	and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	⊦ (15) =		0	(16)
Air permeability value, o	50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabilit	y value, then	(18) = [(1	7) ÷ 20]+(8	3), otherwi	se (18) = (	16)				0.32	(18)
Air permeability value applies	if a pressurisati	on test has	s been dor	ne or a deg	gree air pe	rmeability	is being us	sed			-
Number of sides sheltered	ł									0	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			1	(20)
Infiltration rate incorporation	-				(21) = (18)	) x (20) =				0.32	(21)
Infiltration rate modified fo		· ·								I	
Jan Feb I	Var Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		e 7								I	
(22)m= 5.1 5 4	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	-actor (22	2a)m =	(22)m ÷	4						_			_	
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infiltra	tion rate	e (allowir	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m	-		-		
Calavi	0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.38		
	<i>ate effect</i> echanical		-	ale ior l	ne appli	capie ca	Se						0	(23a)
lf exh	aust air hea	at pump ı	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (	N5)) , othei	wise (23b	) = (23a)			0	(23b)
If bala	anced with I	heat reco	overy: effici	ency in %	allowing f	or in-use f	actor (fror	n Table 4h)	) =				0	(23c)
a) If	balanced	l mecha	anical ve	ntilation	with he	at recove	ery (MV	HR) (24a	ı)m = (2	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balanced	mecha	anical ve	ntilation	without	heat rec	covery (l	MV) (24b	)m = (22	2b)m + (2	23b)		-	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,	whole ho if (22b)m				•	•				.5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,	natural v if (22b)m									0.5]				
(24d)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	]	(24d)
Effe	ctive air c	hange	rate - en	ter (24a	) or (24t	o) or (24	c) or (24	ld) in boy	(25)	_	-	_	_	
(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
3 He	at losses	and he	at loss p	aramete	er:									
0.110														
ELEN		Gros area	S	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²⊷		A X k kJ/K
		Gros	S	Openin	gs						<)			
ELEN Doors		Gros area	S	Openin	gs	A ,r	m <sup>2</sup>		K	(W/I	<) 			kJ/K
ELEN Doors Windo	IENT	Gros area 1	S	Openin	gs	A ,r	m <sup>2</sup> x	W/m2	K =   0.04] =	(W/I 2.2	<) 			kJ/K (26)
ELEN Doors Windo <sup>r</sup> Windo <sup>r</sup>	<b>MENT</b> ws Type	Gros area 1 2	S	Openin	gs	A ,r 2.2 4.37	m <sup>2</sup> x x x1 x1	W/m2	K 0.04] = 0.04] =	(W/I 2.2 5.79	<) 			kJ/K (26) (27)
ELEN Doors Windo <sup>r</sup> Windo <sup>r</sup>	MENT ws Type ws Type : ws Type :	Gros area 1 2	S	Openin	gs	A ,r 2.2 4.37 10	m <sup>2</sup> x x1 x1 x1 x1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+	K 0.04] = 0.04] = 0.04] =	(W/I 2.2 5.79 13.26	$\diamond$			kJ/K (26) (27) (27)
ELEN Doors Windo Windo Windo	MENT ws Type ws Type : ws Type :	Gros area 1 2	S	Openin	gs	A ,r 2.2 4.37 10 11.67	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K 0.04] = 0.04] = 0.04] =	(W/I 2.2 5.79 13.26 15.47				kJ/K (26) (27) (27) (27)
ELEN Doors Windo Windo Windo Rooflig	MENT ws Type ws Type : ws Type :	Gros area 1 2	55 (m²)	Openin	gs 1 <sup>2</sup>	A ,r 2.2 4.37 10 11.67 2.73	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	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/I 2.2 5.79 13.26 15.47 3.822				kJ/K (26) (27) (27) (27) (27) (27b)
ELEN Doors Windo Windo Windo Rooflig Floor	MENT ws Type ws Type : ws Type :	Gros area 1 2 3	3S (m <sup>2</sup> )	Openin m	gs 1 <sup>2</sup>	A ,r 2.2 4.37 10 11.67 2.73 41.51	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x x1 x x1 x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.4 )+ 0.13	K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629				kJ/K (26) (27) (27) (27) (27b) (28)
ELEN Doors Windo Windo Rooflig Floor Walls Roof	MENT ws Type ws Type : ws Type :	Gros area 1 2 3 134. 41.5	4 1	Openin m	gs 1 <sup>2</sup>	A ,r 2.2 4.37 10 11.67 2.73 41.51 106.1	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x3 x1 x1 x1 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) + 0.13 0.18	K 0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629 19.11				kJ/K (26) (27) (27) (27) (27b) (28) (29)
ELEN Doors Windo Windo Rooflig Floor Walls Roof Total a * for win	MENT ws Type ws Type : ghts	Gros area 1 2 3 134. 41.5 ements oof windo	4 (m <sup>2</sup> ) (m <sup>2</sup> ) (1 , m <sup>2</sup> cows, use et	Openin m 28.24 2.73	gs 1 <sup>2</sup> 4 3 indow U-va	A ,r 2.2 4.37 10 11.67 2.73 41.51 106.1 38.78 217.4 alue calcul	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x3 x 2	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	K 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629 19.11 5.04		kJ/m²-	к ] [ ] [	kJ/K (26) (27) (27) (27) (27b) (28) (29) (30)
ELEN Doors Windo Windo Windo Rooflig Floor Walls Roof Total a * for win ** inclua	MENT ws Type ws Type ws Type ghts	Gros area 1 2 3 <u>134.</u> 41.5 ements oof windo	4 (m <sup>2</sup> ) 1 , m <sup>2</sup> ows, use et sides of in	Openin m 28.24 2.73 ffective wi ternal wal	gs 1 <sup>2</sup> 4 3 indow U-va	A ,r 2.2 4.37 10 11.67 2.73 41.51 106.1 38.78 217.4 alue calcul	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x3 x 2	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	K 	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629 19.11 5.04		kJ/m²-	к ] [ ] [	kJ/K (26) (27) (27) (27b) (28) (29) (30) (31)
ELEN Doors Windo Windo Rooflig Floor Walls Roof Total a * for win ** inclua Fabric	MENT ws Type ws Type ws Type ghts area of ele dows and r le the areas	Gros area 1 2 3 134. 41.5 ements oof winde s on both s, W/K =	4 (m <sup>2</sup> ) (m <sup>2</sup> ) , m <sup>2</sup> ows, use en sides of ini- = S (A x	Openin m 28.24 2.73 ffective wi ternal wal	gs 1 <sup>2</sup> 4 3 indow U-va	A ,r 2.2 4.37 10 11.67 2.73 41.51 106.1 38.78 217.4 alue calcul	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x3 x 2	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.13 0.13 g formula 1,	$K =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ 0.04  =   \\ =   \\ =   \\   =   \\   \\   \\ + (32) =   $	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629 19.11 5.04	9 [ ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ] ]	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31)
ELEN Doors Windo Windo Windo Rooflig Floor Walls Roof Total a * for win ** inclua Fabric Heat c Therm	MENT ws Type ws Type ws Type ghts area of ele dows and r le the areas heat loss apacity C al mass p	Gros area 1 2 3 134. 41.5 ements oof winde s on both s, W/K = Cm = S( parame	4 (m <sup>2</sup> )	Openin m 28.24 2.73 ffective witternal walk U) P = Cm ÷	gs 1 <sup>2</sup> 4 indow U-va is and part - TFA) ir	A ,r 2.2 4.37 10 11.67 2.73 41.51 106.1 38.76 217.4 alue calcul titions	m <sup>2</sup> x 1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x2 x1 x1 x2 x1 x1 x1 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 )+ [ 0.13 0.13 0.13 g formula 1, (26)(30)	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] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0	(W/I 2.2 5.79 13.26 15.47 3.822 5.39629 19.11 5.04 <i>Ie)+0.04] a</i> (30) + (32 tive Value	9 [ 9 [ 2 ] + (32a). : Medium	kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (28) (29) (30) (31) 9 (33) (34) (34)
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Average = Sum(39),, /12=       159.89       (39)         Heat loss parameter (HLP), W/m <sup>2</sup> K       (40)m = (39)m ÷ (4)       (40)m = (39)m ÷ (4)         (40)m =       1.51       1.51       1.51       1.49       1.48       1.48       1.48       1.49       1.5       1.5         Number of days in month (Table 1a)       Average = Sum(40),, /12=       1.49       (40)         (41)m =       31       28       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31	Ventila	ation hea	at loss ca	alculated	d monthly	у		_		(38)m	= 0.33 × (	25)m x (5)				
Letter         Letter <th letter<="" td=""><td></td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td><td></td><td></td></th>	<td></td> <td>Jan</td> <td>Feb</td> <td>Mar</td> <td>Apr</td> <td>May</td> <td>Jun</td> <td>Jul</td> <td>Aug</td> <td>Sep</td> <td>Oct</td> <td>Nov</td> <td>Dec</td> <td></td> <td></td>		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(38)m=	54.98	54.68	54.38	52.97	52.71	51.49	51.49	51.26	51.96	52.71	53.24	53.8		(38)	
Average = Sum(39),, /12=       159.89       (39)         Heat loss parameter (HLP), W/m²K       (40)m = (39)m ÷ (4)       (40)m = (39)m ÷ (4)         (40)m=       1.51       1.51       1.49       1.48       1.48       1.48       1.49       1.5       1.5         Number of days in month (Table 1a)       Average = Sum(40),, /12=       1.49       (40)         (41)m=       31       28       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30 <t< td=""><td>Heat tr</td><td>ransfer o</td><td>coefficier</td><td>nt, W/K</td><td></td><td></td><td></td><td></td><td></td><td>(39)m</td><td>= (37) + (3</td><td>38)m</td><td></td><td></td><td></td></t<>	Heat tr	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
Heat loss parameter (HLP), W/m <sup>2</sup> K       (40)m = (39)m ÷ (4)         (40)m = (1.51       1.51       1.51       1.51         (40)m = (3.9)m ÷ (4)         Average = Sum(40)tr /12=       1.49         Number of days in month (Table 1a)         Average = Sum(40)tr /12=       1.49         (41)m =         31       28       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30 <th< td=""><td>(39)m=</td><td>161.89</td><td>161.59</td><td>161.29</td><td>159.89</td><td>159.63</td><td>158.4</td><td>158.4</td><td>158.18</td><td>158.87</td><td>159.63</td><td>160.16</td><td>160.71</td><td></td><td></td></th<>	(39)m=	161.89	161.59	161.29	159.89	159.63	158.4	158.4	158.18	158.87	159.63	160.16	160.71			
$ \begin{array}{c} (40) \text{m} = & \hline 1.51 & 1.51 & 1.51 & 1.49 & 1.49 & 1.48 & 1.48 & 1.48 & 1.48 & 1.48 & 1.48 & 1.5 & 1.5 \\ \hline \text{Average} = \text{Sum}(40)_{1-\text{tr}} / 12= & 1.49 & (40) \\ \hline \text{Number of days in month (Table 1a)} \\ \hline \text{Average} = \text{Sum}(40)_{1-\text{tr}} / 12= & 1.49 & (40) \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(41)m} = & \hline 31 & 28 & 31 & 30 & 31 & 30 & 31 & 30 & 31 & 30 & 31 \\ \hline \text{(42)m} = & \hline 15A > 13.9, \text{N} = 1 + 1.76 \text{ x} [1 - \exp(-0.000349 \text{ x} (\text{TFA} - 13.9)2)] + 0.0013 \text{ x} (\text{TFA} - 13.9) \\ \hline \text{if TFA} > 13.9, \text{N} = 1 + 1.76 \text{ x} [1 - \exp(-0.000349 \text{ x} (\text{TFA} - 13.9)2)] + 0.0013 \text{ x} (\text{TFA} - 13.9) \\ \hline \text{if TFA} > 13.9, \text{N} = 1 + 1.76 \text{ x} [1 - \exp(-0.000349 \text{ x} (\text{TFA} - 13.9)2)] + 0.0013 \text{ x} (\text{TFA} - 13.9) \\ \hline \text{if TFA} > 13.9, \text{N} = 1 \\ \hline \text{Annual average hot water usage in litres per day Vd, average = (25 \text{ x N}) + 36 \\ \hline \text{Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) \\ \hline \hline \text{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec} \\ \hline \text{Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) \\ \hline \text{(44)m} = & 110.67 & 106.65 & 102.62 & 98.6 & 94.57 & 90.55 & 90.55 & 94.57 & 98.6 & 102.62 & 106.65 & 110.67 \\ \hline \text{Total = Sum}(44)_{1-12} = & 1207.31 & (44) \\ \hline \text{Hot water usage in litres per day for each monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) \\ \hline \text{(45)m} = & 164.12 & 143.54 & 148.12 & 129.14 & 123.91 & 106.92 & 99.08 & 113.7 & 115.05 & 134.09 & 14$								-	•		-		12 /12=	159.89	(39)	
Average = Sum(40)		<u> </u>	<u>`</u>	, ·						· · ·	· ,	· · ·				
Number of days in month (Table 1a) $(41)m=$ $Jan$ FebMarAprMayJunJulAugSepOctNovDec $(41)m=$ $31$ $28$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ $30$ $31$ <td>(40)m=</td> <td>1.51</td> <td>1.51</td> <td>1.51</td> <td>1.49</td> <td>1.49</td> <td>1.48</td> <td>1.48</td> <td>1.48</td> <td></td> <td></td> <td></td> <td> </td> <td>4.40</td> <td></td>	(40)m=	1.51	1.51	1.51	1.49	1.49	1.48	1.48	1.48					4.40		
(41)m=       31       28       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31	Numbe	er of day	/s in moi	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 / 12=	1.49	_(40)	
4. Water heating energy requirement:       kWh/year:         Assumed occupancy, N       2.8       (42)         if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)       if TFA £ 13.9, N = 1       (42)         Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ 100.61       (43)         Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)       (43)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)       Total = Sum(44)       100.65       102.62       98.6       94.57       90.55       94.57       98.6       102.62       106.65       110.67         Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)       (44)       (45)m=       164.12       148.12       129.14       123.91       106.92       99.08       113.7       115.05       134.09       146.36       158.94       Total = Sum(45)       1582.98       (45)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Assumed occupancy, N [2.8] (42) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = $(25 \times N) + 36$ [100.61] (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 110.67 106.65 102.62 98.6 94.57 90.55 90.55 94.57 98.6 102.62 106.65 110.67 Total = Sum(44)_{112} = 1207.31 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 164.12 143.54 148.12 129.14 123.91 106.92 99.08 113.7 115.05 134.09 146.36 158.94 Total = Sum(45)_{112} = 1582.98 (45)	(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)	
Assumed occupancy, N [2.8] (42) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = $(25 \times N) + 36$ [100.61] (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 110.67 106.65 102.62 98.6 94.57 90.55 90.55 94.57 98.6 102.62 106.65 110.67 Total = Sum(44)_{112} = 1207.31 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 164.12 143.54 148.12 129.14 123.91 106.92 99.08 113.7 115.05 134.09 146.36 158.94 Total = Sum(45)_{112} = 1582.98 (45)																
Assumed occupancy, N [2.8] (42) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = $(25 \times N) + 36$ [100.61] (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 110.67 106.65 102.62 98.6 94.57 90.55 90.55 94.57 98.6 102.62 106.65 110.67 Total = Sum(44)_{112} = 1207.31 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 164.12 143.54 148.12 129.14 123.91 106.92 99.08 113.7 115.05 134.09 146.36 158.94 Total = Sum(45)_{112} = 1582.98 (45)	4. Wa	ater hea	tina enei	rav reau	irement:								kWh/ve	ear:		
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)         if TFA £ 13.9, N = 1         Annual average hot water usage in litres per day Vd, average = $(25 x N) + 36$ Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)       (44)m=       110.67       106.65       102.62       98.6       94.57       90.55       94.57       98.6       102.62       106.65       110.67         Total = Sum(44)112 =       1207.31       (44)         (45)m=       164.12       143.54       148.12       129.14       123.91       106.92       99.08       113.7       115.05       134.09       146.36       158.94         Total = Sum(45)112 =       1582.98       (45)																
if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) (44)m= 110.67 106.65 102.62 98.6 94.57 90.55 90.55 94.57 98.6 102.62 106.65 110.67 Total = Sum(44) <sub>1-12</sub> = 1207.31 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 164.12 143.54 148.12 129.14 123.91 106.92 99.08 113.7 115.05 134.09 146.36 158.94 Total = Sum(45) <sub>1-12</sub> = 1582.98 (45)					/ [1 - evn			-130	)2)] + 0 (	1013 v ( <sup>-</sup>	TFA -13		.8		(42)	
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target ofnot more that 125 litres per person per day (all water use, hot and cold)JanFebMarAprMayJunJulAugSepOctNovDecHot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m=110.67106.65102.6298.694.5790.5594.5798.6102.62106.65110.67Total = Sum(44)112 =1207.31(44)Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)(45)m=164.12143.54148.12129.14123.91106.9299.08113.7115.05134.09146.36158.94Total = Sum(45)112 =1582.98(45)				11.70		( 0.0000	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	A 10.5	)2)] 10.0		117 10.	.0)				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $													0.61		(43)	
Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)         (44)m=       110.67       106.65       102.62       98.6       94.57       90.55       90.55       94.57       98.6       102.62       106.65       110.67         Total = Sum(44)112 =       1207.31       (44)         (45)m=       164.12       143.54       148.12       129.14       123.91       106.92       99.08       113.7       115.05       134.09       146.36       158.94         Total = Sum(45)112 =       1582.98       (45)			-				-	-	to achieve	a water us	se target o	t				
Hot water usage in litres per day for each month Vd, $m = factor from Table 1c \times (43)$ (44) $m = 110.67 \ 106.65 \ 102.62 \ 98.6 \ 94.57 \ 90.55 \ 90.55 \ 94.57 \ 98.6 \ 102.62 \ 106.65 \ 110.67$ Total = Sum(44) <sub>112</sub> = 1207.31 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd, $m \times nm \times DTm / 3600 \ kWh/month$ (see Tables 1b, 1c, 1d) (45) $m = 164.12 \ 143.54 \ 148.12 \ 129.14 \ 123.91 \ 106.92 \ 99.08 \ 113.7 \ 115.05 \ 134.09 \ 146.36 \ 158.94$ Total = Sum(45) <sub>112</sub> = 1582.98 (45)			· · ·		1			·	<u> </u>	Son	Oct	Nov	Dee			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Hot wate				· · ·				<u> </u>	Sep		NOV	Dec			
$Total = Sum(44)_{112} = 1207.31  (44)$ $(45)m = 164.12  143.54  148.12  129.14  123.91  106.92  99.08  113.7  115.05  134.09  146.36  158.94$ $Total = Sum(45)_{112} = 1582.98  (45)$				-			<del> </del>			98.6	102 62	106 65	110.67			
Energy content of hot water used - calculated monthly = $4.190 \times Vd$ , $m \times nm \times DTm / 3600 \ kWh/month$ (see Tables 1b, 1c, 1d)         (45)m=       164.12       148.12       129.14       123.91       106.92       99.08       113.7       115.05       134.09       146.36       158.94         Total = Sum(45)	()	110.07	100.00	102.02	00.0	04.07	00.00	00.00	04.07					1207.31	(44)	
$Total = Sum(45)_{112} = 1582.98 $ (45)	Energy (	content of	hot water	used - cal	lculated m	onthly = 4.	190 x Vd,r	m x nm x E	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )			· · · ·				
	(45)m=	164.12	143.54	148.12	129.14	123.91	106.92	99.08	113.7	115.05	134.09	146.36	158.94			
											Total = Su	m(45) <sub>112</sub> =	-	1582.98	(45)	
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	lf instant	taneous w	ater heatii	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46	) to (61)		-				
(46)m=         24.62         21.53         22.22         19.37         18.59         16.04         14.86         17.05         17.26         20.11         21.95         23.84         (46)	· · ·			22.22	19.37	18.59	16.04	14.86	17.05	17.26	20.11	21.95	23.84		(46)	
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)		-		includir		alar or M		storago	within or		ما		0		(47)	
Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47) If community heating and no tank in dwelling, enter 110 litres in (47)	-		. ,		• •			-			501		0		(47)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)		•	-			-			. ,	ers) ente	er '0' in (	47)				
Water storage loss:					,					,	,					
a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)	a) If m	nanufact	urer's de	eclared I	loss facto	or is kno	wn (kWł	n/day):					0		(48)	
Temperature factor from Table 2b   0   (49)	Tempe	erature f	actor fro	m Table	e 2b								0		(49)	
Energy lost from water storage, kWh/year $(48) \times (49) = 0$ (50)				•					(48) x (49)	) =			0		(50)	
b) If manufacturer's declared cylinder loss factor is not known:					-										(54)	
Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3			-				n/nne/ua	ay)					0		(51)	
Volume factor from Table 2a 0 (52)		-	-		011 1.0								0		(52)	
Temperature factor from Table 2b 0 (53)					e 2b											
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54)	Energy	y lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)	
Enter (50) or (54) in (55)	Enter	(50) or	(54) in (5	55)									0		(55)	
Water storage loss calculated for each month $((56)m = (55) \times (41)m$	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 0 0 (56)	(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)	

	uns dedicate		rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (57	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circ	uit loss (ar	nnual) fro	om Table	93	-	-					0		(58)
Primary circ					59)m = (	(58) ÷ 36	65 × (41)	m					
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)		I	
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss o	calculated	for each	month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 29.1	7 26.34	29.14	28.18	29.1	28.13	29.06	29.08	28.16	29.12	28.21	29.16		(61)
Total heat re	quired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 193.2	9 169.88	177.27	157.32	153.01	135.06	128.14	142.78	143.21	163.21	174.57	188.1		(62)
Solar DHW inp	ut calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0'	' if no sola	r contribut	ion to wate	er heating)		
(add addition	nal lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix G	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ater											
(64)m= 193.2	9 169.88	177.27	157.32	153.01	135.06	128.14	142.78	143.21	163.21	174.57	188.1		-
							Outp	out from w	ater heate	r (annual)₁	12	1925.84	(64)
Heat gains f	rom water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m= 61.86	5 54.31	56.54	49.98	48.47	42.59	40.21	45.08	45.3	51.86	55.72	60.14		(65)
include (5	7)m in cal	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. Internal	gains (see	e Table 5	5 and 5a)	):									
Metabolic ga	ains (Table	e 5), Wat	ts										
Lev									-		-		
Jar	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 139.8		Mar 139.81		May 139.81	Jun 139.81	Jul 139.81	Aug 139.81	Sep 139.81	Oct 139.81	Nov 139.81	Dec 139.81		(66)
	1 139.81	139.81	Apr 139.81	139.81	139.81	139.81	139.81	139.81					(66)
(66)m= 139.8	1 139.81 ns (calcula	139.81	Apr 139.81	139.81	139.81	139.81	139.81	139.81					(66) (67)
(66)m= 139.8 Lighting gair	1 139.81 ns (calcula 3 21.17	139.81 ited in Ap 17.21	Apr 139.81 opendix 13.03	139.81 _, equat 9.74	139.81 ion L9 oi 8.22	139.81 r L9a), a 8.89	139.81 Iso see 11.55	139.81 Table 5 15.5	139.81 19.69	139.81	139.81		
(66)m= 139.8 Lighting gair (67)m= 23.83	1 139.81 ns (calcula 3 21.17 gains (calc	139.81 ited in Ap 17.21	Apr 139.81 opendix 13.03	139.81 _, equat 9.74	139.81 ion L9 oi 8.22	139.81 r L9a), a 8.89	139.81 Iso see 11.55	139.81 Table 5 15.5	139.81 19.69	139.81	139.81		
(66)m= 139.8 Lighting gair (67)m= 23.8 Appliances g	1         139.81           ns         (calcula           3         21.17           gains         (calcula           1         270.08	139.81 Ited in Ap 17.21 culated in 263.09	Apr 139.81 ppendix 13.03 Append 248.21	139.81 L, equat 9.74 Jix L, eq 229.43	139.81 ion L9 of 8.22 uation L 211.77	139.81 r L9a), a 8.89 13 or L1 199.98	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2	139.81 Table 5 15.5 see Ta 204.19	139.81 19.69 ble 5 219.07	139.81 22.98	139.81 24.49		(67)
(66)m= 139.8 Lighting gair (67)m= 23.83 Appliances ( (68)m= 267.3	1         139.81           is (calcula           3         21.17           gains (calcula           1         270.08           is (calcula	139.81 Ited in Ap 17.21 culated in 263.09	Apr 139.81 ppendix 13.03 Append 248.21	139.81 L, equat 9.74 Jix L, eq 229.43	139.81 ion L9 of 8.22 uation L 211.77	139.81 r L9a), a 8.89 13 or L1 199.98	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2	139.81 Table 5 15.5 see Ta 204.19	139.81 19.69 ble 5 219.07	139.81 22.98	139.81 24.49		(67)
(66)m= 139.8 Lighting gair (67)m= 23.8 Appliances ( (68)m= 267.3 Cooking gair	1       139.81         ns       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98	139.81 Ited in Ap 17.21 culated in 263.09 ated in A 36.98	Apr 139.81 ppendix 13.03 Append 248.21 ppendix 36.98	139.81 L, equat 9.74 Jix L, eq 229.43 L, equat	139.81 ion L9 of 8.22 uation L 211.77 tion L15	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a)	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se	139.81 Table 5 15.5 9 see Ta 204.19 9 Table	139.81 19.69 ble 5 219.07 5	139.81 22.98 237.86	139.81 24.49 255.51		(67) (68)
(66)m= 139.8 Lighting gair (67)m= 23.8 Appliances g (68)m= 267.3 Cooking gair (69)m= 36.9	1       139.81         ns       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98	139.81 Ited in Ap 17.21 culated in 263.09 ated in A 36.98	Apr 139.81 ppendix 13.03 Append 248.21 ppendix 36.98	139.81 L, equat 9.74 Jix L, eq 229.43 L, equat	139.81 ion L9 of 8.22 uation L 211.77 tion L15	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a)	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se	139.81 Table 5 15.5 9 see Ta 204.19 9 Table	139.81 19.69 ble 5 219.07 5	139.81 22.98 237.86	139.81 24.49 255.51		(67) (68)
(66)m= 139.8 Lighting gair (67)m= 23.83 Appliances ( (68)m= 267.3 Cooking gair (69)m= 36.94 Pumps and	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       3	139.81 Ited in Ap 17.21 culated in 263.09 ated in A 36.98 c (Table \$ 3	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3	139.81 L, equat 9.74 dix L, eq 229.43 L, equat 36.98	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98	139.81 Table 5 15.5 see Ta 204.19 ee Table 36.98	139.81 19.69 ble 5 219.07 5 36.98	139.81 22.98 237.86 36.98	139.81 24.49 255.51 36.98		(67) (68) (69)
(66)m= 139.8 Lighting gair (67)m= 23.83 Appliances ( (68)m= 267.3 Cooking gair (69)m= 36.90 Pumps and (70)m= 3	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       36.98         fans       gains         3       36.98	139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         6 (Table 5)         3         0 n (negation)	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3	139.81 L, equat 9.74 dix L, eq 229.43 L, equat 36.98	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98	139.81 Table 5 15.5 see Ta 204.19 ee Table 36.98	139.81 19.69 ble 5 219.07 5 36.98	139.81 22.98 237.86 36.98	139.81 24.49 255.51 36.98		(67) (68) (69)
(66)m= 139.8 Lighting gair (67)m= 23.8 Appliances ( (68)m= 267.3 Cooking gair (69)m= $36.9$ Pumps and (70)m= $3$ Losses e.g.	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       36.98         fans       gains         3       36.98         fans       gains         5       -111.85	139.81 ted in Ap 17.21 culated in 263.09 ated in A 36.98 c (Table 5 3 on (nega -111.85	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98 3 le 5)	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98	139.81 Table 5 15.5 9 see Ta 204.19 9 a Table 36.98	139.81 19.69 ble 5 219.07 5 36.98 3	139.81 22.98 237.86 36.98 3	139.81 24.49 255.51 36.98 3		(67) (68) (69) (70)
(66)m= 139.8 Lighting gair (67)m= 23.83 Appliances ( (68)m= 267.3 Cooking gair (69)m= 36.99 Pumps and 7 (70)m= 3 Losses e.g. (71)m= -111.8	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       3         evaporation       3         15       -111.85         ng       gains (7)	139.81 ted in Ap 17.21 culated in 263.09 ated in A 36.98 c (Table 5 3 on (nega -111.85	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98 3 le 5)	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98	139.81 Table 5 15.5 9 see Ta 204.19 9 a Table 36.98	139.81 19.69 ble 5 219.07 5 36.98 3	139.81 22.98 237.86 36.98 3	139.81 24.49 255.51 36.98 3		(67) (68) (69) (70)
(66)m=       139.8         Lighting gair       (67)m= $(67)m=$ 23.83         Appliances (       (68)m= $(68)m=$ 267.3         Cooking gair       (69)m= $(69)m=$ 36.94         Pumps and       3         Losses e.g.       (70)m= $(71)m=$ -111.8         Water heatir       (72)m= $(72)m=$ $(83.14)$	1       139.81         1s       (calcula         3       21.17         gains       (calcula         3       270.08         1s       (calcula         3       36.98         fans       gains         3       36.98         fans       gains         5       -111.85         ng       gains       (7)         5       80.82	139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         6 (Table 5)         75.99	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu -111.85	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab -111.85	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98 3 le 5) -111.85 59.15	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3 -111.85 54.04	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98 3	139.81 Table 5 15.5 5 see Ta 204.19 36.98 3 -111.85 62.91	139.81 19.69 ble 5 219.07 5 36.98 3 -111.85 69.71	139.81 22.98 237.86 36.98 3 -111.85 77.39	139.81 24.49 255.51 36.98 3 -111.85 80.83		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> </ul>
$(66)m=$ 139.8         Lighting gair       (67)m= $(67)m=$ 23.83         Appliances (       (68)m= $(68)m=$ 267.3         Cooking gair       (69)m= $(69)m=$ 36.98         Pumps and $\frac{1}{3}$ 1 $(70)m=$ 3         Losses e.g.       (71)m= $(71)m=$ $-111.8$ Water heating $(70)m=$	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       36.98         fans       gains         5       -111.85         ng       gains (7         5       80.82         al       gains =	139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         6 (Table 5)         75.99	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu -111.85	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab -111.85	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98 3 le 5) -111.85 59.15	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3 -111.85 54.04	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98 3 -111.85 60.58	139.81 Table 5 15.5 5 see Ta 204.19 36.98 3 -111.85 62.91	139.81 19.69 ble 5 219.07 5 36.98 3 -111.85 69.71	139.81 22.98 237.86 36.98 3 -111.85 77.39	139.81 24.49 255.51 36.98 3 -111.85 80.83		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> </ul>
(66)m=       139.8         Lighting gair       (67)m=         (67)m=       23.83         Appliances (       (68)m=         (68)m=       267.3         Cooking gair       (69)m=         (69)m=       36.94         Pumps and 7       (70)m=         (70)m=       3         Losses e.g.       (71)m=         (71)m=       -111.8         Water heatir       (72)m=         83.14       Total interm	1       139.81         1       139.81         1       21.17         gains (calcula         3       21.17         gains (calcula         1       270.08         ns (calcula         3       36.98         fans gains         3       36.98         fans gains         3       36.98         fans gains         3       9         9       9         111.85       9         9       9         5       80.82         3       440.01	139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         (Table 5)         -111.85         Table 5)         75.99	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu -111.85 69.42	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab -111.85 65.15	139.81 ion L9 or 8.22 uation L 211.77 tion L15 36.98 3 le 5) -111.85 59.15 (66)	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3 -111.85 54.04 m + (67)m	139.81 Iso see <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98 -111.85 60.58 h + (68)m +	139.81 Table 5 15.5 5 see Ta 204.19 204.19 204.19 36.98 3 -111.85 62.91 - (69)m + 1	139.81 19.69 ble 5 219.07 5 36.98 3 -111.85 69.71 (70)m + (7	139.81 22.98 237.86 36.98 3 -111.85 77.39 1)m + (72)	139.81 24.49 255.51 36.98 3 -111.85 80.83 m		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>
(66)m=       139.8         Lighting gair       (67)m=         (67)m=       23.83         Appliances (       (68)m=         (68)m=       267.3         Cooking gair       (69)m=         (69)m=       36.94         Pumps and T       (70)m=         (70)m=       3         Losses e.g.       (71)m=         (71)m=       -111.8         Water heatir       (72)m=         (72)m=       83.19         Total intern       (73)m=	1       139.81         1s       (calcula         3       21.17         gains       (calcula         1       270.08         ns       (calcula         3       36.98         fans       gains         3       36.98         fans       gains         5       -111.85         ng       gains         5       80.82         al       gains         3       440.01         ns:	139.81         139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         (Table 5)         -111.85         Table 5)         75.99         424.24	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu -111.85 69.42 398.61	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab -111.85 65.15 372.26	139.81 ion L9 or 8.22 uation L 211.77 tion L15 36.98 3 111.85 59.15 (66) 347.09	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3 -111.85 54.04 m + (67)m 330.85	139.81 ISO SEE <sup>-</sup> 11.55 3a), also 197.2 ), also se 36.98 -111.85 60.58 + (68)m + 337.28	139.81 Table 5 15.5 9 see Ta 204.19 9 e Table 36.98 3 -111.85 62.91 (69)m + 1 350.55	139.81 19.69 ble 5 219.07 5 36.98 3 -111.85 69.71 (70)m + (7 376.41	139.81 22.98 237.86 36.98 3 -111.85 77.39 1)m + (72) 406.16	139.81 24.49 255.51 36.98 3 -111.85 80.83 m 428.78		<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>
(66)m=       139.8         Lighting gair       (67)m=         (67)m=       23.83         Appliances (       (68)m=         (68)m=       267.3         Cooking gair       (69)m=         (69)m=       36.94         Pumps and 3       (70)m=         (70)m=       3         Losses e.g.       (71)m=         (71)m=       -111.8         Water heatir       (72)m=         (73)m=       442.2         6. Solar ga	1       139.81         1       139.81         1       21.17         gains (calcula         3       21.17         gains (calcula         1       270.08         ns (calcula         3       36.98         fans gains         3       36.98         fans gains         5       -111.85         ng gains (7         5       80.82         al gains =         3       440.01         ns:       e calculated	139.81         139.81         ited in Ap         17.21         culated in         263.09         ated in Ap         36.98         3         (Table 5)         75.99         424.24         using sola         -actor	Apr 139.81 ppendix 13.03 Appendix 248.21 ppendix 36.98 5a) 3 tive valu -111.85 69.42 398.61	139.81 _, equat 9.74 dix L, eq 229.43 L, equat 36.98 3 es) (Tab -111.85 65.15 372.26	139.81 ion L9 of 8.22 uation L 211.77 tion L15 36.98 3 dle 5) -111.85 (66) 347.09 and associ	139.81 r L9a), a 8.89 13 or L1 199.98 or L15a) 36.98 3 -111.85 54.04 m + (67)m 330.85	139.81 Iso see - 11.55 3a), also 197.2 ), also se 36.98 - 111.85 60.58 + (68)m + 337.28 tions to co	139.81 Table 5 15.5 9 see Ta 204.19 9 e Table 36.98 3 -111.85 62.91 (69)m + 1 350.55	139.81 19.69 ble 5 219.07 5 36.98 3 -111.85 69.71 (70)m + (7 376.41 he applicab	139.81 22.98 237.86 36.98 3 -111.85 77.39 1)m + (72) 406.16	139.81 24.49 255.51 36.98 3 -111.85 80.83 m 428.78	Gains	<ul> <li>(67)</li> <li>(68)</li> <li>(69)</li> <li>(70)</li> <li>(71)</li> <li>(72)</li> </ul>

Northeast 0.9x	0.77	] ×	11.67	×	11.28	×	0.76	x	0.7	=	48.54	(75)
Northeast 0.9x	0.77	] x	11.67	x	22.97	x	0.76	x	0.7	]   _	98.81	(75)
Northeast 0.9x	0.77	] x	11.67	×	41.38	×	0.76	x	0.7	=	178.03	(75)
Northeast 0.9x	0.77	] x	11.67	x	67.96	x	0.76	x	0.7	=	292.38	(75)
Northeast 0.9x	0.77	x	11.67	×	91.35	x	0.76	x	0.7	=	393.01	(75)
Northeast 0.9x	0.77	x	11.67	x	97.38	x	0.76	x	0.7	=	418.99	(75)
Northeast 0.9x	0.77	x	11.67	×	91.1	×	0.76	x	0.7	=	391.96	(75)
Northeast 0.9x	0.77	x	11.67	×	72.63	×	0.76	x	0.7	=	312.47	(75)
Northeast 0.9x	0.77	x	11.67	×	50.42	×	0.76	x	0.7	=	216.93	(75)
Northeast 0.9x	0.77	x	11.67	×	28.07	×	0.76	x	0.7	=	120.76	(75)
Northeast 0.9x	0.77	x	11.67	×	14.2	×	0.76	x	0.7	=	61.08	(75)
Northeast 0.9x	0.77	x	11.67	×	9.21	x	0.76	x	0.7	=	39.64	(75)
Southwest <sub>0.9x</sub>	0.77	x	10	×	36.79	]	0.76	x	0.7	=	135.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	62.67		0.76	x	0.7	=	231.06	(79)
Southwest0.9x	0.77	x	10	×	85.75		0.76	x	0.7	=	316.15	(79)
Southwest0.9x	0.77	x	10	×	106.25	]	0.76	x	0.7	=	391.72	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	119.01		0.76	x	0.7	=	438.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	118.15		0.76	x	0.7	=	435.59	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	113.91		0.76	x	0.7	=	419.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	104.39		0.76	x	0.7	=	384.86	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	92.85		0.76	x	0.7	=	342.32	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	69.27		0.76	x	0.7	=	255.37	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	44.07		0.76	x	0.7	=	162.48	(79)
Southwest <sub>0.9x</sub>	0.77	x	10	×	31.49		0.76	x	0.7	=	116.09	(79)
Northwest 0.9x	0.77	x	4.37	×	11.28	×	0.76	x	0.7	=	18.18	(81)
Northwest 0.9x	0.77	x	4.37	×	22.97	×	0.76	x	0.7	=	37	(81)
Northwest 0.9x	0.77	×	4.37	×	41.38	×	0.76	x	0.7	=	66.67	(81)
Northwest 0.9x	0.77	x	4.37	×	67.96	×	0.76	x	0.7	=	109.48	(81)
Northwest 0.9x	0.77	×	4.37	×	91.35	x	0.76	x	0.7	=	147.17	(81)
Northwest 0.9x	0.77	x	4.37	×	97.38	×	0.76	x	0.7	=	156.9	(81)
Northwest 0.9x	0.77	x	4.37	X	91.1	X	0.76	x	0.7	=	146.77	(81)
Northwest 0.9x	0.77	x	4.37	×	72.63	×	0.76	x	0.7	=	117.01	(81)
Northwest 0.9x	0.77	X	4.37	×	50.42	X	0.76	X	0.7	=	81.23	(81)
Northwest 0.9x	0.77	X	4.37	×	28.07	X	0.76	X	0.7	=	45.22	(81)
Northwest 0.9x	0.77	X	4.37	×	14.2	X	0.76	X	0.7	=	22.87	(81)
Northwest 0.9x	0.77	×	4.37	×	9.21	X	0.76	X	0.7	=	14.85	(81)
Rooflights 0.9x	1	X	2.73	×	26	X	0.76	X	0.7	=	33.99	(82)
Rooflights 0.9x	1	×	2.73	×	54	×	0.76	X	0.7	=	70.58	(82)
Rooflights 0.9x	1	×	2.73	×	96	×	0.76	X	0.7	=	125.48	(82)
Rooflights 0.9x	1	×	2.73	×	150	×	0.76	X	0.7	=	196.07	(82)
Rooflights 0.9x	1	x	2.73	×	192	X	0.76	x	0.7	=	250.97	(82)

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Rooflight	s 0.9x	1	×	2.7	73	x		200	×	0.76	X	0.7	=	261.42	(82)
Rooflight	S 0.9x	1	x	2.7	<b>′</b> 3	x		189	x	0.76	x	0.7	=	247.05	(82)
Rooflight	S 0.9x	1	x	2.7	'3	x		157	×	0.76	x	0.7	=	205.22	(82)
Rooflight	S 0.9x	1	x	2.7	'3	x		115	×	0.76	x	0.7	=	150.32	(82)
Rooflight	s 0.9x	1	x	2.7	′3	x		66	×	0.76	×	0.7	=	86.27	(82)
Rooflight	s 0.9x	1	x	2.7	'3	x		33	×	0.76	x	0.7	=	43.14	(82)
Rooflight	s 0.9x	1	x	2.7	<b>′</b> 3	x		21	×	0.76	x	0.7	=	27.45	(82)
Solar ga	ains in y	watts, ca	alculated	for eac	h month	-			(83)m =	= Sum(74)m	(82)m			•	
	236.36	437.46	686.33	989.65	1229.91		272.9	1205.73	1019.	56 790.81	507.62	2 289.57	198.03		(83)
Total ga				· ,	· ,	<u>`</u>	,							1	
(84)m=	678.59	877.47	1110.57	1388.26	1602.18	16	619.99	1536.59	1356.	85 1141.36	884.03	695.73	626.81		(84)
7. Mea	n interi	nal temp	oerature	(heating	seasor	ı)									
Tempe	rature	during h	eating p	eriods ir	n the livi	ng	area f	from Tab	ole 9,	Th1 (°C)				21	(85)
Utilisat	ion fac	tor for g	ains for l	iving are	ea, h1,m	ı (s	ee Ta	ble 9a)						_	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.97	0.91	0.77	(	0.59	0.44	0.52	0.79	0.96	0.99	1		(86)
Mean i	nternal	temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	' in Ta	able 9c)					
(87)m=	19.33	19.57	19.96	20.45	20.8	2	20.95	20.99	20.9	8 20.84	20.33	19.73	19.29	]	(87)
Tempe	rature	during h	eating p	eriods ir	n rest of	dw	velling	from Ta	ble 9.	Th2 (°C)	-		-	-	
·	19.68	19.68	19.68	19.69	19.69	T	19.7	19.7	19.7		19.69	19.69	19.69	]	(88)
∟ L Itilisati	ion fac	tor for a	ains for i	rest of d	welling	<u> </u>	m (se	e Table	9a)	I				4	
(89)m=	1	0.99	0.96	0.88	0.7	T -	0.48	0.32	0.38	0.69	0.94	0.99	1	1	(89)
						 :	TO /6						1	1	
_	17.49	17.85	18.41	19.08	19.51	<u> </u>	12 (IO	19.7	19.7	to 7 in Tab / 19.58	18.95	18.09	17.44	1	(90)
(30)11-	17.45	17.00	10.41	19.00	19.51	<u> </u>	9.07	13.7	13.7			ving area ÷ (4		0.19	(91)
												g	-/	0.19	
		· ·	· · · ·		i	-	•	i	<u>`</u>	• fLA) × T2	1	1		1	(00)
	17.84	18.17	18.7	19.34	19.75		9.91	19.94	19.9		19.21		17.78		(92)
· · · · ·	adjustn 17.84	18.17	ne mean 18.7	19.34	19.75	1	Ire fro 19.91	m Table 19.94	4e, w	/here appr 4 19.82	0priate 19.21	1	17.78	1	(93)
	I		uirement		19.75	L'	5.51	19.94	19.9	4 19.02	19.21	10.4	17.70		(00)
					re obtair	hed	l at ste	en 11 of	Table	9b, so tha	at Ti m=	=(76)m an	d re-cal	culate	
			or gains	•		icu			Tuble	00, 00 m	ac 11,111-	-(70)11 011		Sulate	
Γ	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	g Sep	Oct	Nov	Dec		
Utilisat	ion fac	tor for g	ains, hm	:	-	ī								-	
(94)m=	0.99	0.98	0.96	0.87	0.71		0.5	0.34	0.41	0.7	0.93	0.99	1		(94)
_			, W = (94	, <u> </u>	<u>,</u>	-								1	
	674.57	863.65		1208.15			13.56	524.84	550.8	86 803.28	826.4	687.11	624.07		(95)
	<u> </u>	-	rnal tem		i	-		40.0	40.4		10.0	74	4.0	1	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4		10.6	7.1	4.2	J	(96)
Heat 10 (97)m= 2			1	· · · ·	1	-	1, VV = 41.58	=[(39)m 2 529.1	x [(93) 559.3	)m– (96)m 89 908.19	1373.9	4 1809 01	2182.94	1	(97)
						_				97)m – (95			2102.94	J	(**)
· -	1128.61	860.64	674.89	331.86	113.41	1	0	11 = 0.02		0	407.30	-	1159.8	1	
(	0.01					<u> </u>	-	Ľ	Ĺ		1.57.5			J	

								Tota	l per year	(kWh/year	<sup>.</sup> ) = Sum(9	8)15,912 =	5484.34	(98)
Space	e heatin	g require	ement in	n kWh/m²	²/year								51.21	(99)
9a. En	ergy reo	quiremer	nts – Ind	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heati	-	t from o	ocondor	vloupplo	montory	ovetere					ſ		
				econdar		mentary		(202) = 1 -	- (201) -				0	(201)
				nain syst	. ,			$(202) = 1^{-1}$ (204) = (20)		(203)] -			1	(202)
			•	main syste				(204) - (20	02) ~ [1	(200)] –			1	(204)
	-	-		ling syste		a evetor	o 0/						93.7	(200)
LIICK			· · ·	1				A.1.9	San	Oct	Nov		-	
Space	Jan e heatin	Feb	Mar	Apr calculate	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
opuo	1128.61	r ·	674.89	331.86	113.41	0	0	0	0	407.36	807.77	1159.8		
(211)m	n = {[(98	s)m x (20	4)] } x 1	1 100 ÷ (20	)6)					1				(211)
. ,	1204.49	918.5	720.27	354.17	121.04	0	0	0	0	434.75	862.08	1237.78		
				-				Tota	l (kWh/yea	ar) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>	2=	5853.09	(211)
•		•		ry), kWh/	month									
= {[(98 (215)m=		01)] } x 1	00 ÷ (20	08) 0	0	0	0	0	0	0	0	0		
(213)11-	0	0	0	0	0	0	0	-	-	ar) =Sum(2	-	-	0	(215)
Water	heating	a								, , , ,	· 1			
			ter (calc	ulated a	bove)				-		-			
	193.29	169.88	177.27	157.32	153.01	135.06	128.14	142.78	143.21	163.21	174.57	188.1		-
		ater hea	r	L									87	(216)
(217)m=		90.07	89.9	89.48	88.54	87	87	87	87	89.61	90.02	90.16		(217)
		heating, m x 100												
• •	214.43	188.61	197.17	175.82	172.82	155.24	147.29	164.12	164.61	182.13	193.93	208.62		_
								Tota	I = Sum(2				2164.79	(219)
	I totals		od main	system	1					k	Wh/year		kWh/year 5853.09	7
-	-			system	1									
	-	fuel use											2164.79	
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								
centra	al heatir	ng pump	:									30		(230c)
boiler	with a	fan-assis	sted flue									45		(230e)
Total e	lectricit	y for the	above,	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electri	city for I	ighting											420.86	(232)
Electri	city gen	erated b	y PVs										-745.28	(233)
1 <u>2a.</u> (	CO <u>2 er</u> r	niss <u>ions ·</u>	– Individ	lual heat	ing <u>syste</u>	em <u>s inclu</u>	udi <u>ng mi</u>	cro <u>-CHP</u>						
						E	0.000			Emico	ion fac	tor.	Emissions	
							<b>ergy</b> /h/year			kg CO			kg CO2/yea	

Space heating (main system 1)	(211) x	0.216	=	1264.27	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	467.6	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1731.86	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	218.42	(268)
Energy saving/generation technologies					-
Item 1		0.519	=	-386.8	(269)
Total CO2, kg/year	sum	of (265)(271) =		1602.41	(272)
Dwelling CO2 Emission Rate	(272	(4) =		14.96	(273)
EI rating (section 14)				86	(274)

# Part G Compliance Report

#### **PROJECT DETAILS**

Project Reference: Client: Property:	BE0764 StreetPlot Ltd Garages to the south of 27a West End Lane London NW6 4QJ
Local Authority: Agent:	London Borough of Camden
Assessor:	Mitch Finn
Address:	Build Energy, BH23 3TA
Contact:	01202 280062
Software:	G-Calc 2015 version 3.0.2
Prepared on:	02-Sep-16

#### **RESULT SUMMARY**

By following the Government's national calculation methodology for assessing water efficiency in new dwellings this 3 bed dwelling, as designed, achieves a water consumption of Less than 110 litres per person per day using fittings approach.

Compliance with Building Regulation 36(1) has been demonstrated.

Maximum Fittings Consumption "As Designed"						
Water Fitting	Maximum Consumption					
WCs	4/2.6 litres dual flush					
Showers	8 l/min					
Baths	170 litres					
Basin taps	5l/min					
Sink taps	6 l/min					
Dishwasher	1.25 l/place setting					
Washing machine	8.17 l/kilogram					

The table below is to be filled in by the builder prior to completion. The descriptions, values and quantities should represent the 'as built' specification. Please note the values above represent design values and should not be exceeded without prior consultation with the agent/designer (). The completed table should be returned to the assessor: Mitch Finn (Contact: 01202 280062).

Declaration of fitting types "As Built"							
Water Fitting	Actual Consumption						
WCs							
Showers							
Baths							
Basin taps							
Sink taps							
Dishwasher							
Washing machine							

Project ref: BE0764 - Garages to the south of 27a West End Lane

The above declaration of fittings, values and quantities is a true reflection of those installed on this project.

Name: ..... Signature: ..... Date: .....

-----End of Report-----

Calculated by Stroma FSAP 2012 program, produced and printed on 02 September 2016

#### Property Details: House 1 After Reducing Energy Demand

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass param Night ventilation: Blinds, curtains, shut Ventilation rate durin	es: eter: tters: g hot we	ather (a	ch):	End-terrace House England Thames valley Yes 3 South East Average or unknown None Indicative Value Medium False 8 ( Windows fully open)							
Summer ventilation h			ent:	838.02			(P1)				
Transmission heat lo Summer heat loss co				133.1 971.1	133.1 971.1 ( <b>P2</b> )						
Overhangs:											
Orientation: South East (SE) South West (SW) North East (NE) (Roof)	<b>Ratio:</b> 0 0 0 0		<b>Z_overhangs:</b> 1 1 1 1								
Solar shading:											
Orientation:	Z blind	ls:	Solar access:	Over	hangs:	Z summer:					
South East (SE) South West (SW) North East (NE) (Roof) Solar gains:	1 1 1 1		0.9 0.9 0.9 1	1 1 1 1		0.9 0.9 0.9 1	(P8) (P8) (P8) (P8)				
Orientation		Area	Flux	a	FF	Shading	Gains				
South East (SE) South West (SW) North East (NE)	0.9 x 0.9 x 0.9 x 1 x	19.95 10 14.07 2.73	119.92 119.92 98.85 203	<b>g_</b> 0.76 0.76 0.76 0.76	0.7 0.7 0.7 0.7	0.9 0.9 0.9 1 <b>Total</b>	1030.95 516.77 599.3 265.35 2412.37 <b>(P3/P4)</b>				
Internal gains:											
Internal gains Total summer gains Summer gain/loss ratio Mean summer externa Thermal mass tempera Threshold temperature Likelihood of high inter	I tempera ature incre	ement		30 3.1 16 0.2 19	0.01 85.37 18	July 507.87 2920.25 3.01 17.9 0.25 21.16 Slight	August517.192677.462.76(P5)17.80.2520.81(P7)Slight				

Assessment of likelihood of high internal temperature: <u>Slight</u>

Calculated by Stroma FSAP 2012 program, produced and printed on 02 September 2016

#### Property Details: House 2 After Reducing Energy Demand

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass param Night ventilation: Blinds, curtains, shur Ventilation rate durin	es: eter: tters:	ather (a	ch):	False	alley		
Summer ventilation h Transmission heat lo	ss coeffi	cient:	ent:	765.91 77.6			(P1)
Summer heat loss co	efficient	:		843.56			(P2)
Overhangs:							
Orientation:	Ratio:		Z_overhangs:				
South West (SW)	0		1				
North East (NE)	0		1				
(Roof)	0		1				
Solar shading:							
Orientation:	Z blind	ls:	Solar access:	Over	rhangs:	Z summer:	
South West (SW)	1		0.9	1		0.9	(P8)
North East (NE)	1 1		0.9 1	1 1		0.9 1	(P8) (P8)
(Roof)	I		I	I		I	(F0)
Solar gains:							
Orientation		Area	Flux	<b>g_</b>	FF	Shading	Gains
South West (SW)	0.9 x	10	119.92	0.76	0.7	0.9	516.77
		11 67	98.85	0.76	0.7		
North East (NE)	0.9 x	11.67 2 7 2				0.9	497.08
North East (NE)	0.9 x 1 x	2.73	203	0.76	0.7	1	265.35
North East (NE)						1	265.35
	1 x o I tempera ature incre	2.73 ture (Tr ement	203 names valley)	0.76 Ju 50 18 2.2 16 0.2 18	0.7 I <b>ne</b> 9.57 72.32 22	1	265.35

Calculated by Stroma FSAP 2012 program, produced and printed on 02 September 2016

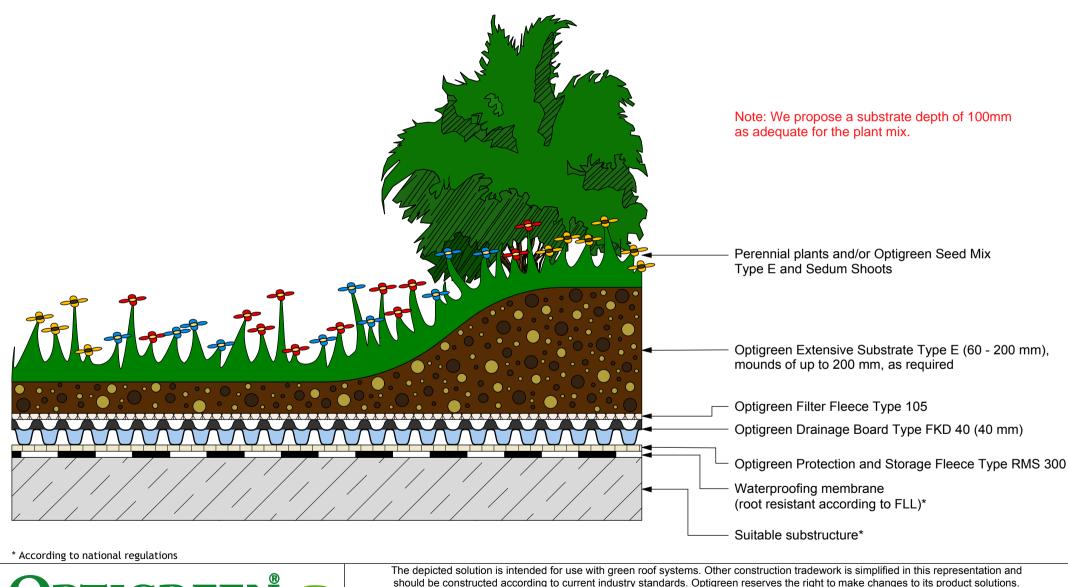
#### Property Details: House 3 After Reducing Energy Demand

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling fac Overshading: Overhangs: Thermal mass param Night ventilation: Blinds, curtains, shu Ventilation rate durin	es: neter: tters: ng hot we	•		End-terrace House England Thames valley Yes 3 North East Average or unknown None Indicative Value Medium False 8 ( Windows fully open)						
Summer ventilation I Transmission heat lo			ient:	754.13 106.9			(P1)			
Summer heat loss co	pefficient	:		861.04			(P2)			
Overhangs:										
Orientation: North West (NW) South West (SW) North East (NE) (Roof) Solar shading:	<b>Ratio:</b> 0 0 0 0		<b>Z_overhangs:</b> 1 1 1 1							
Solar shaung.										
Orientation: North West (NW)	<b>Z blinc</b> 1	ls:	Solar access: 0.9	Ovei 1	rhangs:	<b>Z summer:</b> 0.9	(P8)			
South West (SW) North East (NE) (Roof)	1 1 1		0.9 0.9 1	1 1 1		0.9 0.9 1	(P8) (P8) (P8)			
Solar gains:	·			·						
<b>Orientation</b> North West (NW) South West (SW) North East (NE)	0.9 x 0.9 x 0.9 x 1 x	<b>Area</b> 4.37 10 11.67 2.73	Flux 98.85 119.92 98.85 203	<b>g</b> 0.76 0.76 0.76 0.76	FF 0.7 0.7 0.7 0.7	<b>Shading</b> 0.9 0.9 0.9 1 <b>Total</b>	<b>Gains</b> 186.14 516.77 497.08 265.35 1465.33 <b>(P3/P4)</b>			
Internal gains:										
Internal gains Total summer gains Summer gain/loss ration Mean summer externa Thermal mass temperat Threshold temperature <b>Likelihood of high in</b>	Il tempera ature incre e	ement		50 20 2.4 16 0.2 18		July 485.23 1950.56 2.27 17.9 0.25 20.42 Not significant	August 494.29 1761.46 (P5) 2.05 (P6) 17.8 0.25 20.1 (P7) Not significant			

Assessment of likelihood of high internal temperature: Not significant

## **Optigreen System Type "Nature Roof"**

Solution 1: 0 - 5° pitch / Drainage by FKD 40



	should be const	should be constructed according to current industry standards. Optigreen reserves the right to make changes to its product solutions.										
<b>FIGREEN</b>	Approved:		drawn by:	scale:	update:	Rev.:	Detail-No.:	Reprinting is only permitted with the prior permission of the editors.				
ROOF GREENIN	G HV	0	ob/mh	not to scale	28.07.2014	3	1.050 O	No responsibility for printing errors. Subject to technical modifications.				



#### Care Schedule for Optigreen Extensive Roofs

Vegetation Types:	Sedum, Wildflower, Grasses or a mix of the three
Planting Method:	Pre-Cultivated Mat, Plug Plants, Dry Seeding & Sedum Cuttings, Hydro-Seeding
Frequency:	Minimum of twice per year - ideally in Spring (March-May) and Autumn (September-November)
Fertilising:	Normally one application per year, ideally in Spring
Health & Safety:	The roof should be accessed in accordance with health and safety legislation related to working at heights. Maintenance of green roofs should be carried out by trained personnel.

#### **Introduction**

Once a new green roof has been installed, the initial phase of aftercare is known as **Completion Care** and this will normally last for approximately 12 months. During this time the vegetation is developing and, depending on the planting method used, the green roof may need additional maintenance visits to those described above. This is more likely to be the case for plug planted and seeded roofs. Once this phase is complete the roof can then be maintained in accordance with the above schedule.

Please note that for a green roof to continue to perform in the long term it is vital that it receives the maintenance described within this document and at the frequency shown.

#### **Care Operations**

#### Removal of extraneous and unwanted plant growth.

Weeds and tree saplings should be removed as required. This is best achieved by pulling them out complete with the root and removing them from the roof area.

#### **Pebble Borders**

All pebble borders should be cleared of any vegetation. Weeds and tree saplings should be removed from the roof but sedum and/or wildfower vegetation that has spread from the adjacent green area can be re-planted, if required, where there are bare or sparsely covered areas.

#### Mowing

Dead seasonal wildflower foliage and grasses should be cut back in the Autumn once the seeds have fallen with a mowing/cutting height of 80-100mm. All cuttings should be removed from the roof area.



#### Dead Leaves

Where there are trees adjacent to the roof, dead leaves should be removed from the green roof on each maintenance visit.

#### Inspection Chambers and Roof Drainage

Inspection chambers, roof outlets and gutters should be checked and cleaned out as necessary on each visit.

#### Adding Substrate

It is not normally necessary to add further substrate once the roof has been installed. However, if some erosion of the substrate subsequently takes place it may be necessary to add substrate to return the depth to that originally specified. This is more likely to be the case during the Completion Care phase and where plug plants or seeding methods have been used.

#### **Re-Planting**

If bare or sparsely vegetated areas of more than 0.5m2 are noted during a maintenance visit it may be necessary to carry out additional planting in these areas. This can be done using plug plants, sedum cuttings and dry seeding as appropriate. The most suitable time for this is the Spring and possibly September/October.

#### Fertilising

A slow-release fertiliser, such as Optigreen Opticote Slow Release Fertiliser, should be applied to the vegetated area on an annual basis in the Spring. If extensive moss growth and reddish sedum foliage is visible this indicates a likely nutrient deficiency.

#### Irrigation

Extensive green roofs will not normally require any irrigation beyond the Completion Care phase. Roofs that have been vegetated using pre-cultivated vegetation mats will not normally require any watering beyond 6-8 weeks after installation but roofs that have been plug planted or seeded may require irrigation for a longer period particularly if there is a long hot,dry spell of weather.

Exceptions to this can be roof build-up's where the overall depth is less that 70mm and steeply pitched, south-facing roofs with a build-up depth of less than 100mm.



#### **Plug Plant Species**

Typical species, subject to availability.

- Achillea millefolium
- Galium verum
- Daucus carota
- Lotus corniculatus
- Prunella vulgaris
- Sanguisorba minor
- Origanum vulgare
- Plantago coronopus
- Thymus polytrichus
- **Bellis perennis**
- Glechoma hederacea
- Leontodon hispidus
- Leucanthemum vulgare
- Festuca rubra
- Silene vulgaris
- Hypochaeris radicata
- Briza media
- Carex flacca
- Festuca ovina
- Anthyllis vulneraria
- Campanula glomerata
- Campanula rotundifolia

Note: The vegetation mix will be a mix of maximum of 25% sedum and minimum of 75% native wildflower plants (biodiverse) Fragaria vesca

Geranium robertianum

Helianthemum nummularium

Hypericum perforatorum

Linaria vulgaris

Plantago lanceolata

Ranunculus bulbosus

Scabiosa columbaria

Viola tricolor

Armeria maritima

Leontodon autumnalis

Primula vulgaris

Silene latifolia ssp alba

Viola hirta

Viola riviniana