RIBA Stage 2

Energy Assessment 6 Lindfield Gardens

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Document prepared for

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Date of issue

30/09/2020

Issue no.

2

Our reference

5207-6 Lindfield Gardens-Energy Assessment-2009-30yp.docx

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Executive Summary Energy Assessment 6 Lindfield Gardens

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About the Scheme

The proposal comprises refurbishment and extension of an existing house to create 9 residential units with an internal floor area of approximately 711m². The development is located in the London Borough of Camden.

Planning policy

The scheme has been developed in accordance with the GLA Guidance and Camden Planning Guidance Energy efficiency and adaptation (July 2020). According to the planning policies, the scheme should achieve:

- Greatest possible reduction meeting Part L1B for retained thermal elements (London Plan 5.4, Local Plan CC1)
- 20% Reduction in CO₂ from onsite renewables (London Plan 5.4, 5.7, Local Plan CC1)
- BRFFAM DR Excellent

Summary

All flats have been modelled for the purposes of the energy assessment. The scheme complies with the 2013 Building Regulations Part L and the minimum energy efficiency targets in the following documents have been followed:

 Refurbishment (Part L1B) – Consequential improvements to refurbished areas have been made to ensure that the building complies with Part L, to the extent that such improvements are technically, functionally, and economically feasible.

In addition, the CO_2 emissions of the scheme have been calculated using the SAP 10.0 carbon emission factors, and the scheme can achieve:

- An on-site CO₂ reduction of 3.5% beyond Building Regulations through energy efficiency measures. The design team has maximised the passive design measure, however, the existing wall cannot be further insulated due to interstitial condensation risk. Therefore, no further CO₂ improvement can be achieved.
- No renewable technologies have been specified for the project due to site constrains and conservation criteria.
- BREEAM DR 2014 Energy credits:
 - o Ene 01 0 credits
 - Ene 02 3 credits (Excellent standard)
 - o Ene 03 6 credits
 - Ene 04 0 credits

Executive Summary

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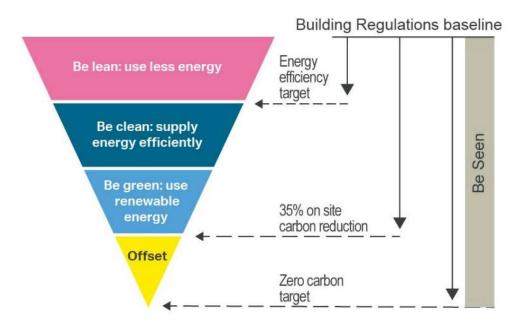
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Energy hierarchy

The proposed scheme has followed the energy hierarchy that is illustrated below:



Source: Greater London Authority

Key measures

Key measures identified for each stage are shown below:

- Be Lean:
 - Low U-values for new opaque elements and fenestration
 - Low g-value for new windows and rooflights
 - High efficiency lighting
- Be Clean:
 - No communal heating system has been provided due to BREEAM scoring (a communal system will result in higher operational cost compared to the baseline case and therefore no credits can be awarded)
- Be Green:
 - No renewable technologies have been specified due to site constrains and conservation criteria.

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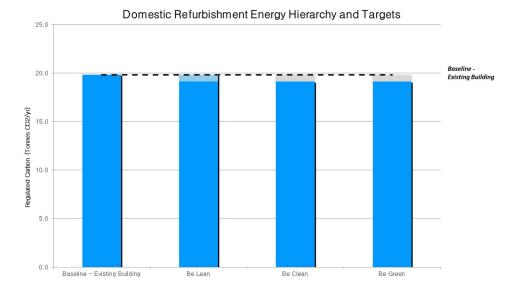
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GLA's Energy Hierarchy: Regulated carbon emissions

The proposed scheme has followed the energy hierarchy. A graphical illustration of how the scheme performs in relation to Building Regulations and the Energy Hierarchy is shown below. Carbon dioxide emission factors for SAP 10.0 have been used for the calculation.

As demonstrated in the figure the proposed scheme will reduce carbon emissions by 3.5% from the fabric energy efficiency measures described in the 'Be Lean' section. No renewable technologies have been specified due to site constrains and conservation criteria.

Therefore, the scheme meets and exceeds Building Regulations and Local Plan policy.



Executive Summary

Energy Assessment 6 Lindfield Gardens

Regulated CO₂ emissions

Site-wide				
GLA's Energy Hierarchy: Regulated CO ₂	 Calculated us 	ing SAP 2012	CO ₂ factors	
	Baseline:	Be lean:	Be clean:	Be green:
CO ₂ emissions (tCO ₂ /yr)	21.45	20.54	-	-
CO ₂ emissions saving (tCO ₂ /yr)	-	0.91	-	-
Saving from each stage (%)	_	4.2	_	-
Total CO ₂ emissions saving (tCO ₂ /yr)	0.91			
4.2% total CO ₂ savings over Building Regulations Part L achieved				
GLA's Energy Hierarchy: Regulated CO ₂	 Calculated us 	ing SAP 10.0 (CO ₂ factors	
	Baseline:	Be lean:	Be clean:	Be green:
CO ₂ emissions (tCO ₂ /yr)	19.83	19.14	-	-
CO ₂ emissions saving (tCO ₂ /yr)	-	0.69	_	_
Saving from each stage (%)	-	3.5	_	-
Total CO ₂ emissions saving (tCO ₂ /yr)	0.69			
3.5% total CO₂ savings over Building Regulations Part L achieved				

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Carbon Emission Factors

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Emission factors:

The Greater London Authority (GLA) Guidance on Energy Assessments published in October 2018 highlights a critical development regarding carbon emission factors. Grid electricity has significantly decarbonised since the last update of Part L in April 2014 and in July 2018 the Government published updated carbon emission factors (SAP 10.0) demonstrating this. Although SAP 10.0 is not in use yet, the GLA Guidance encourages the use of SAP 10.0 carbon emission factors from January 2019 in areas where there are no opportunities to connect to existing or planned district heat networks. Any applicants proposing to use the SAP 2012 emissions factors is required to provide adequate justification.

SAP 2012 emission factors can be used where:

- The scheme is located within a Heat Network Priority area; and
- There is potential to connect to an existing network using gas-engine CHP or a new network using low-emission CHP; and
- The heat network operator has, or is in the process of developing, a strategy to decarbonise
 the network and has shared it with the GLA

While the proposed scheme is expected to comply with SAP 2012 for Building Regulation compliance, the assessment presents total emissions using SAP10.0 as it is required for demonstrating performance against planning policy targets. The revised factors are below:

SAP 2012 SAP10.0 Natural Gas 0.216 0.210	Гуре	el Type	Carbon Factor (kg CO ₂ /kWh)	Carbon Factor (kg CO ₂ /kWh)	
Natural Gas 0.216 0.210			SAP 2012	SAP10.0	
	al Gas	tural Gas	0.216	0.210	
Grid Electricity 0.519 0.233	Electricity	d Electricity	0.519	0.233	

The carbon emissions of the scheme have been calculated using Building Regulations methodology for estimating energy performance against Part L 2013 requirements, and the outputs have been manually converted for the SAP 10.0 emission factors using a spreadsheet.

Establishing CO₂ Energy Assessment 6 Lindfield Gardens

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Methodology

The purpose of an energy assessment is to demonstrate that climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the scheme's design and evolution.

The methodology followed in this report follows the guidance set out by the Greater London Authority (GLA) for developing energy strategies as detailed in the document. "Energy Assessment Guidance: Greater London Authority guidance on preparing energy assessments as part of planning applications (April 2020)". The scheme has been developed in accordance with the Intend to Publish London Plan 2019.

This report has followed these documents and comprises the following components:

- Baseline: A calculation of the Part L 2013 Building Regulations compliant CO₂ emission
 baseline using approved software. The baseline assumes a gas boiler would provide heating
 and any active cooling would be electrically powered and fabric has been modelled as per
 Appendix 4 of GLA's Guidance.
- Be Lean: A calculation of the impact of demand reduction measures. For example, passive
 design measures, including optimising orientation and site layout, natural ventilation and
 lighting, thermal mass and solar shading, and active design measures such as high efficacy
 lighting and efficient mechanical ventilation with heat recovery.
- Cooling Hierarchy: In accordance with Policy 5.9 of London Plan and Intent to Publish London Plan 2019 Policy SI4, measures that are proposed to reduce the demand for cooling have been set out such as minimisation of solar and internal gains and night cooling strategies.
- Be Clean: In accordance with Policy 5.6 of London Plan and Intent to Publish London Plan 2019 Policy SI3, this report has demonstrated how the scheme has selected heating, cooling and power systems to minimise carbon emissions. This comprises an evaluation of the feasibility of connecting to existing low carbon heat networks, planned networks, site—wide and communal heat networks, and CHP.
- Be Green: In accordance with Policy 5.7 of London Plan and Intent to Publish London Plan 2019 Policy SI2, this report has conducted a feasibility assessment of renewable energy technologies. This comprised a site-specific analysis of the technologies and, if applicable, how they would be integrated into the heating and cooling strategy for the scheme.

Establishing CO₂

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Establishing CO₂ emissions

As required by the GLA both the regulated and unregulated emissions of the development must be quantified and demonstrated. The total emissions for the scheme are shown below.

CO ₂ Emissions - Regulated and Unregulated (tonnes CO ₂ /yr) - SAP 10.0 - Residential			
	Regulated Emissions	Unregulated Emissions	Total Emissions
Baseline: Part L 2013	19.83	5.32	25.15
Be Lean: Use less energy	19.14	5.32	24.45
Be Clean: Supply energy efficiently	-	-	_
Be Green: Use renewable energy	_	-	-

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Baseline

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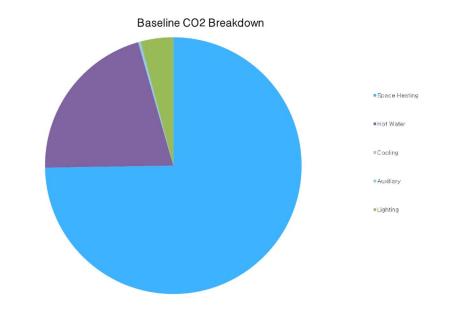
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Building regulations Part L 2013 minimum compliance

The total baseline carbon emissions for the whole scheme is 19.83 tonnes CO_2 /yr (using SAP 10.0 carbon dioxide emission factors).

The pie chart provides a breakdown of the specific carbon emissions by system over the course of one year. The chart shows that space heating is the primary source of carbon dioxide emissions, and hot water is the second largest.

Carbon Emissions in tonnes CO ₂ /yr.				
Heating	Hot Water	Cooling	Auxiliary	Lighting
14.82	4.13	0.00	0.06	0.81



Demand Reduction Energy Assessment

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Be Lean: summary

Demand reduction measures have reduced the scheme's carbon emissions by 3.5% (using SAP 10.0 figures) over the minimum Part L 2013 Building Regulations baseline.

U-values

Element	Minimum Building Regulations U-value W/m²K (Appendix 4 - GLA guidance)	Proposed U-value W/m ² K
Flat roof - Existing	0.18	0.18*
Flat roof - New	0.18	0.14
Pitched roof – Existing	0.18	0.18*
Pitched roof – New	0.18	0.14
Wall - Existing	0.55	0.55*
Wall - New	0.25	0.14
Corridor wall	0.55	0.55*
Ground floor	0.55	0.55*
Exposed floor	0.55	0.55*
Windows - Existing	1.60 (g-value 0.63)	1.60 (g-value 0.63)
Windows - New	1.60 (g-value 0.50)	1.30 (g-value 0.50)
Rooflights - Existing	1.60 (g-value 0.63)	1.60 (g-value 0.63)
Rooflights - New	1.60 (g-value 0.50)	1.30 (g-value 0.50)
Doors	1.80	1.30

^{*}The Building has been fully refurbished and insulated in 2009, therefore the above values have been assumed. It has been estimated that the existing elements cannot be insulated further without increasing the interstitial condensation risk. A dynamic condensation risk analysis (using WUFI) is required in case the existing elements are thermally upgraded.

Party walls will be fully filled cavity with effective sealing at all exposed edges and in line with insulation layers in abutting elements.

Air permeability

A reduced air permeability has been targeted as per the table below:

	Minimum Building Regulations	Proposed
Air permeability (m³/hm² @50 Pa)	10	10

This will require careful attention to two key areas:

- Structural leakage
- Services leakage

Structural leakage occurs at joints in the building fabric and around window and door openings, loft hatches and access openings. There will also be some diffusion through materials such and cracks in masonry walls typically caused by poor perpends in the blockwork or brickwork. Structural leakage is hard to remedy retrospectively therefore good detailing at the design stage is essential.

Services leakage occurs at penetrations from pipes and cables entering the building. These can be sewerage pipes, water pipes and heating pipes. As well as electricity cables there may also be telecommunication cables. Attention, therefore, needs to be paid to sealing all penetrations during construction.

Thermal Bridging:

The default psi-value has been used for all junctions due to the existing structure.

Thermal Mass:

Thermal mass of the scheme has been indicatively modelled as 250 kJ/m²K (medium).

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Heating

The scheme has been modelled with a gas boiler with an efficiency of 89.5%. Heat will be provided via radiators and will be controlled with a programmer, thermostat and TRVs.

Hot Water

The hot water will be provided by the main gas heating system (gas boilers with an efficiency of 89.5%). No hot water cylinder has been specified.

Ventilation

Natural ventilation with extract fans for toilet and kitchen has been specified for all dwellings.

Cooling

The existing house has an air conditioning unit. Air conditioning will be provided for flat 1 (ground floor) to ensure occupant thermal comfort, with an energy label class of A and variable speed compressors. No cooling has been specified for the remaining flats.

Lighting

High efficiency lighting has been specified for the development with a minimum efficacy of 75 lumens/W.

Energy demand following energy efficiency measures (MWh/year)

Space Heating	Hot water	Lighting	Auxiliary	Cooling	Unregulated gas	Unregulated electricity
69.0	18.7	2.8	0.3	0.0	0.0	11.8

Fabric energy efficiency

Design Fabric	Improvement (%)
Energy Efficiency	
(MWh/year)	
64.84	1%
	Energy Efficiency (MWh/year)

Cooling and Overheating Energy Assessment

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Overheating and cooling

The aim of this section is to reduce the impact of the urban heat island effect in London and encourage the design of spaces to avoid overheating and excessive heat generation, and to mitigate overheating due to the impact of climate change.

Where design measures and the use of natural and/or mechanical ventilation are not enough to guarantee the occupant's comfort, in line with the cooling hierarchy the development's cooling strategy must include details of the active cooling plant being proposed, including efficiencies, and the ability to take advantage of free cooling and/or renewable cooling sources.

Where appropriate, the cooling strategy should investigate the opportunities to improve cooling efficiencies through the use of locally available sources such as ground cooling and river/dock water-cooling.

The Cooling Hierarchy in Policy SI4

Developments should reduce potential overheating and reliance on air conditioning systems and demonstrate this with the Cooling Hierarchy:

- 1. Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure
- 2. Minimise internal heat generation through energy efficient design
- 3. Manage the heat within the building through exposed internal thermal mass and high ceilings
- 4. Provide passive ventilation
- Provide mechanical ventilation
- 6. Provide active cooling systems

Avoiding overheating: measures taken

The following measures have been taken in accordance with the cooling hierarchy to reduce overheating and the need for cooling:

- 1. Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure
 - Solar control all methods controlling solar gain to within tolerable limits have been considered. The location, size, design and type of window openings and glazing have been optimised and reduced solar gain factors from low emissivity new windows have been specified.
 - Light-coloured curtain/roller blinds will be specified to limit solar gain. The shading
 has also been optimised to avoid substantially reducing daylighting or increasing
 the requirement for electric lighting.
 - High albedo materials: A high albedo (reflective) surface has been specified for the
 roof in order to minimise the heat absorbed by the roof, and significant thermal
 insulation has been specified to prevent any heat absorbed being transferred into
 the building
 - Insulation levels have been maximised and the resulting U-values for the new elements are lower than required by Building Regulations. The build-ups therefore prevent the penetration of heat as much as practically possible. See the 'Be Lean' section of this report for target u values.

Cooling and Overheating

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- 2. Minimise internal heat generation through energy efficient design
 - Internal heat gains have been minimised where possible. The scheme will target
 the BREEAM Domestic Refurbishment Energy 5: Energy Labelled White Goods.
 Energy efficient appliances will help reduce internal heat gain and reduce the
 cooling requirement.
 - Energy efficient lighting will also be specified as per the 'Be Lean' section.
- 3. Manage the heat within the building through exposed internal thermal mass and high ceilings
 - High thermal mass exposed building fabric materials such as masonry or concrete have been utilised in the form of concrete floors and dense masonry external walls. These materials act as 'thermal batteries'; they absorb heat gains during the day when the building is occupied and 'store' it for an extended period, thereby helping to stabilise daytime temperatures. At night this heat can be dissipated, which 'resets' the heating cycle. Ventilation will also be used at night to purge the stored heat within the structure. A 'ground coupled' system that uses the thermal storage capacity of the ground has not been specified as the passive ventilation option has been selected instead.
 - Room heights high ceilings are traditionally used in hot climates to allow thermal stratification so that occupants can inhabit the lower cooler space, and to decrease the transfer of heat gain through the roof. The proposed building has floor to ceiling heights of more than 2.5m. As the roof will be well insulated to below building regulations, there will be minimal penetration of heat through the roof.

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- 4. Provide passive ventilation
 - Openable windows are specified on all facades of the building.
 - Shallow floorplates have been specified with dual aspect units, where possible, to allow for cross ventilation. Cross ventilation will be achieved by opening windows on two facades and ensuring there is a clear path for airflow.
 - Night time cooling will also be utilised. This will work in tandem with high thermal
 mass materials specified. The larger temperature differential that exists between
 internal and external temperatures at night will allow effective stack ventilation and
 purging of heat accumulated within the structure during the day.
- 5. Provide mechanical ventilation
 - Natural ventilation with extract fans for toilet and kitchen has been specified for all dwellings.
 - The mechanical systems will comply with the Domestic Building Services Compliance Guide.

Cooling and Overheating

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Overheating risk

The overheating risk considering all the above described passive measures have been assessed for the scheme:

Areas	Overheating risk from SBEM and SAP
Flat 1	Not significant
Flat 2	Slight
Flat 3	Slight
Flat 4	Slight
Flat 5	Slight
Flat 6	Medium
Flat 7	Medium
Flat 8	Medium
Flat 9	Medium

According to the GLA guidance on preparing energy assessments (April 2020) Section 8, a dynamic modelling in line with CIBSE TM52 and TM59 should be carried out to assess the risk of overheating. The dynamic overheating analysis has been carried out by eight Associates '5207–6 Lindfield Gardens–Overheating–2009–07yp', issued on the 07/09/2020, confirms that the scheme meets the CIBSE TM52 and TM59 requirements.

Active cooling

Air conditioning has just been specified for Flat 1(ground floor). No cooling has been specified for other flats since the overheating analysis demonstrates the there is no significant risk of overheating and the passive design measured are enough to guarantee the occupant's comfort.

For flat 1, to ensure the cooling system is the most carbon efficient possible the following parameters have been selected:

- Location: Indoor cooling units have been specified on a localised basis where internal gains
 are too high. The units will be fully fitted with local temperature controls for optimal usage.
- The location of the outdoor units that 'dump' the heat has been carefully conspired carefully
 so not to cause problems for people and the environment, and not to add to the urban heat
 island effect. They will be located on the roof space and will allow adequate air movement
 around the condensing units; this will ensure maximum operating efficiency and will limit the
 impacts of dumped heat on people and the environment.
- The AC systems will follow the Domestic Building Services Compliance Guide

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Heating infrastructure including CHP

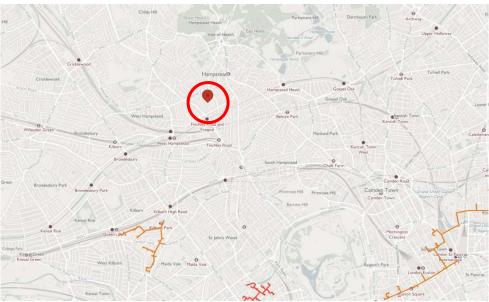
Once demand for energy has been minimised, schemes must demonstrate how their energy systems have been selected in accordance with the order of preference in Policy 5.6B of London Plan and Policy SI3 of Intended to publish London Plan. This has involved a systematic appraisal of the potential to connect to existing or planned heating networks and on site communal and CHP systems.

To comply with London Plan Policy SI 3, developments in Heat Network Priority Areas (HNPAs) should have a communal low-temperature heating system and should select a heat source in accordance with the following heating hierarchy:

- a) connect to local existing or planned heat networks
- use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
- use low-emission combined heat and power (only where there is a case for CHP to enable
 the delivery of an area-wide heat network, meet the development's electricity demand and
 provide demand response to the local electricity network)
- d) use ultra-low NOx gas boilers

Connect to local existing or planned heat network

The illustration below shows the London heat map. Red lines are existing heat networks and orange lines are proposed heat networks. The red circle shows the location of the proposed scheme.



A review of the London Heat Map demonstrates that there are no existing networks present within connectable range of the scheme. Therefore, a connection is not possible.

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Use zero-emission and/or local secondary heat sources

According to the GLA and Intend to Publish London Plan Policy SI3, the exploitation of local energy opportunities to maximise the use of locally available energy sources whilst minimising primary energy demand and carbon emissions is encouraged. Secondary heat includes environmental sources such as air, water and ground; and waste sources such as heat from the sewerage system, sewage treatment plants, the tube network, data centres and chiller systems.

There are no local available waste heat sources for the scheme. The possibilities of capturing waste heat from nearby sources has been undertaken, however the amount of heat available is likely a fraction of the scheme's demand which makes its collection trivial within the context of the scheme.

Use low-emission combined heat and power (CHP)

In accordance with section 9 of the GLA guidance for Energy Planning where connection to an area wide heat network will not be available in the foreseeable future i.e. 5 years following completion, or the development is of such a scale that it could be the catalyst for an area wide heat network, applicants should evaluate the feasibility of on–site CHP

GLA guidance stipulates that small, or purely residential developments of less than 350 dwellings will not be expected to include on—site CHP. CHP systems are best utilised where there is a consistent and high demand for heat. Because of the small electricity supplies and demand of this scheme, a CHP installed to meet the base heat load would typically require the export of electricity to the grid. The administrative burden of managing CHP electricity sales at a small scale without an active energy service companies (ESCOs) is prohibitive for smaller operators of residential developments.

The heat demand profile of this residential scheme is not suitable to CHP. The implemented fabric improvements from the 'Be Lean' scenario have also reduced the energy demand from space heating to hot water. For CHP systems to be economically viable they need to run for at least 5,000 hours per year. Therefore, a CHP system would most likely be oversized, and as a result less efficient and economic.

Use ultra-low NOx gas boilers

Where it is clearly demonstrate that the above heating options (District heating, local secondary heat source and CHP) have been fully investigated and ruled out, then a site-wide heating strategy led by ultra-low NOx gas boilers can be considered.

In accordance with section 9 of the GLA guidance for Energy Planning, where it is demonstrable that a site wide network is not feasible then an individual heating strategy can be implemented. A site wide network will not be adopted because local conditions are not favourable to centralised distribution. Therefore, it is considered that distribution losses would be relatively large and the effectiveness and carbon reducing potential would be undermined when compared to an individual servicing strategy.

Moreover, the scheme is required to achieve a BREEAM Excellent rating. The score for the energy credits is calculated based on the EER (Energy efficiency rating) improvement and primary energy. The EER is based on the energy costs associated with space heating, water heating, ventilation, and lighting. Any communal system will result in distribution losses and a slightly higher cost compared to the baseline. Therefore, no energy credits can be achieved if a communal heating system is specified and a BREEAM DR 'Excellent' rating is not achievable.

Therefore, an individual heating system has been specified for each dwelling

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Renewable Energy Feasibility:

In line with Policy SI2 of the Intend to publish London Plan the feasibility of renewable energy technologies has been considered. A detailed site—specific analysis and associated carbon saving calculations has also been provided for renewable energy technologies considered feasible.

Each technology has been assessed under 3 broader categories. There are key criteria for each category on which the technology is evaluated. The key criteria have been given a weighting based on a tick-system, a graphical representation of this is shown below:

The weighting of each of the criteria within the categories is shown below:

- Local, site-specific impact: (Maximum score of 5)
 - Local planning criteria = ✓✓
 - Land used by all components = ✓
 - Noise impact from operation = ✓
 - o Interaction on the current building design = ✓
 - Buildability of installation = ✓
- Economic viability: (Maximum score of 5)
 - Capital cost of all components = ✓
 - o Grants and funding available = ✓
 - Payback periods (years) 3-5, 5-10, 10-15 = ✓
 - o Servicing requirements (low or high) = ✓
 - o Maintenance costs (low or high) = ✓

- CO2 and sustainability: (Maximum score of 10)
 - o Carbon saving per year = ✓✓✓✓
 - Impact of future grid decarbonisation (gas vs. electric) = ✓✓
 - Local air quality/pollution = ✓✓
 - Resource use of installation = ✓✓

Key comments on each of the criteria and the corresponding score will be provided in a table for each of the technologies. The score for each of the criteria will be summed and each of the technologies will then be ranked. The assessment of each technology is undertaken on the following pages.

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Biomass & Biofuel - Rejected

Biomass is normally considered a carbon 'neutral' fuel, as the carbon dioxide emitted on burning has been recently absorbed from the atmosphere by photosynthesis. Although some form of fossil fuel derived inputs are required in the production and transportation of the fuel.

Wood is seen as a by-product of other industries and the small quantity of energy for drying, sawing, pelleting and delivery are typically discounted. Biomass from coppicing is likely to have external energy inputs from fertiliser, cutting, drying etc. and these may need to be considered. In this toolkit, all biomass fuels are considered to have zero net carbon emissions.

Biomass can be burnt directly to provide heat in buildings. Wood from forests, urban tree pruning, farmed coppices or farm and factory waste, is the most common fuel and is used commercially in the form of wood chips or pellets. Biomass boilers can also be designed to burn smokeless to comply with the Clean Air Acts.

Boilers can be fed automatically by screw drives from fuel hoppers. This typically involves daily addition of bagged fuels.

A biomass boiler could be installed on site for supplementary LTHW heating; however, a major factor influencing the suitability of a biomass boiler is the availability of the biomass fuel. A local and reliable fuel source would be essential for the biomass boiler to be an efficient replacement for a conventional boiler system. Therefore, a very comprehensive feasibility assessment needs to be undertaken to understand the practicalities of such a system.

It is estimated that the heating and hot water demand of the site is too large to meet the required CO_2 emissions reduction if a biomass boiler was a standalone system. Therefore, a biomass boiler would need to be combined with energy demand reduction measures and/or CHP. The likely installed cost would be circa £30,000. The additional cost of providing and storing the bio-fuel also needs to be accounted for. The site is likely to be unsuitable for biomass boilers due to site constraints such as limited transport, and storage of the biomass fuel. A detailed feasibility study will be required to investigate the suitability.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)
✓	///	√√√√
Local air quality impacts, increased transport usage, increased plant space, slightly increased buildability issues.	Increased capital costs of installation, typical payback of 8 years, Increased maintenance relative to gas boiler, resource use not significantly increased if well serviced.	Very low carbon intensity of feedstock if properly procured. Decarbonisation impact not applicable, air quality issues.

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Photovoltaic Panels (PV) - Rejected

Photovoltaic systems convert energy from the sun into electricity through semi-conductor cells. Systems consist of semi-conductor cells connected together and mounted into modules. Modules are connected to an inverter to turn the direct current (DC) output into alternating current (AC) electricity for use in buildings.

Photovoltaic panels supply electricity to the building and are attached to electricity gird or to any other electrical load. Excess electricity can be sold to the National Grid when the generated power exceeds the local need. PV systems require only daylight, not sunlight to generate electricity (although more electricity is produced with more sunlight), so energy can still be produced in overcast or cloudy conditions.

The cost of PV cells is heavily dependent on the size of the array. There are significant cost reductions available for larger installations.

The most suitable location for mounting photovoltaic panels is on roofs as they usually have the greatest exposure to the sun. The proposed site has a very small potential roof area, however, due to the visual impact that the PVs are likely to have on the conservation value, PV panels are not considered to be acceptable.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)
√√ √	√√	√√√√
No local air quality impacts, use of unutilised roof space, no noise issues, good orientation, and slightly increased buildability issues for wiring and metering.	Increased capital costs of installation, typical payback of 10–15 years, Feed in Tariff available, limited servicing and maintenance i.e. 1 visit per year, inverter will require replacement.	High carbon saving from electricity, uses minimal grid electricity, no local air impact, high embodied energy of panels.

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Solar Thermal - Rejected

Solar water heating systems use the energy from the sun to heat water for domestic hot water needs. The systems use a heat collector, generally mounted on the roof in which a fluid is heated by the sun. This fluid is used to heat up water that is stored in either a separate hot water cylinder or a twin coil hot water cylinder inside the building. The systems work very successfully in all parts of the UK, as they can work in diffuse light conditions.

Like photovoltaic panels the most suitable location for mounting solar hot water panels is on roofs as they usually have the greatest exposure to the sun. The proposed site has a very small potential roof area, however due to the visual impact that the solar thermal panels are likely to have on the conservation value, they are not considered to be acceptable.

Local, site-specific impact	Economic viability	CO ₂ and sustainability
(out of 5)	(out of 5)	(out of 10)
///	///	////
No local air quality impacts, use of unutilised roof space, no noise issues, good orientation, slightly increased buildability issues for piping and cylinders.	Increased capital costs of installation, typical payback of 8–10 years, Heat Incentive available, limited servicing and maintenance i.e. 1 visit per year, heat transfer fluid requires replacing every 10 years.	Lower carbon saving as primarily displacing gas, uses minimal grid electricity, no local air impact, medium embodied energy of panels.

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Wind Energy - Rejected

Wind energy is a cost-effective method of renewable power generation. Wind turbines can produce electricity without carbon dioxide emissions in ranges from watts to megawatt outputs. The most common design is for three blades mounted on a horizontal axis, which is free to rotate into the wind on a tall tower

The blades drive a generator either directly or via a gearbox to produce electricity. The electricity can either be linked to the grid or charge batteries. An inverter is required to convert the electricity from direct current (DC) to alternating current (AC) for feeding into the grid.

Modern quiet wind turbines are becoming viable in low density areas where ease of maintenance and immediate connection to the grid or direct use of the electricity in a building, may make them cost effective, despite lower wind speeds than open areas.

Wind turbines are generally less suited to dense urban areas as their output will be affected by potentially lower and more disrupted wind speeds, and their use of much more cost-effective machines may be prohibited by their proximity to some building types. Small turbines can be used in inner city areas mounted on buildings, although there are relatively few installations.

A detailed wind resource evaluation would be required for the site to fully understand the generation potential and payback period. Also, it is likely that planning restrictions and resistance from groups within the local community could also affect the viability of wind energy for the project.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)
✓	$\checkmark\checkmark\checkmark$	$\checkmark\checkmark\checkmark\checkmark$
No local air quality impacts, use of unutilised roof space, medium noise issues, relatively limited wind speeds in local area, increased buildability issues for wiring and metering.	Medium capital costs of installation, typical payback of 5 years, Feed in Tariff available, limited servicing and maintenance, costs of 2–3% typical.	High carbon saving from electricity, output limited from urban installation, consumes little grid electricity, no local air impact, low embodied energy of panels

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Ground Source Heat Pump (GSHP) - Rejected

Geo-thermal energy is essentially heat collected from the ground. Heat obtained from the ground may be considered it as a source of heating and cooling within the UK by the use of a geo-thermal heat pump or ground source heat pumps.

A ground source heat pump is a device for converting energy in the form of low-level heat to heat at a usable temperature. The heat pump consists of five main parts: ground collector loop/or boreholes, heat exchanger, compressor, condenser heat exchanger and expansion valve.

At approximately 1.2–1.5 metres down below ground level the temperature is a constant 10 to 12°C. Any boreholes would need to be sunk to an effective depth of 50 – 120m and a ground feasibility report would be required to ascertain if this method of heat source were viable.

From the boreholes pre-insulated pipework is laid in the ground to the heat exchanger device. The system is filled with water and antifreeze. The cooled water is pumped around the loop / borehole gathering energy as it circulates. The water that has been heated to 10–12°C is returned to the ground source heat exchanger where the energy is transferred to the refrigerant gas. For every 1kW of energy used to compress the refrigerant, the process 'gives up' 4 kW of energy for use in the system being used to heat the building.

The installation cost for a Ground Source Heat pump is typically high compared to a gas-boiler installation. Moreover, the installation of the ground collector it will be hard due to the existing structures that are on site. Therefore, the GSHP has been rejected.

Local, site-specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)
No local air quality impacts, no visual impact, no noise issues, however the constrained site may prohibit its installation. Increased buildability issues for pipework and heating emitters internally.	High capital costs of installation, typical payback >15 years where gas is displaced, Renewable Heat Incentive available, limited servicing and maintenance i.e. 1 visit per year, mechanical	Medium carbon saving from gas displacement, consumes some electricity so benefits from decarbonisation, no local air impact, high embodied energy of equipment.
	parts may require replacement over lifespan.	

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Air Source Heat Pump (GSHP) - Rejected

Air source heat pump systems work on the same principle as a ground source heat pump although they use the outside air as the heat source.

The coefficients of performance given by air source heat pump systems are inferior to that of ground source systems due to varying air temperatures. In the depth of winter, the energy efficiency of an air source system will be lower than that of a ground source system, and it is likely that more back-up heat will be required if an air source unit is fitted. This back-up heat often comes from a direct electric heater. They operate over a varying temperatures range of -15°C to +25°C, however, the performance will reduce to below the required 3 to 1 carbon saving ratio in winter, and they also require a defrosting mechanism to melt ice that forms on the air heat exchanger.

ASHPs are cheaper to install than ground source heat pumps but carbon dioxide emission savings will typically be less than that of a ground source heat pump. There is limited available space in the scheme and no ASHPs can be specified on the roof due to conservation. Moreover, the heating demand of the scheme will be high compared to new builds, because of the existing wall fabric that cannot be further upgraded due to interstitial condensation risk. Therefore, an electric ASHP will increase the operational cost and would not be viable. The ASHP has been rejected.

Local, site-specific impact Ecor	nomic viability	CO ₂ and sustainability
(out of 5) (out	of 5)	(out of 10)
√√√		$\checkmark\checkmark\checkmark\checkmark$
use of unutilised roof space, over visual impact, low noise issues, increased buildability issues for pipework and heating emitters internally. Limit mair year,	um- high capital costs of Illation, typical payback years where gas is aced, Renewable Heat ntive available ed servicing and Intenance i.e. 1 visit per mechanical parts may ire replacement over	Medium carbon saving from gas displacement, less efficient in winter, consumes electricity so benefits from decarbonisation, no local air impact, high embodied energy of equipment.

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Summary comparison matrix

An assessment of the feasibility of each of the technologies is shown below.

Renewable Technology	Comments	Local, site- specific impact (out of 5)	Economic viability (out of 5)	CO ₂ and sustainability (out of 10)	Total Score
Biomass Boiler	Rejected - High air quality impact	✓	V V V	////	9
Photovoltaic	Accepted - High CO ₂ savings and have low visual impact	√√√	√ √	√√√√ √√√	13
Solar Thermal	Rejected - Low CO ₂ savings compared to PV panels	√√√	/ / /	√√√√ √	12
Wind Energy	Rejected - High visual and noise impact	√	/ / / /	\ \ \ \ \ \ \	10
GSHP	Rejected - High capital cost	√ √	✓	√√√√ √√√	11
ASHP	Accepted - Can provide carbon savings with minimal site impact	√ √√	√ √	√√√√ √√	12

Photovoltaic panels, solar thermal panels and ASHPs have scored the best. However, due to the limited amount of roof, visual impact and conservation criteria, no renewable technologies have been specified.

Conclusion

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Summary

All flats have been modelled for the purposes of the energy assessment. The scheme complies with the 2013 Building Regulations Part L and the minimum energy efficiency targets in the following documents have been followed:

Refurbishment (Part L1B) – Consequential improvements to refurbished areas have been
made to ensure that the building complies with Part L, to the extent that such improvements
are technically, functionally, and economically feasible.

In addition, the CO_2 emissions of the scheme have been calculated using the SAP 10.0 carbon emission factors, and the scheme can achieve:

- An on-site CO₂ reduction of 3.5% beyond Building Regulations through energy efficiency measures. The design team has maximised the passive design measure, however, the existing wall cannot be further insulated due to interstitial condensation risk. Therefore, no further CO₂ improvement can be achieved.
- No renewable technologies have been specified for the project due to site constrains and conservation criteria.
- BREEAM DR 2014 Energy credits:
 - o Ene 01 0 credits
 - Ene 02 3 credits (Excellent standard)
 - o Ene 03 6 credits
 - Fne 04 0 credits

Appendix A

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Total fuel consumption

The total gas and electricity consumption are shown in the table below.

Energy source	Total fuel consumption (MWh/year)
Grid electricity	14.9
Gas boilers (communal/individual)	87.7
Gas CHP	_
Connection to existing District Heating network	_
Other gas use (e.g. cookers)	-

Appendix B

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SAP and BRUKL files

The emission figures and details of the calculations and methodology used to determine the figures provided within the report can be found in the following pages:

- Baseline DER from the Baseline scenario DER SAP worksheet
- Be Lean Residential DER from the Be Lean scenario DER SAP worksheet

Appendix B Energy Assessment 6 Lindfield Gardens

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Baseline Residential - DER from the Baseline scenario DER SAP worksheet

		User Details:			
Assessor Name:	Chris Hocknell	Stroma Num	nber: STR	O016363	
Software Name:	Stroma FSAP 2012	Software Ve	rsion: Versi	on: 1.0.4.26	
	Pro	perty Address: Flat 1-	Existing		
Address :	Flat 1, 6, Lindfield Gardens, L	ONDON, NW3 6PU			
1. Overall dwelling dime	ensions:				
		Area(m²)	Av. Height(m)	Volume(m³)	_
Ground floor		92.28 (1a) x	4.18 (2a) =	385.73	(3a)
First floor		40.18 (1b) x	2.5 (2b) =	100.45	(3b)
Second floor		106.16 (1c) x	2.63 (2c) =	279.2	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	238.62 (4)			
Dwelling volume		(3a)+(3l	(3c)+(3c)+(3d)+(3e)+(3n) =	765.38	(5)
2. Ventilation rate:					
	main secondary heating heating	other	total	m³ per hour	•
Number of chimneys	0 + 0	+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent fa	ins		5 x 10 =	50	(7a)
Number of passive vents	;		0 x 10 =	0	(7b)
Number of flueless gas fi	ires		0 x 40 =	0	(7c)
		L		hanges per hou	
	9 (0-) (0h) (7-)	V. (71.) . (7.)		ranges per not	_
	ys, flues and fans = (6a)+(6b)+(7a) neen carried out or is intended, proceed it	L	\div (5) =	0.07	(8)
Number of storeys in the	,	o (11), otherwise continue i	10111 (3) 10 (10)	0	(9)
Additional infiltration	ino arreining (ne)		[(9)-1]x0.1 =	0	(10)
	.25 for steel or timber frame or 0).35 for masonry const		0	(11)
if both types of wall are p	resent, use the value corresponding to t	•			
deducting areas of openii		(_
·	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0		0	(12)
If no draught lobby, en				0	(13)
<u> </u>	s and doors draught stripped		4001	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	-	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
•	q50, expressed in cubic metres		netre of envelope area	10	(17)
•	lity value, then (18) = [(17) ÷ 20]+(8).			0.57	(18)
	es if a pressurisation test has been done	or a degree air permeability	is being used		_
Number of sides sheltere	ed	(00) 4 10 075	40)7	2	(19)
Shelter factor		$(20) = 1 - [0.075 \times ($		0.85	(20)
Infiltration rate incorporate	-	(21) = (18) x (20) =		0.48	(21)
Infiltration rate modified f	or monthly wind speed			_	
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov Dec		
Monthly average wind sp	peed from Table 7			_	

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
A 11 (1 C1(·		.,			(0.4.)	(00.)					
Adjusted infiltr	ation rat	e (allowi	ng for sr 0.53	0.52	a wina s	0.46	(21a) X 0.44	(22a)m 0.48	0.52	0.54	0.56		
Calculate effe	1	1	1				0.44	0.46	0.52	0.54	0.56		
If mechanic		_										0	(23a)
If exhaust air h	eat pump i	using Appe	endix N, (2	3b) = (23a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c)												÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat rec	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				-									
<u> </u>	n < 0.5 ×	` 	· ` `	<u> </u>		<u> </u>	ŕ	ŕ	· ` ·	ŕ			(0.4.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural	ventilation n = 1, the								0.51				
(24d)m = 0.69	0.68	0.67	0.64	0.63	0.6	0.6	0.5 . [(2	0.62	0.63	0.65	0.66		(24d)
Effective air													` ,
(25)m= 0.69	0.68	0.67	0.64	0.63	0.6	0.6	0.6	0.62	0.63	0.65	0.66		(25)
	<u> </u>							<u> </u>					
2 Heatleses	مطالم عرمي												
3. Heat losse		•			Not Ar	00	I I vali	ue.	A Y I I		k value		Λ Y k
3. Heat losse ELEMENT	s and he Gros area	SS	oaramete Openin m	gs	Net Ar		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·ł		A X k kJ/K
	Gros	SS	Openin	gs						K)			
ELEMENT	Gros area	SS	Openin	gs	A ,n	m² x	W/m2	2K =	(W/I	K)			kJ/K
ELEMENT Doors	Gros area e 1	SS	Openin	gs	A ,n	m² x x1.	W/m2	eK = 0.04] =	7.668	K)			kJ/K (26)
ELEMENT Doors Windows Type	Gros area e 1 e 2	SS	Openin	gs	A ,n 4.26	m² x x1.	W/m2 1.8 /[1/(1.6)+	0.04] = 0.04] =	7.668 5.17	K)			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 4.26 3.44 1.56	x1 x1 x1 x1	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+	0.04] = 0.04] = 0.04] =	7.668 5.17 2.35	K)			kJ/K (26) (27) (27)
Doors Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67	x1. x1. x1.	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	0.04] = 0.04] = 0.04] = 0.04] =	7.668 5.17 2.35 1.01	K)			kJ/K (26) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4 e 5	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67	x1. x1. x1. x1. x1.	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	7.668 5.17 2.35 1.01 1.05	K)			kJ/K (26) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52	x1. x1. x1. x1. x1. x1.	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	0.04] = 0.04]	(W/I 7.668 5.17 2.35 1.01 1.05 1.08	K)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72	x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	0.04] = 0.04]	(W/I 7.668 5.17 2.35 1.01 1.05 1.08 0.78	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type	Gros area 1 2 2 3 4 4 5 5 6 6 7 8 8	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3	x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 7.668 5.17 2.35 1.01 1.05 1.08 0.78 1.08	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type	Gros area 1	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3	x1.	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 7.668 5.17 2.35 1.01 1.05 1.08 0.78 1.08 1.95	<) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type	Gros area 1	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3 1 8.58	x1.	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 7.668 5.17 2.35 1.01 1.05 1.08 0.78 1.95 1.5	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 o e 1	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3 1 8.58 0.47	x1.	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 7.668 5.17 2.35 1.01 1.05 1.08 0.78 1.95 1.5 12.9 0.752	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Type Rooflights Type	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 8 8 9 9 6 10 9 6 1	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3 1 8.58 0.47 0.63	x1.	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 7.668 5.17 2.35 1.01 1.05 1.08 0.78 1.08 1.95 1.5 12.9 0.752 1.008	<) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Typ Rooflights Typ	Gros area 1	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 1.3 1 8.58 0.47 0.63 0.84	x1.	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 7.668 5.17 2.35 1.01 1.05 1.08 0.78 1.95 1.5 12.9 0.752 1.008 1.344	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Typ Rooflights Typ Rooflights Typ	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 o e 1 o e 2 o e 3 o e 4	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3 1 8.58 0.47 0.63 0.84 0.62	x1	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 7.668 5.17 2.35 1.01 1.05 1.08 0.78 1.95 1.5 12.9 0.752 1.008 1.344 0.992	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Rooflights Typ Rooflights Typ	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 1 e 2 e 3 e 4 e 5	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 1.3 1 8.58 0.47 0.63 0.84	x1	W/m2 1.8 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 7.668 5.17 2.35 1.01 1.05 1.08 0.78 1.95 1.5 12.9 0.752 1.008 1.344	<) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

Rooflights Type 7	3.27 x1	/[1/(1.6) + (0.04] =	5.232				(27b)
Rooflights Type 8	0.89 x1	/[1/(1.6) + (0.04] =	1.424	=			(27b)
Rooflights Type 9	1.29 x1	/[1/(1.6) + (0.04] =	2.064	=			(27b)
Rooflights Type 10	2.37 x1	/[1/(1.6) + (0.04] =	3.792	=			(27b)
Floor Type 1	191.44 X	0.55	= [105.292	<u>=</u> [(28)
Floor Type 2	10.26 X	0.55	= [5.643				(28)
Walls Type1 145.59 0	145.59 X	0.55	= [80.07				(29)
Walls Type2 147.31 12.75	134.56 X	0.55	= [74.01				(29)
Walls Type3 42.7 14.84	27.86 ×	0.28	= [7.8				(29)
Roof Type1 88.47 17.67	70.8 ×	0.18	= [12.74				(30)
Roof Type2 28.75 0	28.75 X	0.18	_ = [5.18				(30)
Total area of elements, m²	654.52						_	(31)
Party wall	53.98 ×	0	= [0				(32)
Party ceiling	84.47							(32b)
* for windows and roof windows, use effective window U-va ** include the areas on both sides of internal walls and part.		g formula 1/	/[(1/U-valu	re)+0.04] a	s given in	paragraph	3.2	
Fabric heat loss, W/K = S (A x U)		(26)(30)	+ (32) =			[360.06	(33)
Heat capacity Cm = S(A x k)			((28)	.(30) + (32	?) + (32a)	.(32e) =	35022.54	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in	ı kJ/m²K		Indica	tive Value:	Medium		250	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.	on are not known p	recisely the	indicative	values of	TMP in Ta	ble 1f		
Thermal bridges : S (L x Y) calculated using Ap	pendix K						98.18	(36)
if details of thermal bridging are not known (36) = $0.05 \times (3)$	1)					ļ		_
Total fabric heat loss				(36) =			458.24	(37)
Ventilation heat loss calculated monthly				= 0.33 × (2		_		
(38)m= Jan Feb Mar Apr May	Jun Jul 152.61 152.61	Aug 151.24	Sep 155.45	Oct 159.99	Nov 163.19	Dec 166.55		(38)
` '	102.01	101.24				100.00		(00)
Heat transfer coefficient, W/K (39)m= 631.93 630.09 628.28 619.81 618.22	610.84 610.84	609.48	613.69	= (37) + (3 618.22	621.43	624.79		
(60) 301.00 000.00 020.20 010.01 010.22	010.04	000.40		Average =			619.8	(39)
Heat loss parameter (HLP), W/m²K				= (39)m ÷				
(40)m= 2.65 2.64 2.63 2.6 2.59	2.56 2.56	2.55	2.57	2.59	2.6	2.62		_
Number of days in month (Table 1a)			,	Average =	Sum(40) ₁	.12 /12=	2.6	(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)
	<u>!</u>							
4. Water heating energy requirement:						kWh/ye	ear:	
Assumed occupancy, N					3.	05		(42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.0003 if TFA £ 13.9, N = 1	49 x (TFA -13.9))2)] + 0.0	0013 x (ΓFA -13.				()
Annual average hot water usage in litres per da Reduce the annual average hot water usage by 5% if the d				se target of	11	2.3		(43)
not more that 125 litres per person per day (all water use, h		.s admicve	vaior us	.s .argot Of				
Jan Feb Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month Vd,m = fac	ctor from Table 1c x	(43)						
Statoma FSAB.2812 Western 110.4.25 (SAF09062) -10555/W	vv1.9sttr.0077na.col011.07	105.57	110.06	114.55	119.04	123.53		3 of 14
			•	Total = Sur	m(44) =		1347 64	(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) 183.2 160.23 165.34 144.15 138.31 119.35 110.6 126.91 128.43 149.67 163.38 177.42 (45)m =Total = $Sum(45)_{1...12}$ = 1766.97 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 27.48 24.03 (46)24.8 21.62 20.75 17.9 16.59 19.26 22.45 24.51 26.61 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): (48)Temperature factor from Table 2b 0 (49)Energy lost from water storage, kWh/year $(48) \times (49) =$ (50)0 b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)If community heating see section 4.3 Volume factor from Table 2a 0 (52)Temperature factor from Table 2b 0 (53)Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ (54)0 Enter (50) or (54) in (55) (55)0 Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m =0 0 (56)If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H (57)(57)m =(58)Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)(59)m =O Combi loss calculated for each month (61)m = (60) \div 365 × (41)m 50.96 50.96 49.32 50.96 49.32 50.96 50.96 49.32 50.96 49.32 50.96 (61)(61)m=Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m 177.87 234.16 206.25 216.3 193.46 161.56 177.74 (62)189.27 168.67 200.63 212.69 228.38 (62)m=Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)(63)m=0 0 0 0 0 0 0 Output from water heater (64)m=234.16 206.25 216.3 161.56 193.46 189.27 168.67 177.87 177.74 200.63 212.69 228.38 (64)Output from water heater (annual)_{1...12} 2366.97 Heat gains from water heating, kWh/month 0.25 \(^{1}\) [0.85 \times (45)m + (61)m] + 0.8 \(^{1}\) [(46)m + (57)m + (59)m] 67.71 49.51 54.94 (65)(65)m=73.65 60.26 58.73 52.01 55.03 62.51 include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Aug Jan Feb Mar Apr May Jun Jul Sep Oct Nov Dec

(66)m=	152.61	152.61	152.61	152.61	152.61	152.61	152.61	152.61	152.61	152.61	152.61	152.61		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equati	ion L9 oı	r L9a), a	lso see	Table 5				_	
(67)m=	45.62	40.52	32.95	24.94	18.65	15.74	17.01	22.11	29.68	37.68	43.98	46.88		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													_	
(68)m=	406.41	410.63	400	377.38	348.82	321.98	304.05	299.83	310.46	333.08	361.64	388.48		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
(69)m=	38.26	38.26	38.26	38.26	38.26	38.26	38.26	38.26	38.26	38.26	38.26	38.26		(69)
Pumps	and far	ns gains	(Table 5	ōa)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m=	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09		(71)
Water	heating	gains (T	able 5)											
(72)m=	99	96.4	91.01	83.69	78.94	72.24	66.55	73.84	76.43	84.01	92.57	96.41		(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	+ (69)m + (70)m + (7	1)m + (72)	m		
(73)m=	622.81	619.33	595.75	557.8	518.18	481.74	459.39	467.56	488.35	526.56	569.97	603.56		(73)
6. Sol	ar gains	S:												

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

	access Facto able 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c	Gains (W)		
Northeast _{0.9x}	0.77	x	0.72	x	11.28	x	0.63	x	0.7	=	2.48	(75)
Northeast _{0.9x}	0.77	x	1	x	11.28	x	0.63	x	0.7	=	6.9	(75)
Northeast _{0.9x}	0.77	x	8.58	x	11.28	x	0.63	x	0.7	=	29.59	(75)
Northeast _{0.9x}	0.77	x	0.72	x	22.97	x	0.63	x	0.7	=	5.05	(75)
Northeast _{0.9x}	0.77	x	1	x	22.97	x	0.63	x	0.7	=	14.04	(75)
Northeast _{0.9x}	0.77	x	8.58	x	22.97	x	0.63	x	0.7	=	60.22	(75)
Northeast _{0.9x}	0.77	x	0.72	x	41.38	x	0.63	x	0.7	=	9.11	(75)
Northeast _{0.9x}	0.77	x	1	x	41.38	x	0.63	x	0.7	=	25.29	(75)
Northeast _{0.9x}	0.77	x	8.58	x	41.38	x	0.63	x	0.7	=	108.5	(75)
Northeast _{0.9x}	0.77	x	0.72	x	67.96	x	0.63	x	0.7	=	14.95	(75)
Northeast _{0.9x}	0.77	x	1	x	67.96	x	0.63	x	0.7	=	41.54	(75)
Northeast 0.9x	0.77	x	8.58	x	67.96	x	0.63	x	0.7	=	178.19	(75)
Northeast _{0.9x}	0.77	x	0.72	x	91.35	x	0.63	x	0.7	=	20.1	(75)
Northeast _{0.9x}	0.77	x	1	x	91.35	x	0.63	x	0.7	=	55.83	(75)
Northeast 0.9x	0.77	x	8.58	x	91.35	x	0.63	x	0.7	=	239.52	(75)
Northeast _{0.9x}	0.77	x	0.72	X	97.38	x	0.63	x	0.7	=	21.43	(75)
Northeast _{0.9x}	0.77	x	1	X	97.38	X	0.63	x	0.7	=	59.52	(75)
Northeast _{0.9x}	0.77	x	8.58	X	97.38	x	0.63	x	0.7	=	255.36	(75)
Northeast _{0.9x}	0.77	x	0.72	X	91.1	X	0.63	X	0.7	=	20.05	(75)
Northeast _{0.9x}	0.77	x	1	x	91.1	x	0.63	x	0.7	=	55.68	(75)
Northeast _{0.9x}	0.77	x	8.58	x	91.1	x	0.63	x	0.7	=	238.88	(75)

Northeast _{0.9x}		1	0.70	1		1		۱		1 _	15.00	7(75)
Northeast 0.9x	0.77	X	0.72	X	72.63] X	0.63	X	0.7] = 1	15.98	(75)
Northeast 0.9x	0.77	X	1	X	72.63] X]	0.63	X	0.7] = 1	44.39	(75)
<u> </u>	0.77	X	8.58	X	72.63] X]	0.63	X	0.7] = 1	190.44	(75)
Northeast 0.9x	0.77	X	0.72	X	50.42] X]	0.63	X	0.7] = 1	11.09	(75)
Northeast 0.9x	0.77	X	1	X	50.42	X	0.63	X	0.7] =	30.82	(75)
Northeast 0.9x	0.77	X	8.58	X	50.42	X	0.63	Х	0.7] =	132.21	(75)
Northeast 0.9x	0.77	X	0.72	X	28.07	X	0.63	Х	0.7] =	6.18	(75)
Northeast _{0.9x}	0.77	X	1	X	28.07	X	0.63	X	0.7	=	17.16	(75)
Northeast _{0.9x}	0.77	X	8.58	X	28.07	X	0.63	X	0.7] =	73.6	(75)
Northeast _{0.9x}	0.77	X	0.72	X	14.2	X	0.63	X	0.7	=	3.12	(75)
Northeast _{0.9x}	0.77	X	1	X	14.2	X	0.63	Х	0.7	=	8.68	(75)
Northeast _{0.9x}	0.77	X	8.58	X	14.2	X	0.63	X	0.7	=	37.23	(75)
Northeast _{0.9x}	0.77	X	0.72	X	9.21	X	0.63	X	0.7	=	2.03	(75)
Northeast _{0.9x}	0.77	X	1	X	9.21	X	0.63	X	0.7	=	5.63	(75)
Northeast _{0.9x}	0.77	X	8.58	X	9.21	X	0.63	X	0.7	=	24.16	(75)
Southeast _{0.9x}	0.77	X	0.7	x	36.79	X	0.63	X	0.7	=	7.87	(77)
Southeast _{0.9x}	0.77	X	0.52	X	36.79	X	0.63	X	0.7	=	11.69	(77)
Southeast _{0.9x}	0.77	X	1.3	X	36.79	X	0.63	x	0.7	=	43.85	(77)
Southeast _{0.9x}	0.77	X	0.7	X	62.67	X	0.63	x	0.7	=	13.41	(77)
Southeast _{0.9x}	0.77	X	0.52	X	62.67	X	0.63	х	0.7] =	19.92	(77)
Southeast _{0.9x}	0.77	X	1.3	x	62.67	X	0.63	х	0.7] =	74.7	(77)
Southeast 0.9x	0.77	X	0.7	x	85.75	x	0.63	x	0.7] =	18.34	(77)
Southeast 0.9x	0.77	X	0.52	x	85.75	x	0.63	х	0.7	Ī =	27.26	(77)
Southeast 0.9x	0.77	X	1.3	x	85.75	x	0.63	х	0.7	j =	102.21	(77)
Southeast 0.9x	0.77	X	0.7	x	106.25	x	0.63	х	0.7	j =	22.73	(77)
Southeast 0.9x	0.77	X	0.52	x	106.25	x	0.63	х	0.7	j =	33.77	(77)
Southeast 0.9x	0.77	X	1.3	x	106.25	x	0.63	х	0.7	j =	126.64	(77)
Southeast _{0.9x}	0.77	X	0.7	x	119.01	x	0.63	х	0.7	j =	25.46	(77)
Southeast _{0.9x}	0.77	X	0.52	x	119.01	x	0.63	х	0.7	j =	37.83	(77)
Southeast 0.9x	0.77	X	1.3	x	119.01	x	0.63	х	0.7	j =	141.85	(77)
Southeast _{0.9x}	0.77	X	0.7	x	118.15	x	0.63	х	0.7	j =	25.28	(77)
Southeast _{0.9x}	0.77	X	0.52	x	118.15	x	0.63	х	0.7	j =	37.55	(77)
Southeast 0.9x	0.77	X	1.3	x	118.15	x	0.63	х	0.7	j =	140.82	(77)
Southeast _{0.9x}	0.77	j×	0.7	x	113.91	x	0.63	х	0.7	j =	24.37	(77)
Southeast _{0.9x}	0.77	x	0.52	X	113.91	x	0.63	x	0.7	i =	36.2	(77)
Southeast _{0.9x}	0.77	X	1.3	X	113.91	X	0.63	х	0.7] =	135.77	(77)
Southeast _{0.9x}	0.77	X	0.7	X	104.39	X	0.63	х	0.7] =	22.33	(77)
Southeast _{0.9x}	0.77	X	0.52	X	104.39) x	0.63	х	0.7	=	33.18	(77)
Southeast _{0.9x}	0.77) x	1.3	X	104.39)] x	0.63	X	0.7] =	124.42	(77)
Southeast _{0.9x}	0.77	X	0.7	X	92.85)] x	0.63	X	0.7]] =	19.86	(77)
Southeast _{0.9x}	0.77	X	0.52) x	92.85) x	0.63	X	0.7]] =	29.51	(77)
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Southeast 0.9x	0.77	X	1.3	X	92.85	X	0.63	X	0.7	=	110.67	(77)
Southeast 0.9x	0.77	X	0.7	Х	69.27	X	0.63	X	0.7	=	14.82	(77)
Southeast _{0.9x}	0.77	X	0.52	X	69.27	X	0.63	X	0.7	=	22.02	(77)
Southeast _{0.9x}	0.77	X	1.3	X	69.27	X	0.63	X	0.7	=	82.56	(77)
Southeast _{0.9x}	0.77	X	0.7	X	44.07	X	0.63	X	0.7	=	9.43	(77)
Southeast _{0.9x}	0.77	X	0.52	X	44.07	X	0.63	X	0.7	=	14.01	(77)
Southeast _{0.9x}	0.77	X	1.3	X	44.07	X	0.63	X	0.7	=	52.53	(77)
Southeast _{0.9x}	0.77	X	0.7	X	31.49	X	0.63	X	0.7	=	6.74	(77)
Southeast _{0.9x}	0.77	X	0.52	X	31.49	X	0.63	X	0.7	=	10.01	(77)
Southeast 0.9x	0.77	X	1.3	X	31.49	X	0.63	X	0.7	=	37.53	(77)
Southwest _{0.9x}	0.77	X	3.44	X	36.79]	0.63	X	0.7	=	38.68	(79)
Southwest _{0.9x}	0.77	X	1.56	X	36.79]	0.63	X	0.7	=	17.54	(79)
Southwest _{0.9x}	0.77	X	0.67	x	36.79]	0.63	x	0.7	=	7.53	(79)
Southwest _{0.9x}	0.77	X	0.72	x	36.79]	0.63	x	0.7	=	8.1	(79)
Southwest _{0.9x}	0.77	X	3.44	x	62.67]	0.63	x	0.7	=	65.89	(79)
Southwest _{0.9x}	0.77	X	1.56	x	62.67]	0.63	x	0.7	=	29.88	(79)
Southwest _{0.9x}	0.77	X	0.67	x	62.67]	0.63	X	0.7] =	12.83	(79)
Southwest _{0.9x}	0.77	X	0.72	x	62.67]	0.63	x	0.7	=	13.79	(79)
Southwest _{0.9x}	0.77	x	3.44	x	85.75	Ī	0.63	x	0.7] =	90.15	(79)
Southwest _{0.9x}	0.77	x	1.56	x	85.75	Ī	0.63	x	0.7] =	40.88	(79)
Southwest _{0.9x}	0.77	x	0.67	x	85.75	ĺ	0.63	x	0.7	j =	17.56	(79)
Southwest _{0.9x}	0.77	x	0.72	х	85.75	ĺ	0.63	x	0.7	j =	18.87	(79)
Southwest _{0.9x}	0.77	x	3.44	x	106.25	ĺ	0.63	x	0.7	j =	111.7	(79)
Southwest _{0.9x}	0.77	x	1.56	x	106.25	ĺ	0.63	x	0.7	j =	50.66	(79)
Southwest _{0.9x}	0.77	x	0.67	x	106.25	ĺ	0.63	x	0.7	j =	21.76	(79)
Southwest _{0.9x}	0.77	x	0.72	x	106.25	ĺ	0.63	x	0.7	j =	23.38	(79)
Southwest _{0.9x}	0.77	x	3.44	x	119.01	ĺ	0.63	x	0.7	j =	125.12	(79)
Southwest _{0.9x}	0.77	x	1.56	х	119.01	j	0.63	x	0.7] =	56.74	(79)
Southwest _{0.9x}	0.77	x	0.67	х	119.01	j	0.63	x	0.7	=	24.37	(79)
Southwest _{0.9x}	0.77	x	0.72	х	119.01	j	0.63	x	0.7	j =	26.19	(79)
Southwest _{0.9x}	0.77	x	3.44	x	118.15	j	0.63	x	0.7	j =	124.21	(79)
Southwest _{0.9x}	0.77	x	1.56	x	118.15	j	0.63	x	0.7	j =	56.33	(79)
Southwest _{0.9x}	0.77	x	0.67	x	118.15	j	0.63	x	0.7	j =	24.19	(79)
Southwest _{0.9x}	0.77	x	0.72	x	118.15	j	0.63	x	0.7	j =	26	(79)
Southwest _{0.9x}	0.77	x	3.44	x	113.91	ĺ	0.63	x	0.7	j =	119.75	(79)
Southwest _{0.9x}	0.77	X	1.56	x	113.91	j	0.63	x	0.7	=	54.31	(79)
Southwest _{0.9x}	0.77	X	0.67	x	113.91	j	0.63	x	0.7	=	23.32	(79)
Southwest _{0.9x}	0.77	X	0.72	x	113.91	ĺ	0.63	x	0.7] =	25.06	(79)
Southwest _{0.9x}	0.77	X	3.44	X	104.39	ĺ	0.63	x	0.7	=	109.75	(79)
Southwest _{0.9x}	0.77	X	1.56	X	104.39	ĺ	0.63	x	0.7] =	49.77	(79)
Southwest _{0.9x}	0.77	X	0.67	X	104.39	ĺ	0.63	x	0.7] =	21.38	(79)
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Southwest0.9x 0.77 x 0.72 x 104.39 0.63 x 0.7 = 22.97 Southwest0.9x 0.77 x 3.44 x 92.85 0.63 x 0.7 = 97.62 Southwest0.9x 0.77 x 1.56 x 92.85 0.63 x 0.7 = 44.27 Southwest0.9x 0.77 x 0.67 x 92.85 0.63 x 0.7 = 19.01 Southwest0.9x 0.77 x 0.67 x 92.85 0.63 x 0.7 = 19.01 Southwest0.9x 0.77 x 3.44 x 69.27 0.63 x 0.7 = 72.82 Southwest0.9x 0.77 x 1.56 x 69.27 0.63 x 0.7 = 14.18 Southwest0.9x 0.77 x 0.67 x 69.27 0.63 x 0.7 =	[(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79) [(79)
Southwest0.9x 0.77 x 1.56 x 92.85 0.63 x 0.7 = 44.27 Southwest0.9x 0.77 x 0.67 x 92.85 0.63 x 0.7 = 19.01 Southwest0.9x 0.77 x 0.72 x 92.85 0.63 x 0.7 = 20.43 Southwest0.9x 0.77 x 3.44 x 69.27 0.63 x 0.7 = 72.82 Southwest0.9x 0.77 x 1.56 x 69.27 0.63 x 0.7 = 14.18 Southwest0.9x 0.77 x 0.67 x 69.27 0.63 x 0.7 = 14.18 Southwest0.9x 0.77 x 0.72 x 69.27 0.63 x 0.7 = 15.24 Southwest0.9x 0.77 x 1.56 x 44.07 0.63 x 0.7 =	[(79)] [(79)] [(79)] [(79)] [(79)] [(79)] [(79)] [(79)] [(79)] [(79)] [(79)]
Southwest0.9x 0.77 x 0.67 x 92.85 0.63 x 0.7 = 19.01 Southwest0.9x 0.77 x 0.72 x 92.85 0.63 x 0.7 = 20.43 Southwest0.9x 0.77 x 3.44 x 69.27 0.63 x 0.7 = 72.82 Southwest0.9x 0.77 x 1.56 x 69.27 0.63 x 0.7 = 33.02 Southwest0.9x 0.77 x 0.67 x 69.27 0.63 x 0.7 = 14.18 Southwest0.9x 0.77 x 0.72 x 69.27 0.63 x 0.7 = 15.24 Southwest0.9x 0.77 x 3.44 x 44.07 0.63 x 0.7 = 46.33 Southwest0.9x 0.77 x 1.56 x 44.07 0.63 x 0.7 =	(79) (79) (79) (79) (79) (79) (79) (79)
Southwest0.9x 0.77 x 0.72 x 92.85 0.63 x 0.7 = 20.43 Southwest0.9x 0.77 x 3.44 x 69.27 0.63 x 0.7 = 72.82 Southwest0.9x 0.77 x 1.56 x 69.27 0.63 x 0.7 = 33.02 Southwest0.9x 0.77 x 0.67 x 69.27 0.63 x 0.7 = 14.18 Southwest0.9x 0.77 x 0.72 x 69.27 0.63 x 0.7 = 15.24 Southwest0.9x 0.77 x 3.44 x 44.07 0.63 x 0.7 = 46.33 Southwest0.9x 0.77 x 1.56 x 44.07 0.63 x 0.7 = 21.01 Southwest0.9x 0.77 x 0.67 x 44.07 0.63 x 0.7 = 9.02	(79) (79) (79) (79) (79) (79) (79) (79)
Southwest0.9x 0.77 x 3.44 x 69.27 0.63 x 0.7 = 72.82 Southwest0.9x 0.77 x 1.56 x 69.27 0.63 x 0.7 = 33.02 Southwest0.9x 0.77 x 0.67 x 69.27 0.63 x 0.7 = 14.18 Southwest0.9x 0.77 x 0.72 x 69.27 0.63 x 0.7 = 15.24 Southwest0.9x 0.77 x 3.44 x 44.07 0.63 x 0.7 = 46.33 Southwest0.9x 0.77 x 1.56 x 44.07 0.63 x 0.7 = 21.01 Southwest0.9x 0.77 x 0.67 x 44.07 0.63 x 0.7 = 9.02	[(79) (79) (79) (79) (79) (79) [(79)
Southwest0.9x 0.77 x 1.56 x 69.27 0.63 x 0.7 = 33.02 Southwest0.9x 0.77 x 0.67 x 69.27 0.63 x 0.7 = 14.18 Southwest0.9x 0.77 x 0.72 x 69.27 0.63 x 0.7 = 15.24 Southwest0.9x 0.77 x 3.44 x 44.07 0.63 x 0.7 = 46.33 Southwest0.9x 0.77 x 1.56 x 44.07 0.63 x 0.7 = 21.01 Southwest0.9x 0.77 x 0.67 x 44.07 0.63 x 0.7 = 9.02	(79) (79) (79) (79) (79) (79)
Southwest0.9x 0.77 x 0.67 x 69.27 0.63 x 0.7 = 14.18 Southwest0.9x 0.77 x 0.72 x 69.27 0.63 x 0.7 = 15.24 Southwest0.9x 0.77 x 3.44 x 44.07 0.63 x 0.7 = 46.33 Southwest0.9x 0.77 x 1.56 x 44.07 0.63 x 0.7 = 21.01 Southwest0.9x 0.77 x 0.67 x 44.07 0.63 x 0.7 = 9.02	(79) (79) (79) (79) (79)
Southwest0.9x 0.77 x 0.72 x 69.27 0.63 x 0.7 = 15.24 Southwest0.9x 0.77 x 3.44 x 44.07 0.63 x 0.7 = 46.33 Southwest0.9x 0.77 x 1.56 x 44.07 0.63 x 0.7 = 21.01 Southwest0.9x 0.77 x 0.67 x 44.07 0.63 x 0.7 = 9.02	(79) (79) (79) (79)
Southwest0.9x 0.77 x 3.44 x 44.07 0.63 x 0.7 = 46.33 Southwest0.9x 0.77 x 1.56 x 44.07 0.63 x 0.7 = 21.01 Southwest0.9x 0.77 x 0.67 x 44.07 0.63 x 0.7 = 9.02	(79) (79) (79)
Southwest0.9x 0.77 x 1.56 x 44.07 0.63 x 0.7 = 21.01 Southwest0.9x 0.77 x 0.67 x 44.07 0.63 x 0.7 = 9.02	(79) (79)
Southwest _{0.9x} 0.77 x 0.67 x 44.07 0.63 x 0.7 = 9.02	(79)
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Southwest _{0.9x} 0.77 x 0.72 x 44.07 0.63 x 0.7 = 9.7	(79)
	_
Southwest _{0.9x} 0.77 x 3.44 x 31.49 0.63 x 0.7 = 33.1	(79)
Southwest _{0.9x} 0.77 x 1.56 x 31.49 0.63 x 0.7 = 15.01	(79)
Southwest _{0.9x} 0.77 x 0.67 x 31.49 0.63 x 0.7 = 6.45	(79)
Southwest _{0.9x} 0.77 x 0.72 x 31.49 0.63 x 0.7 = 6.93	(79)
Rooflights 0.9x 1 x 0.47 x 26 x 0.63 x 0.8 = 11.09	(82)
Rooflights 0.9x 1 x 0.63 x 26 x 0.63 x 0.8 = 14.86	(82)
Rooflights 0.9x 1 x 0.84 x 26 x 0.63 x 0.8 = 29.72	(82)
Rooflights 0.9x 1 x 0.62 x 26 x 0.63 x 0.8 = 7.31	(82)
Rooflights 0.9x 1 x 2.36 x 26 x 0.63 x 0.8 = 27.83	(82)
Rooflights 0.9x 1 x 2.15 x 26 x 0.63 x 0.8 = 25.36	(82)
Rooflights 0.9x 1 x 3.27 x 26 x 0.63 x 0.8 = 38.57	(82)
Rooflights 0.9x 1 x 0.89 x 26 x 0.63 x 0.8 = 10.5	(82)
Rooflights 0.9x 1 x 1.29 x 26 x 0.63 x 0.8 = 15.21	(82)
Rooflights 0.9x 1 x 2.37 x 26 x 0.63 x 0.8 = 27.95	(82)
Rooflights 0.9x 1 x 0.47 x 54 x 0.63 x 0.8 = 23.02	(82)
Rooflights 0.9x 1 x 0.63 x 54 x 0.63 x 0.8 = 30.86	(82)
Rooflights 0.9x 1 x 0.84 x 54 x 0.63 x 0.8 = 61.73	(82)
Rooflights 0.9x 1 x 0.62 x 54 x 0.63 x 0.8 = 15.19	(82)
Rooflights 0.9x 1 x 2.36 x 54 x 0.63 x 0.8 = 57.81	(82)
Rooflights 0.9x 1 x 2.15 x 54 x 0.63 x 0.8 = 52.66	(82)
Rooflights 0.9x 1 x 3.27 x 54 x 0.63 x 0.8 = 80.1	(82)
Rooflights 0.9x 1 x 0.89 x 54 x 0.63 x 0.8 = 21.8	(82)
Rooflights 0.9x 1 x 1.29 x 54 x 0.63 x 0.8 = 31.6	(82)
Rooflights 0.9x 1 x 2.37 x 54 x 0.63 x 0.8 = 58.05	(82)
Rooflights 0.9x 1 x 0.47 x 96 x 0.63 x 0.8 = 40.93	(82)
Rooflights 0.9x 1 x 0.63 x 96 x 0.63 x 0.8 = 54.87	(82)
Rooflights 0.9x 1 x 0.84 x 96 x 0.63 x 0.8 = 109.73	(82)
Rooflights 0.9x 1 x 0.62 x 96 x 0.63 x 0.8 = 27	(82)
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Rooflights 0.9x		٦ ,	0.00	1	00	1	0.00	l "	0.0	1 =	400.77	7(02)
Rooflights 0.9x	1] X]	2.36	X 1	96	X	0.63	X	0.8]	102.77	(82)
Rooflights 0.9x	1] X]	2.15	X	96	X	0.63	X	0.8] = 1 _	93.62	(82)
Rooflights 0.9x	1	X	3.27	X	96	X	0.63	X	0.8] = 1	142.39	(82)
	1	X	0.89	X	96	X	0.63	X	0.8] = 1	38.76	(82)
Rooflights 0.9x	1	X	1.29	X	96	X	0.63	X	0.8] = 1	56.17	(82)
Rooflights 0.9x	1	X	2.37	X	96] X	0.63	X	0.8] = 1	103.2	(82)
Rooflights 0.9x	1	X	0.47	X	150] X]	0.63	X	0.8] =	63.96	(82)
Rooflights 0.9x	1	X	0.63	X	150	X	0.63	X	0.8] = 1	85.73	(82)
Rooflights 0.9x	1	X	0.84	X	150	X	0.63	X	0.8] =	171.46	(82)
Rooflights 0.9x	1	X	0.62	X	150	X	0.63	X	0.8] =	42.18	(82)
Rooflights 0.9x	1	X	2.36	X	150	X	0.63	X	0.8] =	160.57	(82)
Rooflights _{0.9x}	1	X	2.15	X	150	X	0.63	X	0.8] =	146.29	(82)
Rooflights 0.9x	1	X	3.27	X	150	X	0.63	X	0.8	=	222.49	(82)
Rooflights _{0.9x}	1	X	0.89	X	150	X	0.63	X	0.8	_ =	60.56	(82)
Rooflights _{0.9x}	1	X	1.29	X	150	X	0.63	X	0.8	=	87.77	(82)
Rooflights _{0.9x}	1	X	2.37	X	150	X	0.63	X	0.8	=	161.25	(82)
Rooflights _{0.9x}	1	X	0.47	X	192	X	0.63	X	0.8] =	81.87	(82)
Rooflights 0.9x	1	X	0.63	X	192	X	0.63	X	0.8	=	109.73	(82)
Rooflights 0.9x	1	X	0.84	X	192	X	0.63	X	0.8	=	219.47	(82)
Rooflights _{0.9x}	1	X	0.62	X	192	X	0.63	X	0.8	=	54	(82)
Rooflights _{0.9x}	1	X	2.36	X	192	X	0.63	X	0.8	=	205.54	(82)
Rooflights _{0.9x}	1	x	2.15	x	192	x	0.63	x	0.8] =	187.25	(82)
Rooflights _{0.9x}	1	X	3.27	X	192	X	0.63	x	0.8] =	284.79	(82)
Rooflights _{0.9x}	1	X	0.89	x	192	x	0.63	X	0.8	=	77.51	(82)
Rooflights _{0.9x}	1	X	1.29	x	192	x	0.63	X	0.8] =	112.35	(82)
Rooflights _{0.9x}	1	X	2.37	X	192	x	0.63	X	0.8	=	206.41	(82)
Rooflights _{0.9x}	1	X	0.47	x	200	x	0.63	x	0.8	=	85.28	(82)
Rooflights _{0.9x}	1	x	0.63	x	200	x	0.63	x	0.8	=	114.31	(82)
Rooflights _{0.9x}	1	х	0.84	x	200	x	0.63	x	0.8	=	228.61	(82)
Rooflights 0.9x	1	X	0.62	x	200	x	0.63	x	0.8	=	56.25	(82)
Rooflights _{0.9x}	1	X	2.36	x	200	x	0.63	x	0.8] =	214.1	(82)
Rooflights _{0.9x}	1	X	2.15	x	200	x	0.63	x	0.8] =	195.05	(82)
Rooflights 0.9x	1	X	3.27	x	200	x	0.63	x	0.8] =	296.65	(82)
Rooflights 0.9x	1	x	0.89	x	200	х	0.63	х	0.8	j =	80.74	(82)
Rooflights 0.9x	1	x	1.29	x	200	х	0.63	x	0.8	j =	117.03	(82)
Rooflights _{0.9x}	1	j x	2.37	x	200	x	0.63	x	0.8	j =	215.01	(82)
Rooflights _{0.9x}	1	X	0.47	x	189	x	0.63	x	0.8] =	80.59	(82)
Rooflights _{0.9x}	1	i x	0.63	X	189	X	0.63	x	0.8] =	108.02	(82)
Rooflights _{0.9x}	1	i x	0.84	X	189	X	0.63	x	0.8] =	216.04	(82)
Rooflights _{0.9x}	1	i x	0.62	x	189	x	0.63	x	0.8	j =	53.15	(82)
Rooflights _{0.9x}	1] x	2.36	X	189	X	0.63	X	0.8] =	202.32	(82)
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Rooflights 0.9x	11	X	2.15	X	189	X	0.63	X	0.8	=	184.32	(82)
Rooflights 0.9x	1	X	3.27	X	189	X	0.63	X	0.8	=	280.34	(82)
Rooflights 0.9x	1	X	0.89	X	189	X	0.63	X	0.8	=	76.3	(82)
Rooflights 0.9x	1	X	1.29	X	189	X	0.63	X	0.8	=	110.59	(82)
Rooflights _{0.9x}	1	X	2.37	X	189	X	0.63	X	0.8	=	203.18	(82)
Rooflights _{0.9x}	1	X	0.47	X	157	X	0.63	X	0.8	=	66.94	(82)
Rooflights 0.9x	1	X	0.63	X	157	X	0.63	X	0.8	=	89.73	(82)
Rooflights _{0.9x}	1	X	0.84	X	157	X	0.63	X	0.8	=	179.46	(82)
Rooflights _{0.9x}	1	X	0.62	X	157	X	0.63	X	0.8	=	44.15	(82)
Rooflights 0.9x	1	X	2.36	X	157	X	0.63	X	0.8	=	168.07	(82)
Rooflights 0.9x	1	X	2.15	X	157	X	0.63	X	0.8	=	153.11	(82)
Rooflights 0.9x	1	X	3.27	X	157	X	0.63	X	0.8	=	232.87	(82)
Rooflights 0.9x	1	X	0.89	x	157	x	0.63	X	0.8	=	63.38	(82)
Rooflights 0.9x	1	X	1.29	X	157	x	0.63	X	0.8	=	91.87	(82)
Rooflights _{0.9x}	1	x	2.37	x	157	X	0.63	X	0.8	=	168.78	(82)
Rooflights 0.9x	1	X	0.47	x	115	X	0.63	X	0.8] =	49.03	(82)
Rooflights 0.9x	1	x	0.63	X	115	X	0.63	X	0.8] =	65.73	(82)
Rooflights 0.9x	1	X	0.84	x	115	X	0.63	X	0.8	=	131.45	(82)
Rooflights 0.9x	1	x	0.62	x	115	x	0.63	X	0.8	=	32.34	(82)
Rooflights 0.9x	1	х	2.36	x	115	x	0.63	x	0.8	Ī =	123.11	(82)
Rooflights 0.9x	1	х	2.15	x	115	x	0.63	x	0.8	j =	112.15	(82)
Rooflights 0.9x	1	x	3.27	x	115	x	0.63	x	0.8	j =	170.58	(82)
Rooflights 0.9x	1	x	0.89	x	115	X	0.63	x	0.8	j =	46.43	(82)
Rooflights 0.9x	1	x	1.29	x	115	x	0.63	x	0.8	j =	67.29	(82)
Rooflights 0.9x	1	x	2.37	x	115	x	0.63	x	0.8	j =	123.63	(82)
Rooflights 0.9x	1	x	0.47	x	66	X	0.63	x	0.8	j =	28.14	(82)
Rooflights 0.9x	1	x	0.63	x	66	x	0.63	x	0.8	j =	37.72	(82)
Rooflights 0.9x	1	х	0.84	x	66	x	0.63	X	0.8	j =	75.44	(82)
Rooflights 0.9x	1	х	0.62	x	66	X	0.63	X	0.8	=	18.56	(82)
Rooflights 0.9x	1	х	2.36	x	66	x	0.63	X	0.8	j =	70.65	(82)
Rooflights 0.9x	1	x	2.15	x	66	x	0.63	x	0.8	i =	64.37	(82)
Rooflights 0.9x	1	x	3.27	x	66	x	0.63	x	0.8	=	97.9	(82)
Rooflights 0.9x	1	x	0.89	x	66	x	0.63	X	0.8	i =	26.64	(82)
Rooflights 0.9x	1	x	1.29	x	66	x	0.63	x	0.8	j =	38.62	(82)
Rooflights 0.9x	1	x	2.37	x	66	x	0.63	x	0.8	i =	70.95	(82)
Rooflights 0.9x	1	X	0.47	X	33	X	0.63	x	0.8	, =	14.07	(82)
Rooflights 0.9x	1	X	0.63	X	33	X	0.63	x	0.8	=	18.86	(82)
Rooflights 0.9x	1	X	0.84	X	33	X	0.63	x	0.8	; =	37.72	(82)
Rooflights 0.9x	1) x	0.62	X	33	X	0.63	x	0.8	=	9.28	(82)
Rooflights 0.9x	1	X	2.36	X	33	X	0.63	x	0.8	 =	35.33	(82)
Rooflights 0.9x	1	X	2.15	X	33	X	0.63	x	0.8] =	32.18	(82)
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Roofligh	its _{0.9x}	1	X	3.2	27	x		33	x	0.63	x	0.8		=	48.95	(82)
Roofligh	its _{0.9x}	1	X	3.0	39	x		33	x	0.63	x	0.8		=	13.32	(82)
Roofligh	its _{0.9x}	1	X	1.2	29	x		33	x	0.63	x	0.8		=	19.31	(82)
Roofligh	nts _{0.9x}	1	X	2.3	37	x		33	x	0.63	X	0.8		=	35.48	(82)
Roofligh	nts _{0.9x}	1	X	0.4	1 7	x		21	x	0.63	х	0.8		=	8.95	(82)
Roofligh	nts _{0.9x}	1	X	0.6	63	x		21	х	0.63	x	0.8		=	12	(82)
Roofligh	nts 0.9x	1	X	3.0	34	х		21	х	0.63	x	0.8		=	24	(82)
Roofligh	nts _{0.9x}	1	X	0.6	62	x		21	x	0.63	x	0.8		=	5.91	(82)
Roofligh	nts _{0.9x}	1	X	2.3	36	х		21	x	0.63	x	0.8		=	22.48	(82)
Roofligh	nts 0.9x	1	X	2.1	15	х		21	x	0.63	x	0.8		=	20.48	(82)
Roofligh	nts _{0.9x}	1	X	3.2	27	х		21	х	0.63	x	0.8		=	31.15	(82)
Roofligh	nts _{0.9x}	1	X	0.0	39	х		21	х	0.63	x	0.8		=	8.48	(82)
Roofligh	nts _{0.9x}	1	X	1.2	29	x		21	x	0.63	×	0.8		=	12.29	(82)
Roofligh	nts _{0.9x}	1	X	2.3	37	x		21	x	0.63	×	0.8		=	22.58	(82)
	_					٠										
Solar ga	ains in v	watts, ca	alculated	I for eac	h month)			(83)m	= Sum(74)m	(82)n	1				
(83)m=	382.63	742.55	1227.62	1827.58	2291.9	23	373.71	2248.26	1892.	98 1437.23	880.5	9 475.5	31	5.9		(83)
Total ga	ains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (8	33)m ,	watts		•	•	•	•		4	
(84)m=	1005.44	1361.88	1823.37	2385.38	2810.09	28	355.46	2707.65	2360.	54 1925.58	3 1407.	14 1045.5	3 919	9.46		(84)
7. Mea	an interr	nal temp	erature	(heating	seasor	1)				-		-				
				eriods ir		<u> </u>	area f	rom Tab	ole 9	Th1 (°C)					21	(85)
		J														
l Itilisat	tion fact	tor for a	ains for	living are	≏ah1 m	_			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(0)						(/
Utilisat	I	Ť		living are) (se	ee Ta	ble 9a)			T 00	t Nov	, г)ec]	
	Jan	tor for ga Feb	Mar	Apr	May	n (se	ee Ta Jun	ble 9a) Jul	Au	g Sep	Oc.	+	+)ec 1]	
(86)m=	Jan 1	Feb 1	Mar 0.99	Apr 0.97	May 0.93	n (se	ee Ta Jun 0.84	Jul 0.73	A u	g Sep 0.94	Oc 0.99	+	+)ec 1		(86)
(86)m= Mean	Jan 1 internal	Feb 1 tempera	Mar 0.99 ature in	Apr 0.97 living are	0.93 ea T1 (f	ollor	ee Ta Jun 0.84 w ste	ble 9a) Jul 0.73 os 3 to 7	Au 0.8 ' in Ta	g Sep 0.94 able 9c)	0.99	1		1]	(86)
(86)m= Mean (87)m=	Jan 1 internal	Feb 1 tempera 18.28	Mar 0.99 ature in 18.74	Apr 0.97 living are	May 0.93 ea T1 (for 20.02	ollov	Jun 0.84 w step 20.53	ble 9a) Jul 0.73 os 3 to 7 20.78	Au 0.8 ' in Ta 20.7	g Sep 0.94 able 9c) 1 20.24	+	1				
(86)m=	Jan 1 internal 18.05 erature	Feb 1 tempera 18.28 during h	Mar 0.99 ature in 18.74 eating p	Apr 0.97 living ard 19.39 periods in	May 0.93 ea T1 (for 20.02	ollov	ee Ta Jun 0.84 w step 0.53 relling	ble 9a) Jul 0.73 ps 3 to 7 20.78 from Ta	Au 0.8 ' in Ta 20.7 ble 9	g Sep 0.94 able 9c) 1 20.24 , Th2 (°C)	0.99	1 18.64	18	.03		(86)
(86)m= Mean (87)m=	Jan 1 internal	Feb 1 tempera 18.28	Mar 0.99 ature in 18.74	Apr 0.97 living are	May 0.93 ea T1 (for 20.02	ollov	Jun 0.84 w step 20.53	ble 9a) Jul 0.73 os 3 to 7 20.78	Au 0.8 ' in Ta 20.7	g Sep 0.94 able 9c) 1 20.24 , Th2 (°C)	0.99	1 18.64	18	1		(86)
(86)m=	Jan 1 internal 18.05 erature 18.94	Feb 1 tempera 18.28 during h	Mar 0.99 ature in 18.74 eating p	Apr 0.97 living ard 19.39 periods in	May 0.93 ea T1 (for 20.02 n rest of 18.97	ollovidw	Jun 0.84 w step 0.53 relling 8.99	ble 9a) Jul 0.73 ps 3 to 7 20.78 from Ta 18.99	0.8 ' in Ta 20.7 ble 9	g Sep 0.94 able 9c) 1 20.24 , Th2 (°C)	0.99	1 18.64	18	.03		(86)
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(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m=	Jan 1 internal 18.05 erature 18.94 tion fact 1 internal 16.39	Feb 1 tempera 18.28 during h 18.94 tor for ga 1 tempera 16.62	Mar 0.99 ature in 18.74 eating p 18.94 ains for 0.99 ature in 17.08	Apr 0.97 living ard 19.39 periods in 18.96 rest of d 0.96 the rest 17.73	May 0.93 ea T1 (for 20.02 n rest of 18.97 welling, 0.88 of dwell 18.34	(se	ee Ta Jun 0.84 w step 0.53 relling 8.99 m (se 0.71 T2 (fo 8.79	Jul 0.73 0.73 0.78 os 3 to 7 20.78 from Ta 18.99 e Table 0.49 ollow ste	Au 0.8 7 in Ta 20.7 8ble 9 18.9 9a) 0.58 8ps 3	g Sep 0.94 able 9c) 1 20.24 Th2 (°C) 9 18.98 0.87 to 7 in Tak 2 18.57	0.99 19.4 18.9 0.98 ble 9c) 17.7 fLA = L	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	18	.03		(86) (87) (88) (89)
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(86)m= Mean (87)m= Tempe (88)m= Utilisat (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti the util	Jan 1 internal 18.05 erature 18.94 tion fact 1 internal 16.39 internal 16.63 adjustm 16.63 ace heat to the n llisation Jan	Feb 1 tempera 18.28 during h 18.94 tor for ga 1 tempera 16.62 tempera 16.86 nent to th 16.86 ting required interperation interperation interperation interperation interperation for Feb	Mar 0.99 ature in 18.74 eating p 18.94 ains for 0.99 ature in 17.08 ature (for 17.32 ne mean 17.32 direment ernal ternal	Apr 0.97 living are 19.39 periods in 18.96 rest of d 0.96 the rest 17.73 or the wh 17.97 n interna 17.97 mperaturusing Tal	May 0.93 ea T1 (for 20.02 n rest of 18.97 welling, 0.88 of dwell 18.34 nole dwell 18.58 I temper 18.58 re obtain able 9a	ollor 2 dw 11 h2, c ing 11 ratu 11 med	ee Ta Jun 0.84 w step 0.53 relling 8.99 m (se 0.71 T2 (fc 8.79 g) = fL 9.04 at ste	ble 9a) Jul 0.73 ps 3 to 7 20.78 from Ta 18.99 e Table 0.49 bllow ste 18.95 A × T1 19.21 m Table 19.21 ep 11 of	Au 0.8 7 in Ta 20.7 8ble 9 18.9 9a) 0.58 18.9 + (1 - 19.1 4e, v 19.1	g Sep 0.94 able 9c) 1 20.24 , Th2 (°C) 9 18.98 3 0.87 to 7 in Tal 2 18.57 -fLA) × T2 8 18.81 where app 8 18.81 e 9b, so th g Sep	0.99 19.4 18.9 0.98 0.98 0.98 17.7 fLA = L 2 18.0 ropriate 18.0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	18 18 18 16 16 16 16 16	.03 .95 .38	0.15	(86) (87) (88) (89) (90) (91) (92)

l leefu	ıl naine	hmGm	, W = (94	1)m v (8,	1)m									
			1787.74			2050 61	1424.97	1433 35	1663 76	1370.58	1039 57	917.25		(95)
` ′			ernal tem				1		.0000	1070100		011120		, ,
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
` '	loss rat	<u> </u>	an intern	l al tempe	erature.	Lm . W :	I =[(39)m :	x [(93)m-	 _ (96)m	l 1			l	
		7538.32		5624.09		2711.97	-` 	-``	2892.17		6296.32	7757.88		(97)
Space	L e heatir	na reauire	ement fo	r each n	nonth. k\	Mh/mon [·]	th = 0.02	24 x [(97])m – (95)ml x (4	L 1)m	l .		
(98)m=	5051		3728.25		1357.03	1	0	0	0	2395.9	·	5089.43		
		·				<u> </u>		Tota	l per year	L (kWh/year) = Sum(9	8) _{15,912} =	27990.3	(98)
Space	e heatin	na reauir	ement in	kWh/m²	/vear							,	117.3	(99)
-			quiremen		,,,								117.0	
		Ĭ	July and		Soo Tol	blo 10b								
Calcu	Jan	Feb	Mar	August.	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I			alculated	<u> </u>		L								
(100)m=		0	0	0	0	5741.92			0	0	0	0		(100)
` ′		tor for lo	ss hm			l .	<u> </u>						l	
(101)m=		0	0	0	0	0.51	0.58	0.52	0	0	0	0		(101)
		nmLm (V	Vatts) = ((100)m x	(101)m	!	<u> </u>	<u> </u>		<u> </u>		ļ		
(102)m=		0	0	0	0	2902.09	2628.26	2413.04	0	0	0	0		(102)
Gains	(solar	gains ca	lculated	tor appli	cable w	eather re	egion, se	e Table	10)	<u> </u>		ļ	1	
(103)m=	<u> </u>	0	0	0	0	3213.4	<u> </u>	2694.15	0	0	0	0		(103)
Space	e coolin	g require	ement fo	r month,	whole o	lwelling,	continue	ous (kW	h' = 0.0	24 x [(10	03)m — (°	102)m] :	x (41)m	
set (1	04)m to	zero if ((104)m <	3 × (98)m								•	
(104)m=	0	0	0	0	0	0	315.53	0	0	0	0	0		
										= Sum(,	=	315.53	(104)
Cooled									f C =	cooled	area ÷ (4	4) =	0.29	(105)
ı		<u> </u>	able 10b			0.05	1 0.05	0.05	_					
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0 T-4-	0	0	0	_	7(100)
Space	cooling	ı roquiro	ment for	month -	(104)m	v (105)	v (106)r	n	ıotai	l = Sum(1 04)	=	0	(106)
(107)m=		0	0	0	0	0	23.14	0	0	0	0	0		
(107)	Ů	<u> </u>		Ŭ	Ů		20.14			l = Sum(=	23.14	(107)
Canan	!:			1 A / la / las 2 /s						,	19291)	_		 ` ` `
•		'	ment in k						` ') ÷ (4) =			0.1	(108)
	<u> </u>	•	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
-	e heati	_	at from s	econdar	u/eunnle	mentary	, evetem						0	(201)
						illelital y	-		(201) -					⊣ ՝ ՝
			at from m	-	` '			(202) = 1 -		,			1	(202)
Fracti	on of to	otal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								90.3	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heatin	g systen	ո, %						0	(208)
Coolir	ng Syst	em Ener	gy Efficie	ency Rat	tio								4.32	(209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	— ear
Space	e heatir	ng require	ement (c	alculate	d above)								
	5051	4157.32	3728.25	2426.51	1357.03	0	0	0	0	2395.9	3784.86	5089.43		
'														

11)m = {[(98)m x (204)] } x							,				(2
5593.58 4603.9 4128.7	74 2687.17	1502.8	0	0	0	0		4191.43			_
					lota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	2	30997.01	(2
pace heating fuel (second	• / /	month									
$ \begin{array}{c c} [(98)m \times (201)] \\ \hline 5)m = 0 & 0 & 0 \end{array} $	0	0	0	0	0	0	0	0	0		
, <u> </u>					Tota	l (kWh/yea	I ar) =Sum(2	L 215) _{15,1012}	<u></u>	0	(2
ater heating									l		
ıtput from water heater (ca							•	ı			
234.16 206.25 216.3	193.46	189.27	168.67	161.56	177.87	177.74	200.63	212.69	228.38	0.4	
iciency of water heater 7)m= 89.84 89.81 89.74	89.54	89.05	81	81	81	81	89.51	89.75	89.86	81	(2 (2
el for water heating, kWh/i		09.03	01	01	01	01	09.51	09.73	09.00		(2
$19)m = (64)m \times 100 \div (21)$											
9)m= 260.63 229.65 241.0	4 216.06	212.55	208.23	199.45	219.59	219.44	224.15	236.98	254.15		_
and and the first take (a.u.41-				Гota	ı = Sum(2	(19a) ₁₁₂ =			2721.92	(2
pace cooling fuel, kWh/m 21)m = (107)m÷ (209)	ontn.										
1)m= 0 0 0	0	0	0	5.36	0	0	0	0	0		
					Tota	I = Sum(2	21) ₆₈ =			5.36	(2
nual totals							k'	Wh/year		kWh/yea	ar_
ace heating fuel used, ma	in system	1								30997.01	
ater heating fuel used										2721.92	
ace cooling fuel used										5.36	
ectricity for pumps, fans an	d electric	keep-ho	t								
entral heating pump:									30		(2
tal electricity for the above	, kWh/yea	ır			sum	of (230a).	(230g) =			30	(2
ectricity for lighting										805.58	(2
2a. CO2 emissions – Indiv	idual heat	ing syste	ems inclu	uding mi	cro-CHF						
			Fn	ergy			Fmice	ion fac	tor	Emission	•
				/h/year			kg CO			kg CO2/ye	
ace heating (main system	1)		(211	1) x			0.2	16	=	6695.35	(2
ace heating (secondary)			(215	5) x			0.5	19	=	0	<u></u>
ater heating			(219	9) x			0.2		= [587.93	(2
ace and water heating			(261	1) + (262) ·	+ (263) + (264) =			[7283.29	(2
ace cooling) x		•	0.5	10	= [2.78	(2
_	nd electric	keen ho		1) x					= [=
actricity for number take on	ia electric	veeh-110	(20)				0.5	19	l	15.57	(2
ectricity for pumps, fans an			(22)\ v			_	, , I	_		//
ectricity for lighting			(232	2) x			0.5		= [418.1	=
ectricity for pumps, fans an ectricity for lighting tal CO2, kg/year velling CO2 Emission Ra			(232	2) x			0.5 of (265)(2 ÷ (4) =		= [418.1 7719.74	(2

El rating (section 14) 64 (274)

			User D	etails: _						
Assessor Name:	Chris Hock	noll	– - 0361 L	Strom	o Nives	ber:		STD0	016363	
Software Name:	Stroma FS			Softwa					on: 1.0.4.26	
Software Name:	Stroma PS							versio	JII. 1.0. 4 .20	
A 1.1			Property			=xisting				
Address: 1. Overall dwelling dime		ndfield Gardens	, LONDC	JIN, INVVS	6 6 P U					
1. Overall dwelling dime	ensions.		Δ	n (m²)		Av. Ua	iaht/m\		Valuma/m³	31
Ground floor				a(m²)	[(10) x		eight(m)	7(20) -	Volume(m ³	<u>.</u>
				98.7	(1a) x		2.5	(2a) =	246.75	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	98.7	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	246.75	(5)
2. Ventilation rate:										
	main heating	seconda heating	ry	other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [0] = [0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	Ħ + F	0	j = [0	х	20 =	0	(6b)
Number of intermittent fa	ans					3	×	10 =	30	(7a)
Number of passive vents					L			10 =		Ⅎ``
·					Ļ	0			0	(7b)
Number of flueless gas f	ires					0	X	40 =	0	(7c)
								Δir ch	anges per ho	nur.
Letter Born born to the	((C-) (Ch) (7-1./751./	7-) -	_					_
Infiltration due to chimne					L L	30		÷ (5) =	0.12	(8)
If a pressurisation test has be Number of storeys in t			ea to (17), (otnerwise (continue tr	om (9) to	(10)			(9)
Additional infiltration	ne dweiling (na	·)					[/9])-1]x0.1 =	0	(10)
Structural infiltration: 0	25 for steel or	timber frame o	r 0.35 fo	r masoni	rv consti	ruction	I(°	, 1,10.1	0	(11)
if both types of wall are p					•				0	(/
deducting areas of openi	• ,									_
If suspended wooden		,).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en									0	(13)
Percentage of window	s and doors dra	aught stripped		0.05 10.0		1001			0	(14)
Window infiltration				0.25 - [0.2		_			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value,			•	•	•	etre of e	envelope	area	10	(17)
If based on air permeabi	•								0.62	(18)
Air permeability value applie		on test has been do	ne or a de	gree air pe	rmeability	is being u	sed		_	_
Number of sides sheltered	ed			(00) - 4	[0 0 7 E + //	10)1 -			2	(19)
Shelter factor				(20) = 1 -		19)] =			0.85	(20)
Infiltration rate incorpora	-			(21) = (18) x (20) =				0.53	(21)
Infiltration rate modified	 	'	1, .1	Λ	0.5:-		NI=	Dat]	
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			1			1	1 . =	1 -	1	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4									
(220)m= 1.27 1.25		1.09 0.05	T 0.05	1 0 00		1 00	1 440	1 440	l	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltr	ation rate	(allowi	ng for sh	nelter an	nd wind s	peed) =	(21a) x	(22a)m				_	
0.67	0.66	0.65	0.58	0.57	0.5	0.5	0.49	0.53	0.57	0.59	0.62]	
Calculate effec		•	rate for t	he appli	cable ca	se			-		-		(00)
If mechanicate of the street o			endix N (2	3h) = (23a	a) x Fmv (e	equation (NS)) other	wise (23h) = (23a)			0	(238
If balanced with									(200)			0	(23k
		-	-	_					2h)m + (2	226) v [1 (220	0 \ ÷ 1001	(230
a) If balance (24a)m= 0		0	0	0	0	0	0	0	0	0 0	0) + 100j]	(24a
b) If balance]	(
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24)
c) If whole h	LL											J	(=
,	n < 0.5 × (•	•				.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(240
d) If natural	ventilatior	n or wh	ole hous	e positiv	ve input	ventilati	on from l	oft	!!			J	
,	n = 1, the				•				0.5]				
(24d)m= 0.73	0.72	0.71	0.67	0.66	0.63	0.63	0.62	0.64	0.66	0.68	0.69		(240
Effective air	change ra	ate - er	nter (24a) or (24l	b) or (24	c) or (24	d) in box	(25)	-		-	_	
(25)m= 0.73	0.72	0.71	0.67	0.66	0.63	0.63	0.62	0.64	0.66	0.68	0.69]	(25)
3. Heat losse	s and hea	at lose r	naramete	ar.								_	
ELEMENT	Gross		Openin		Net Ar	ea	U-valı	ıe	AXU		k-valu	e	ΑΧk
	area (m²)	· m		A ,r	n²	W/m2	K	(W/k	()	kJ/m²·	K	kJ/K
Doors					2.2	X	1.8	=	3.96				(26)
Windows Type	e 1				6.4	_x 1	/[1/(1.6)+	0.04] =	9.62				(27)
Windows Type	2				1.2	x1	/[1/(1.6)+	0.04] =	1.8				(27)
Windows Type	e 3				8.58	x1	/[1/(1.6)+	0.04] =	12.9				(27)
Windows Type	e 4				1.39	x1	/[1/(1.6)+	0.04] =	2.09				(27)
Floor					98.7	x	0.55	=	54.285	\neg [(28)
Walls Type1	22.19		5.56		16.63	3 x	0.55	<u> </u>	9.15	₹ i		- -	(29)
Walls Type2	31.7		17.3	3	14.32	<u>x</u>	0.28	= i	4.01	Ħ i		T F	(29)
Walls Type3	12.82		2.2		10.62	2 x	0.55	= i	5.84	≓ i		T F	(29)
Roof	33.18		0		33.18	x	0.18	╡┇	5.97	F i		=	(30)
Total area of e	elements,	m²			198.5	=							(31)
Party wall	·				36.56		0		0			— г	(32)
Party ceiling					65.52	=			<u> </u>			룩 누	(32)
* for windows and					alue calcul		formula 1	/[(1/U-valu	ıe)+0.04] as	L s given in	paragrapi	 h 3.2	(02)
** include the area				s and pan	titions		(26)(30)	+ (32) =				447	74 (22)
Fabric heat los Heat capacity		•	J)				(=0)(00)		(30) + (32) + (322)	(326) -	117.	
⊓eaι capacity Thermal mass	•	•) - Cm ·	. TE^\:	n k 1/m²!/			** /		, , ,	(326) =	18812	
THEITHAI IIIASS	paramet	⊃ı (ılvı⊦	- UIII 7	IFA) II	1 V7/111-1/			muica	tive Value:	MEGINIII		25) (35)
	sments whe	re the de	tails of the	construct	ion are no	known n	ecisely the	indicative	values of	TMP in T	able 1f		
For design assess can be used inste				construct	ion are no	t known pi	ecisely the	indicative	e values of	TMP in Ta	able 1f		
or design assess	ad of a deta	iled calcı	ulation.			·	recisely the	indicative	e values of	TMP in Ta	able 1f	29.7	79 (36

if details of therma		are not kn	own (36) =	= 0.05 x (3	1)								_
Total fabric he								, ,	(36) =	,,		147.5	(37)
Ventilation hea		ı		, 	Ι.	Ι	I .	·	`	25)m x (5)		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m= 59.19	58.47	57.77	54.47	53.85	50.97	50.97	50.44	52.08	53.85	55.1	56.4		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 206.69	205.97	205.27	201.96	201.35	198.47	198.47	197.94	199.58	201.35	202.6	203.9		_
		II D) \ \	l 217						•	Sum(39) ₁	12 /12=	201.96	(39)
Heat loss para	<u>`</u>	- 		204	2.04	1 2 24	0.04	`	= (39)m ÷	<u>` </u>	0.07	1	
(40)m= 2.09	2.09	2.08	2.05	2.04	2.01	2.01	2.01	2.02	2.04	2.05	2.07	2.05	(40)
Number of day	/s in moi	nth (Tab	le 1a)		_		_		average =	Sum(40) ₁	12 / 12=	2.05	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requi	irement:								kWh/y	ear:	
Δ												1	
Assumed occu if TFA > 13.9			[1 - evn	(<u>-</u> 0 0003	849 v /TF	-Δ ₋ 13 Ω)2)1 + 0 (1013 v (Γ F Δ _13		73		(42)
if TFA £ 13.9		1.70 X	Γι - exp	(-0.000	743 X (11	A - 13.3	<i>)</i> 2)]) X C1 OC	11 / - 10.	.9)			
Annual averag											4.18]	(43)
Reduce the annua							to achieve	a water us	se target o	f		1	
not more that 125	iitres per j	person per T	ay (ali w	rater use, r r	101 and co.	ia) 1		1				1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	day for ea	ach month	Vd,m = ta	ctor from	l able 1c x	(43)					1	
(44)m= 114.6	110.43	106.26	102.1	97.93	93.76	93.76	97.93	102.1	106.26	110.43	114.6		_
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1250.15	(44)
(45)m= 169.94	148.63	153.38	133.72	128.31	110.72	102.6	117.73	119.14	138.84	151.56	164.58		
	<u> </u>		<u>. </u>	<u>. </u>					Total = Su	m(45) ₁₁₂ =	=	1639.14	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)					_
(46)m= 25.49	22.3	23.01	20.06	19.25	16.61	15.39	17.66	17.87	20.83	22.73	24.69		(46)
Water storage			-					-					
Storage volum	, ,					ŭ		ame ves	sel		0		(47)
If community h	_			_			, ,		(01: /				
Otherwise if no		not wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (47)			
Water storage a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day).					0]	(48)
Temperature f				JI 10 KI10	WII (ICVVI	i, day j.]]	(49)
•				oor			(49) v (40)	\ <u>-</u>			0] 1	, ,
Energy lost fro b) If manufact		-	-		or is not		(48) x (49)) –			0	J	(50)
Hot water stora			•								0]	(51)
If community h	_			•		- •						ı	` '
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or ((54) in (5	55)									0		(55)

Water	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylind	ler contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Prima	ry circuit	loss (an	nual) fro	m Table	e 3							0		(58)
Prima	ry circuit	loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fr	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Comb	i loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m		_				
(61)m=	50.96	46.03	50.96	49.32	49.9	46.24	47.78	49.9	49.32	50.96	49.32	50.96		(61)
Total I	heat req	uired for	water he	eating ca	alculated	l for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	220.9	194.66	204.34	183.03	178.21	156.96	150.38	167.63	168.45	189.8	200.87	215.54		(62)
Solar D	HW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	additiona	I lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	it from w	ater hea	ter	-	-	-	-	-	-		-	-		
(64)m=	220.9	194.66	204.34	183.03	178.21	156.96	150.38	167.63	168.45	189.8	200.87	215.54		
			•			•	•	Outp	out from w	ater heate	r (annual) ₁	12	2230.77	(64)
Heat o	gains fro	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 :	x [(46)m	+ (57)m	+ (59)m]	_
(65)m=	69.25	60.93	CO 74	50.70			- ` ´ 	<u> </u>		-` <i>'</i>	<u> </u>	<u> </u>	-	
		00.00	63.74	56.79	55.14	48.37	46.06	51.62	51.94	58.9	62.72	67.46		(65)
incl		<u> </u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>	ļ	ļ	<u> </u>	<u> </u>		eating	(65)
	ude (57)	m in cald	culation (of (65)m	only if c	<u> </u>	<u> </u>	ļ	ļ	<u> </u>	<u> </u>		eating	(65)
5. In	ude (57) ternal ga	m in cald ains (see	culation of Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>	ļ	ļ	<u> </u>	<u> </u>		eating	(65)
5. In	ude (57) iternal ga polic gain	m in calc ains (see as (Table	culation of Table 5	of (65)m and 5a	only if o	ylinder i	s in the o	dwelling	or hot w	rater is fr	om com	munity h	eating	(65)
5. In	ude (57) iternal ga polic gain Jan	m in cald ains (see as (Table Feb	culation of Table 5 5), Wat	of (65)m and 5a ts Apr	only if c	ylinder is	<u> </u>	ļ	or hot w	<u> </u>	<u> </u>	munity h	eating	(65)
5. In Metab	ude (57) sternal ga polic gain Jan 136.36	m in calc ains (see as (Table Feb	E Table 5 5), Wat Mar 136.36	of (65)m 5 and 5a ts Apr 136.36	only if c): May 136.36	Jun 136.36	Jul 136.36	Aug 136.36	or hot w	vater is fr	om com	munity h	eating	
5. In Metab (66)m= Lightir	ude (57) nternal gain Jan 136.36	m in calc ains (see s (Table Feb 136.36 (calcula	Example 5 to 2 to	of (65)m and 5a ts Apr 136.36	only if construction only is constructed only in construction only in co	Jun 136.36	Jul 136.36 r L9a), a	Aug 136.36	Sep 136.36	Oct 136.36	Nov 136.36	Dec 136.36	eating	(66)
5. In Metab (66)m= Lightir (67)m=	ude (57) sternal gar polic gain Jan 136.36 ng gains 28.33	m in calcular in c	Table 5 2 5), Wat Mar 136.36 ted in Ap	of (65)m 6 and 5a tts Apr 136.36 ppendix 15.49	only if construction only if c	Jun 136.36 ion L9 o	Jul 136.36 r L9a), a	Aug 136.36 Iso see	Sep 136.36 Table 5	Oct 136.36	om com	munity h	eating	
5. In Metab (66)m= Lightir (67)m= Applia	ude (57) Iternal gar polic gain Jan 136.36 ng gains 28.33	m in calcains (see Feb 136.36 (calcula 25.16 ins (calc	Evaluation of Table 5 Evaluation of Table 5 Evaluation of Table 5 Evaluation of Table 5 Mar 136.36 ted in Ap 20.46 ulated in	of (65)m and 5a ts Apr 136.36 ppendix 15.49 Append	only if construction only if c	Jun 136.36 ion L9 o 9.78 uation L	Jul 136.36 r L9a), a 10.56	Aug 136.36 Iso see 13.73 3a), also	Sep 136.36 Table 5 18.43	Oct 136.36 23.4 ble 5	Nov 136.36 27.31	Dec 136.36	eating	(66) (67)
5. In Metab (66)m= Lightir (67)m= Applia (68)m=	ude (57) Iternal garage polic gain Jan 136.36 Ing gains 28.33 Inces ga 254.21	m in calc ains (see s (Table Feb 136.36 (calcula 25.16 ins (calc	Table 5 25), Wat Mar 136.36 ted in Ap 20.46 ulated ir 250.2	of (65)m 5 and 5a ts Apr 136.36 ppendix 15.49 Appendix 236.05	only if construction only if c	Jun 136.36 ion L9 o 9.78 uation L 201.39	Jul 136.36 r L9a), a 10.56 13 or L1	Aug 136.36 Iso see 13.73 3a), also	Sep 136.36 Table 5 18.43 see Ta	Oct 136.36 23.4 ble 5 208.34	Nov 136.36	Dec 136.36	eating	(66)
5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookii	ude (57) Iternal gar polic gain Jan 136.36 Ing gains 28.33 Inces ga 254.21 Ing gains	m in calc ains (see as (Table Feb 136.36 (calcula 25.16 ins (calc 256.85 (calcula	Table 5 2 5), Wat Mar 136.36 ted in Ap 20.46 ulated ir 250.2	of (65)m and 5a ts Apr 136.36 ppendix 15.49 Append 236.05 ppendix	only if construction only in construction only in construction only in c	Jun 136.36 ion L9 o 9.78 uation L 201.39	Jul 136.36 r L9a), a 10.56 13 or L1 190.18 or L15a	Aug 136.36 Iso see 13.73 3a), also 187.54), also se	Sep 136.36 Table 5 18.43 See Ta 194.19 ee Table	Oct 136.36 23.4 ble 5 208.34	Nov 136.36 27.31	Dec 136.36 29.12 242.99	eating	(66) (67)
5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookii (69)m=	ude (57) Iternal garage polic gain Jan 136.36 Ing gains 28.33 Inces ga 254.21 Ing gains 36.64	m in calcains (see Feb 136.36 (calcula 25.16 ins (calcula 256.85 (calcula 36.64	Table 5 25), Wat Mar 136.36 ted in Ap 20.46 ulated in 250.2 tted in A 36.64	of (65)m ts Apr 136.36 ppendix 15.49 Append 236.05 ppendix 36.64	only if construction only if c	Jun 136.36 ion L9 o 9.78 uation L 201.39	Jul 136.36 r L9a), a 10.56 13 or L1	Aug 136.36 Iso see 13.73 3a), also	Sep 136.36 Table 5 18.43 see Ta	Oct 136.36 23.4 ble 5 208.34	Nov 136.36 27.31	Dec 136.36	eating	(66) (67) (68)
5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pump	oolic gain Jan 136.36 ng gains 28.33 ances ga 254.21 ng gains 36.64 s and fai	m in calc ains (see s (Table Feb 136.36 (calcula 25.16 ins (calc 256.85 (calcula 36.64 ns gains	Table 5 25), Wat Mar 136.36 ted in Ap 20.46 ulated ir 250.2 ted in A 36.64 (Table 5	of (65)m 5 and 5a ts Apr 136.36 ppendix 15.49 Appendix 236.05 ppendix 36.64 5a)	only if construction only if c	Jun 136.36 ion L9 o 9.78 uation L 201.39 tion L15 36.64	Jul 136.36 r L9a), a 10.56 13 or L1 190.18 or L15a)	Aug 136.36 Iso see 13.73 3a), also 187.54), also se 36.64	Sep 136.36 Table 5 18.43 see Ta 194.19 ee Table 36.64	Oct 136.36 23.4 ble 5 208.34 25 36.64	Nov 136.36 27.31 226.2	Dec 136.36 29.12 242.99 36.64	eating	(66) (67) (68) (69)
5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookii (69)m= Pump (70)m=	ude (57) Iternal gar polic gain Jan 136.36 Ing gains 28.33 Innees ga 254.21 Ing gains 36.64 Is and fai	m in calc ains (see s (Table Feb 136.36 (calcula 25.16 ins (calc 256.85 (calcula 36.64 ns gains	ted in Apulated in	of (65)m ts Apr 136.36 ppendix 15.49 Appendix 236.05 ppendix 36.64 5a)	only if construction only if c	Jun 136.36 ion L9 of 9.78 uation L 201.39 tion L15 36.64	Jul 136.36 r L9a), a 10.56 13 or L1 190.18 or L15a	Aug 136.36 Iso see 13.73 3a), also 187.54), also se	Sep 136.36 Table 5 18.43 See Ta 194.19 ee Table	Oct 136.36 23.4 ble 5 208.34	Nov 136.36 27.31	Dec 136.36 29.12 242.99	eating	(66) (67) (68)
5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pump (70)m= Losse	oolic gain Jan 136.36 ng gains 28.33 ances ga 254.21 ng gains 36.64 s and fat	m in calc ains (see s (Table Feb 136.36 (calcula 25.16 ins (calc 256.85 (calcula 36.64 ns gains 3	ted in Ap 250.2 ted in A 36.64 (Table \$ 3 on (negar	of (65)m ts Apr 136.36 ppendix 15.49 Append 236.05 ppendix 36.64 5a) 3	only if construction only if c	Jun 136.36 ion L9 of 9.78 uation L 201.39 tion L15 36.64	Jul 136.36 r L9a), a 10.56 13 or L1 190.18 or L15a) 36.64	Aug 136.36 Iso see 13.73 3a), also 187.54), also se 36.64	Sep 136.36 Table 5 18.43 See Ta 194.19 ee Table 36.64	Oct 136.36 23.4 ble 5 208.34 e 5 36.64	Nov 136.36 27.31 226.2 36.64	Dec 136.36 29.12 242.99 36.64	eating	(66) (67) (68) (69)
5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pump (70)m= Losse (71)m=	oolic gain Jan 136.36 ng gains 28.33 ances ga 254.21 ng gains 36.64 s and fal as e.g. ev -109.09	m in calc ains (see as (Table Feb 136.36 (calcula 25.16 ins (calc 256.85 (calcula 36.64 as gains 3 raporatio -109.09	ted in Ap 250.2 ted in A 36.64 (Table 5 3 on (negar and a 109.09)	of (65)m ts Apr 136.36 ppendix 15.49 Appendix 236.05 ppendix 36.64 5a)	only if construction only if c	Jun 136.36 ion L9 of 9.78 uation L 201.39 tion L15 36.64	Jul 136.36 r L9a), a 10.56 13 or L1 190.18 or L15a)	Aug 136.36 Iso see 13.73 3a), also 187.54), also se 36.64	Sep 136.36 Table 5 18.43 see Ta 194.19 ee Table 36.64	Oct 136.36 23.4 ble 5 208.34 25 36.64	Nov 136.36 27.31 226.2	Dec 136.36 29.12 242.99 36.64	eating	(66) (67) (68) (69)
5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pump (70)m= Losse (71)m= Water	ude (57) Iternal gare Jan 136.36 Ing gains 28.33 Inces ga 254.21 Ing gains 36.64 Is and fall Is e.g. ev 109.09 Theating	m in calc ains (see as (Table Feb 136.36 (calcula 25.16 ins (calc 256.85 (calcula 36.64 as gains 3 vaporatio -109.09 gains (T	ted in Ap 20.46 ulated in Ap 36.64 (Table 5 3 on (negarable 5)	of (65)m 5 and 5a ts Apr 136.36 ppendix 15.49 Appendix 236.05 ppendix 36.64 5a) 3 tive value -109.09	only if construction only if c	Jun 136.36 ion L9 or 9.78 uation L 201.39 tion L15 36.64 3 ole 5) -109.09	Jul 136.36 r L9a), a 10.56 13 or L1 190.18 or L15a) 36.64	Aug 136.36 Iso see 13.73 3a), also 187.54), also se 36.64	Sep 136.36 Table 5 18.43 See Ta 194.19 ee Table 36.64	Oct 136.36 23.4 ble 5 208.34 25 36.64	Nov 136.36 27.31 226.2 36.64 3	Dec 136.36 29.12 242.99 36.64 3	eating	(66) (67) (68) (69) (70) (71)
5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pump (70)m= Losse (71)m= Water (72)m=	ude (57) Iternal garage polic gain Jan 136.36 Ing gains 28.33 Inces ga 254.21 Ing gains 36.64 Is and fair 3 Is e.g. ev -109.09 Inheating 93.07	m in calce in s (Table Feb 136.36 (Calcular 25.16 ins (Calcular 36.64 ins gains 3 (Calcular 30.09 gains (Table 90.67)	ted in Ap 20.46 ulated in 250.2 ted in A 36.64 (Table 5 3 on (negative) able 5) 85.67	of (65)m ts Apr 136.36 ppendix 15.49 Append 236.05 ppendix 36.64 5a) 3	only if construction only if c	Jun 136.36 ion L9 of 9.78 uation L 201.39 tion L15 36.64 3 ble 5) -109.09	Jul 136.36 r L9a), a 10.56 13 or L1 190.18 or L15a) 36.64	Aug 136.36 Iso see 13.73 3a), also 187.54), also se 36.64 3	Sep 136.36 Table 5 18.43 See Ta 194.19 ee Table 36.64	Oct 136.36 23.4 ble 5 208.34 2 5 36.64 3 -109.09	Nov 136.36 27.31 226.2 36.64 3	Dec 136.36 29.12 242.99 36.64 3 -109.09 90.68	eating	(66) (67) (68) (69)
5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookir (69)m= Pump (70)m= Losse (71)m= Water (72)m= Total	oolic gain Jan 136.36 ng gains 28.33 ances ga 254.21 ng gains 36.64 s and fal 3 s e.g. ev -109.09 heating 93.07 internal	m in calc ains (see s (Table Feb 136.36 (calcula 25.16 ins (calc 256.85 (calcula 36.64 ns gains 3 raporatio -109.09 gains (T 90.67 gains =	ted in Ap 20.46 ulated in 250.2 ted in A 36.64 (Table 5 3 on (negarable 5) 85.67	of (65)m 5 and 5a ts Apr 136.36 ppendix 15.49 Appendix 236.05 ppendix 36.64 5a) 3 tive valu -109.09	only if only i	Jun 136.36 ion L9 of 9.78 uation L 201.39 tion L15 36.64 3 ole 5) -109.09	Jul 136.36 r L9a), a 10.56 13 or L1 190.18 or L15a) 36.64 3	Aug 136.36 Iso see 13.73 3a), also 187.54), also se 36.64 3	Sep 136.36 Table 5 18.43 See Ta 194.19 See Table 36.64 3	Oct 136.36 23.4 ble 5 208.34 5 36.64 3 -109.09 79.17 (70)m + (7	Nov 136.36 27.31 226.2 36.64 3 -109.09 87.11 1)m + (72	Dec 136.36 29.12 242.99 36.64 3 -109.09 90.68	eating	(66) (67) (68) (69) (70) (71)
5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cookii (69)m= Pump (70)m= Losse (71)m= Water (72)m= Total (73)m=	oolic gain Jan 136.36 ng gains 28.33 ances ga 254.21 ng gains 36.64 s and fal 3 s e.g. ev -109.09 heating 93.07 internal	m in calc ains (see as (Table Feb 136.36 (calcula 25.16 ins (calc 256.85 (calcula 36.64 as gains 3 vaporatio -109.09 gains (T 90.67 gains =	ted in Ap 20.46 ulated in 250.2 ted in A 36.64 (Table 5 3 on (negative) able 5) 85.67	of (65)m 5 and 5a ts Apr 136.36 ppendix 15.49 Appendix 236.05 ppendix 36.64 5a) 3 tive value -109.09	only if construction only if c	Jun 136.36 ion L9 of 9.78 uation L 201.39 tion L15 36.64 3 ble 5) -109.09	Jul 136.36 r L9a), a 10.56 13 or L1 190.18 or L15a) 36.64	Aug 136.36 Iso see 13.73 3a), also 187.54), also se 36.64 3	Sep 136.36 Table 5 18.43 See Ta 194.19 ee Table 36.64	Oct 136.36 23.4 ble 5 208.34 2 5 36.64 3 -109.09	Nov 136.36 27.31 226.2 36.64 3	Dec 136.36 29.12 242.99 36.64 3 -109.09 90.68	eating	(66) (67) (68) (69) (70) (71)

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

Orientation: Access Fac Table 6d	tor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	x	6.4	x	11.28	x	0.63	x	0.7	=	22.07	(75)
Northeast _{0.9x} 0.77	×	1.2	x	11.28	x	0.63	х	0.7	=	8.28	(75)
Northeast 0.9x 0.77	×	8.58	x	11.28	x	0.63	х	0.7	=	29.59	(75)
Northeast 0.9x 0.77	x	6.4	x	22.97	x	0.63	x	0.7] =	44.92	(75)
Northeast 0.9x 0.77	X	1.2	x	22.97	x	0.63	х	0.7	=	16.85	(75)
Northeast 0.9x 0.77	X	8.58	x	22.97	x	0.63	х	0.7	=	60.22	(75)
Northeast _{0.9x} 0.77	×	6.4	x	41.38	x	0.63	х	0.7	=	80.93	(75)
Northeast _{0.9x} 0.77	X	1.2	X	41.38	X	0.63	х	0.7	=	30.35	(75)
Northeast _{0.9x} 0.77	X	8.58	x	41.38	x	0.63	х	0.7	=	108.5	(75)
Northeast _{0.9x} 0.77	X	6.4	X	67.96	X	0.63	х	0.7	=	132.92	(75)
Northeast _{0.9x} 0.77	X	1.2	X	67.96	X	0.63	х	0.7	=	49.84	(75)
Northeast _{0.9x} 0.77	X	8.58	x	67.96	X	0.63	х	0.7	=	178.19	(75)
Northeast _{0.9x} 0.77	X	6.4	X	91.35	X	0.63	х	0.7	=	178.67	(75)
Northeast _{0.9x} 0.77	X	1.2	x	91.35	X	0.63	х	0.7	=	67	(75)
Northeast 0.9x 0.77	X	8.58	x	91.35	x	0.63	х	0.7	=	239.52	(75)
Northeast _{0.9x} 0.77	X	6.4	x	97.38	x	0.63	х	0.7	=	190.48	(75)
Northeast _{0.9x} 0.77	X	1.2	x	97.38	X	0.63	х	0.7	=	71.43	(75)
Northeast 0.9x 0.77	X	8.58	x	97.38	x	0.63	х	0.7	=	255.36	(75)
Northeast _{0.9x} 0.77	×	6.4	x	91.1	x	0.63	х	0.7	=	178.19	(75)
Northeast _{0.9x} 0.77	X	1.2	x	91.1	x	0.63	х	0.7	=	66.82	(75)
Northeast 0.9x 0.77	X	8.58	x	91.1	x	0.63	х	0.7	=	238.88	(75)
Northeast _{0.9x} 0.77	X	6.4	x	72.63	x	0.63	х	0.7	=	142.05	(75)
Northeast _{0.9x} 0.77	x	1.2	x	72.63	X	0.63	х	0.7	=	53.27	(75)
Northeast _{0.9x} 0.77	X	8.58	X	72.63	X	0.63	х	0.7	=	190.44	(75)
Northeast _{0.9x} 0.77	X	6.4	x	50.42	x	0.63	x	0.7	=	98.62	(75)
Northeast _{0.9x} 0.77	X	1.2	x	50.42	x	0.63	x	0.7	=	36.98	(75)
Northeast _{0.9x} 0.77	x	8.58	X	50.42	X	0.63	х	0.7	=	132.21	(75)
Northeast _{0.9x} 0.77	X	6.4	X	28.07	x	0.63	x	0.7	=	54.9	(75)
Northeast 0.9x 0.77	X	1.2	x	28.07	x	0.63	X	0.7	=	20.59	(75)
Northeast _{0.9x} 0.77	X	8.58	x	28.07	x	0.63	x	0.7	=	73.6	(75)
Northeast _{0.9x} 0.77	X	6.4	x	14.2	x	0.63	x	0.7	=	27.77	(75)
Northeast 0.9x 0.77	X	1.2	x	14.2	x	0.63	x	0.7	=	10.41	(75)
Northeast _{0.9x} 0.77	X	8.58	X	14.2	X	0.63	х	0.7	=	37.23	(75)
Northeast _{0.9x} 0.77	X	6.4	X	9.21	X	0.63	х	0.7	=	18.02	(75)
Northeast _{0.9x} 0.77	X	1.2	x	9.21	x	0.63	х	0.7	=	6.76	(75)
Northeast _{0.9x} 0.77	×	8.58	x	9.21	x	0.63	х	0.7] =	24.16	(75)
Northwest 0.9x 0.77	×	1.39	x	11.28	x	0.63	х	0.7] =	19.17	(81)
Northwest 0.9x 0.77	×	1.39	x	22.97	x	0.63	x	0.7] =	39.03	(81)
Northwest 0.9x 0.77	X	1.39	x	41.38	x	0.63	X	0.7] =	70.31	(81)

Northwest 0.9x 0.7	7 ×	1.3	39	x	67.96	X		0.63	x	0.7	=	115.47	(81)
Northwest 0.9x 0.7	7 x	1.3	39	x [91.35	X		0.63	x [0.7	=	155.22	(81)
Northwest 0.9x 0.7	7 x	1.3	39	x	97.38	X		0.63	x	0.7	=	165.48	(81)
Northwest 0.9x 0.7	7 x	1.3	39	x	91.1	X		0.63	x	0.7	=	154.8	(81)
Northwest 0.9x 0.7	7 x	1.3	39	x	72.63	X		0.63	x [0.7	=	123.41	(81)
Northwest 0.9x 0.7	7 ×	1.3	39	x	50.42	X		0.63	x	0.7	=	85.68	(81)
Northwest 0.9x 0.7	7 x	1.3	39	x	28.07	X		0.63	x	0.7	=	47.69	(81)
Northwest 0.9x 0.7	7 ×	1.3	39	x $\overline{}$	14.2	X		0.63	x	0.7	=	24.12	(81)
Northwest 0.9x 0.7	7 ×	1.3	39	x	9.21	X		0.63	x	0.7	=	15.66	(81)
													
Solar gains in watts,	calculated	d for eac	h month			(83)m	n = Sur	m(74)m .	(82)m				
(83)m= 79.1 161.0°	290.1	476.42	640.4	682.	74 638.69	509	.17	353.49	196.77	99.53	64.6		(83)
Total gains – interna	and sola	r (84)m =	= (73)m ·	+ (83)	m , watts					•	•	_	
(84)m= 521.62 600.6	713.33	873.74	1011.19	102	8 968.24	846	.73	705.15	574.59	507.07	494.29		(84)
7. Mean internal ter	nperature	(heating	season)									
Temperature during	•	,		<i>'</i>	ea from Tal	ble 9.	, Th1	(°C)				21	(85)
Utilisation factor for	•			•		,	,	()					
Jan Feb	`	Apr	May	Ju		Α	ug	Sep	Oct	Nov	Dec		
(86)m= 1 1	0.99	0.98	0.93	0.8	4 0.73	0.7	79	0.94	0.99	1	1		(86)
Mean internal temp	arature in	livina ar	aa T1 (fo	llow/	etene 3 to ⁻	7 in T	ahla	صــــــــــــــــــــــــــــــــــــ			1	J	
(87)m= 18.62 18.79		19.7	20.24	20.6	-i	20		20.42	19.75	19.11	18.61	1	(87)
` '			<u> </u>	l									, ,
Temperature during (88)m= 19.27 19.28		19.3	19.31	19.3		19.	- -	2 (°C) 19.32	19.31	19.3	19.29	1	(88)
				l		<u> </u>	33	19.32	19.51	19.3	19.29		(00)
Utilisation factor for	gains for	1	welling,	h2,m	` i	9a)						7	
(89)m= 1 1	0.99	0.97	0.89	0.7	3 0.52	0.6	31	0.89	0.98	1	1		(89)
Mean internal temp	erature in	the rest	of dwelli	ng T2	2 (follow ste	eps 3	to 7	in Tabl	e 9c)				
(90)m= 17.18 17.36	17.72	18.27	18.79	19.1	7 19.29	19.	28	18.98	18.33	17.69	17.18		(90)
_								f	LA = Livir	ng area ÷ (4	4) =	0.32	(91)
Mean internal temp	erature (fo	or the wh	nole dwe	llina)	= fLA × T1	+ (1	– fLA	A) × T2					
(92)m= 17.65 17.82		18.73	19.26	19.6	-	19.		19.44	18.79	18.15	17.64]	(92)
Apply adjustment to	the mear	ı interna	l temper	uture	from Table	4e,	wher	e appro	priate	!		1	
(93)m= 17.65 17.82	18.18	18.73	19.26	19.6	5 19.8	19.	77	19.44	18.79	18.15	17.64]	(93)
8. Space heating re	quiremen	t				1							
Set Ti to the mean i	nternal te	mperatu	re obtain	ed at	step 11 of	[:] Tabl	le 9b,	, so tha	t Ti,m=((76)m an	d re-cal	culate	
the utilisation factor	for gains	using Ta	able 9a	ı								1	
Jan Feb		Apr	May	Ju	n Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisation factor for	-	1								1		1	(0.4)
(94)m= 1 0.99	0.99	0.96	0.89	0.70	6 0.59	0.6	57	0.9	0.98	0.99	1		(94)
Useful gains, hmGn (95)m= 519.6 596.73		4)m x (8 839.11	4)m 903.22	770	31 570.16	566	70	631.32	562.54	503.94	402.72	1	(95)
` '		l		779.		500	0.79	031.32	502.54	503.94	492.72		(95)
Monthly average ex (96)m= 4.3 4.9	6.5	8.9	11.7	14.0		16	4	14.1	10.6	7.1	4.2	1	(96)
Heat loss rate for m				<u> </u>						1 '.1	T.2	J	(55)
	2 2397.98		1522.12	-		T 666		1066.07	1649.1	2238.53	2740.96]	(97)
2. 33.21 2330.1	1=007.00	1	1		1 33 1.00	1 200				1	1]	` '

Space heating 1665.56	1387	1260.88	825.8	460.46	0	0	0	0	808.4	1248.9	1672.69		
,		<u> </u>		<u> </u>		<u>!</u>	Tota	l per year	kWh/year) = Sum(9	8) _{15,912} =	9329.71	(98)
Space heating	g require	ement in	kWh/m²	²/year							Ī	94.53	(99)
a. Energy red	uiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)			_		
Space heatir	•			, .							г		¬,,,,
Fraction of sp					mentary	•		(201) -			ļ	0	(201
Fraction of sp			-	` '			(202) = 1 - (204) =		(203)] -		Ĺ	1	(202
Fraction of to		_	-				(204) - (2	02) ^ [1 -	(203)] -		Ĺ	1 00.2	(204
Efficiency of r Efficiency of s	•				a cycton	o 0/ ₂					Ĺ	90.3	(206
							Δ	0	0.4	NI		0	(208
Jan Space heating	Feb	Mar Mar	Apr alculate	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
1665.56	1387	1260.88	825.8	460.46	0	0	0	0	808.4	1248.9	1672.69		
ـــــــــا 211)m = {[(98)m x (20)4)] } x 1	00 ÷ (20)6)		<u>!</u>	<u>l</u>	<u>I</u>	<u>l</u>	<u>I</u>			(211
		1396.33	914.51	509.92	0	0	0	0	895.24	1383.06	1852.38		
				-		-	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	10331.9	(211
Space heating	•	-	, , .	month									
{[(98)m x (20	1)]} x 1	00 ÷ (20	8)	ı			г	I	ı	I			
215)m= 0	0	0	0	0	0	0	O Tota	0	0 ar) =Sum(2	0	0		7,045
Votor booting							TOLA	ii (KVVII/yea	ar) –Surri(2	213) _{15,1012}		0	(215
Vater heating Output from wa		ter (calcı	ılated a	hove)									
220.9	194.66	204.34	183.03	178.21	156.96	150.38	167.63	168.45	189.8	200.87	215.54		
fficiency of w	ater hea	ater										81	(216
217)m= 89.1	89.04	88.88	88.46	87.5	81	81	81	81	88.37	88.89	89.13		(217
uel for water 219)m = (64)													
219)m= 247.92	218.62	229.91	206.92	203.67	193.77	185.65	206.96	207.97	214.78	225.99	241.82		
							Tota	I = Sum(2	19a) ₁₁₂ =			2583.97	(219
nnual totals									k\	Wh/year		kWh/yea	<u></u>
Space heating	fuel use	ed, main	system	1							L	10331.9	╝
Vater heating	fuel use	ed										2583.97	
Electricity for p	umps, f	ans and	electric	keep-ho	t								
central heatin	g pump	:									30		(230
otal electricity	for the	above, k	:Wh/yea	ır			sum	of (230a).	(230g) =			30	(231
Electricity for li	ghting										ļ	500.29	(232
•				ing syste							L		

Energy kWh/year

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Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216 =	2231.69 (261))
Space heating (secondary)	(215) x	0.519 =	0 (263)	3)
Water heating	(219) x	0.216 =	558.14 (264)	!)
Space and water heating	(261) + (262) + (263) + (264) =		2789.83 (265)	5)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	15.57 (267)	')
Electricity for lighting	(232) x	0.519 =	259.65 (268)	3)
Total CO2, kg/year	sum	of (265)(271) =	3065.05 (272)	2)
Dwelling CO2 Emission Rate	(272	(4) =	31.05 (273)	3)
El rating (section 14)			71 (274)	!)

			User D	etails: _						
Assessor Name:	Chris Hocki	nell		Strom	a Num	her:		STPO	016363	
Software Name:	Stroma FS			Softwa					on: 1.0.4.26	
Software Name.	Strollia FSA)roporty					VEISIC	л. 1.0.4.20	
Adduses	Flot 2 6 Lin			Address		zxisting				
Address: 1. Overall dwelling dime		dfield Gardens	, LONDC	JIN, INVVS	6 6 P U					
1. Overall dwelling diffic	ensions.		Δ κο.	n (m²)		Av. Ua	iabt/m)		Valuma/m³	31
Ground floor				a(m²) 39.67	(1a) x		ight(m) 3.1	(2a) =	Volume(m ³	(3a)
Total floor area TFA = (1	a\+(1b\+(1a\+()	1d)+(1a)+ (1					J. I		122.90	(0a)
	ia) (ib) (ic) (14) (16)(1	'''	39.67	(4))+(3c)+(3(d)+(3e)+	(3n) =		— ,,
Dwelling volume					(3a)+(3b)+(30)+(30	u)+(3 e)+	(311) –	122.98	(5)
2. Ventilation rate:	main	seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating	heating	, +		7 = F		x	40 =		(6a)
•	0		╛╘	0	╛╘	0			0	╣ .
Number of open flues	0	+ 0	+	0	_ = _	0	X	20 =	0	(6b)
Number of intermittent fa	ans					2	Х	10 =	20	(7a)
Number of passive vents	5					0	х	10 =	0	(7b)
Number of flueless gas f	fires				Ī	0	x	40 =	0	(7c)
					_					
								Air ch	anges per ho	our
Infiltration due to chimne	eys, flues and fa	ns = (6a) + (6b) + (6b)	7a)+(7b)+(7c) =		20		÷ (5) =	0.16	(8)
If a pressurisation test has b			ed to (17), o	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in t	the dwelling (ns)							0	(9)
Additional infiltration	056 ()		0.05.6				[(9])-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
if both types of wall are p deducting areas of openi			o ine great	er wall are	a (aner					
If suspended wooden	floor, enter 0.2	(unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else e	nter 0							0	(13)
Percentage of window	s and doors dra	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	, q50, expressed	d in cubic metre	es per ho	our per s	quare m	etre of e	envelope	area	10	(17)
If based on air permeabi	lity value, then	(18) = [(17) ÷ 20]+	(8), otherw	ise (18) = ((16)				0.66	(18)
Air permeability value applie	es if a pressurisation	n test has been do	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fact	or		(21) = (18) x (20) =				0.56	(21)
Infiltration rate modified	for monthly wind	d speed	_		1	1	_	_	1	
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	7						_		
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22-) (2	12\m · 4									
Wind Factor (22a)m = $(2^{2})^{2}$		1.00 0.05	T 0.05	T 0 00	T		1	1	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltration rate (allowing for shelter a	and wind speed)	= (21a) v	(22a)m					
0.72 0.7 0.69 0.62 0.61	0.54 0.54	0.52	0.56	0.61	0.63	0.66	1	
Calculate effective air change rate for the app		0.02		0.01	1 0.00	1 0.00	J	
If mechanical ventilation:							0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (2	3a) × Fmv (equation	(N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with heat recovery: efficiency in % allowing	g for in-use factor (fro	om Table 4h) =				0	(23c)
a) If balanced mechanical ventilation with h	eat recovery (M\	/HR) (24a	a)m = (22	2b)m + (23b) × [1 – (23c)) ÷ 100]	
(24a)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation without	ut heat recovery	(MV) (24b)m = (22	2b)m + (23b)		_	
(24b)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or posi if (22b)m < 0.5 × (23b), then (24c) = (23b)	•			.5 × (23b	o)			
(24c)m= 0 0 0 0 0	0 0	0	0	0	0	0]	(24c)
d) If natural ventilation or whole house posi	tive input ventila	tion from I	oft	I.	1		1	
if (22b)m = 1, then (24d)m = (22b)m otl	nerwise (24d)m =	0.5 + [(2	2b)m² x	0.5]			,	
(24d)m= 0.76 0.75 0.74 0.69 0.68	0.64 0.64	0.64	0.66	0.68	0.7	0.72		(24d)
Effective air change rate - enter (24a) or (2	4b) or (24c) or (2	4d) in box	x (25)				-	
(25)m= 0.76 0.75 0.74 0.69 0.68	0.64 0.64	0.64	0.66	0.68	0.7	0.72		(25)
3. Heat losses and heat loss parameter:								
ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-valı W/m2		A X U (W/l		k-value kJ/m²·		X k /K
Doors	2.2			3.96	$\stackrel{\prime}{ o}$		-	(26)
Windows Type 1		+(1.6)/1 ₁	0.041 =	1.07	=			(27)
Windows Type 2		· · · / ₍ 1/[1/(1.6)+	L	10.05	\exists			(27)
Floor			= [(28)
	39.67		_	21.818			╡	= '
Walls Type1 46.29 7.39	38.9		=	21.4	닠 ¦		┥	(29)
Walls Type2 23.82 2.2	21.62	0.55	= [11.89				(29)
Total area of elements, m ²	109.78							(31)
Party wall	27.35	0	= [0			_	(32)
Party ceiling	39.67							(32b)
* for windows and roof windows, use effective window U- ** include the areas on both sides of internal walls and p.		ng formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	h 3.2	
Fabric heat loss, W/K = S (A x U)	artitions	(26)(30)) + (32) =				70.18	(33)
Heat capacity Cm = S(A x k)				(30) + (32	2) + (32a)	(32e) =	9422.38	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in k.l/m²K			tive Value		(/	250	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.		precisely the				able 1f	230	(00)
Thermal bridges: S (L x Y) calculated using A	Annendix K						16.47	(36)
if details of thermal bridging are not known (36) = 0.05×10^{-3}							10.47	(00)
Total fabric heat loss	()		(33) +	(36) =			86.64	(37)
Ventilation heat loss calculated monthly			(38)m	= 0.33 × ((25)m x (5)		
Jan Feb Mar Apr May	/ Jun Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 30.76 30.35 29.95 28.08 27.73	26.1 26.1	25.8	26.73	27.73	28.44	29.18]	(38)
Heat transfer coefficient, W/K			(39)m	= (37) + (37)	38)m		_	
(39)m= 117.4 116.99 116.6 114.72 114.3	7 112.74 112.74	112.44	113.37	114.37	115.08	115.82]	
Stroma FSAP 2012 Version: 1.0.4.26 (SAP 9.92) - http://	www.stroma.com			L Average =	Sum(39) ₁	12 /12=	114.72 _{age}	2 of ³⁹)

Heat loss pa	arameter (HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 2.96	`	2.94	2.89	2.88	2.84	2.84	2.83	2.86	2.88	2.9	2.92		
		1							Average =	Sum(40) ₁ .	12 /12=	2.89	(40)
Number of c	-i	- ` -					ı	1					
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water he	eating ene	rgy requi	rement:								kWh/ye	ar:	
Assumed od if TFA > 1 if TFA £ 1	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	-A -13.9)2)] + 0.(0013 x (⁻	TFA -13		.4		(42)
Annual aver Reduce the an	nual average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.94		(43)
		· ·				,	Aug	Con	Oct	Nov	Dee		
Jar Hot water usag		Mar r day for ea	Apr ach month	May Vd,m = fa	Jun ctor from 7	Jul Fable 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 78.0		72.36	69.52	66.68	63.85	63.85	66.68	69.52	72.36	75.2	78.03		
(44)111- 76.0	3 75.2	72.30	09.52	00.00	03.65	03.63	00.00	<u> </u>		m(44) ₁₁₂ =	L .	851.28	(44)
Energy content	t of hot water	used - cal	culated mo	onthly = 4.	190 x Vd,n	n x nm x D	Tm / 3600			. ,	L	001.20	(
(45)m= 115.7	72 101.21	104.44	91.05	87.37	75.39	69.86	80.17	81.13	94.54	103.2	112.07		
` ′	I	1							I Total = Su	m(45) ₁₁₂ =	=	1116.16	(45)
If instantaneou	s water heat	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					
(46)m= 17.3	1	15.67	13.66	13.11	11.31	10.48	12.03	12.17	14.18	15.48	16.81		(46)
Water storage	_												
Storage volu	`	,				Ū		ame ves	sel		0		(47)
If community Otherwise if	_			_				ore) onto	or 'O' in <i>(</i>	47)			
Water storage		not wate	i (ulis ii	iciuues i	HStaritar	ieous co	ווטט וטוווי	C15) C1110	51 0 111 ((47)			
a) If manufa	_	eclared le	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperatur	e factor fro	om Table	2b		,	• ,					0		(49)
Energy lost				ear			(48) x (49)) =			0		(50)
b) If manufa		_	-		or is not	known:							(3-2)
Hot water st	•			e 2 (kW	h/litre/da	ıy)					0		(51)
If community Volume fact			on 4.3								_		(=o)
Temperature			2h								0		(52) (53)
•							(47) (54)	\ (F 0) (EO) -		0		
Energy lost Enter (50) of		_	, KVVN/ye	ear			(47) X (51)) x (52) x (53) =		0		(54) (55)
Water storage	, , ,	•	or each	month			((56)m = (55) × (41):	m		0		(55)
	-									Ι .			(50)
(56)m= 0 If cylinder conta	0 ains dedicate	0 ed solar sto	0 rage, (57)	0 m = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (0 H11) is fro	m Appendi	¢Н	(56)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circ	uit loss (a	nnual) fro	m Table	 e 3	-		-				0		(58)
Primary circ	•				59)m = ((58) ÷ 36	65 × (41)	m					• •
(modified				•		,	, ,		r thermo	stat)			

O		f		(04)	(00) . (OCE /44	\						
Combi loss o				<u> </u>	` 	- `	,	1 04 00	1 00 07	1 07.00	1 00 77	1	(61)
(61)m= 39.77		36.87	34.28	33.98	31.49	32.54	33.98	<u> </u>	36.87	37.08	39.77	(50) (04)	(01)
	`						`		` 	ì ´ 	`	(59)m + (61)m 1	(00)
(62)m= 155.4		141.31	125.34	121.35	106.88		114.1		131.42	140.28	151.84	J	(62)
Solar DHW inpu									ır contribut	tion to wate	er heating)		
(add addition							i 		<u> </u>			1	(63)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(03)
Output from						T	1	-	1	1	1	1	
(64)m= 155.4	9 135.82	141.31	125.34	121.35	106.88	102.4	114.1		131.42	140.28	151.84	4544.00	7(64)
								utput from w				1541.68	(64)
Heat gains fr		<u>_</u>				- ` ´ 	- `-		-``	- ` ´ 	- ` 	i] 1	
(65)m= 48.42	42.31	43.94	38.85	37.55	32.94	31.36	35.15	35.55	40.65	43.59	47.2	J	(65)
include (5	7)m in cald	culation	of (65)m	only if o	ylinder	is in the	dwellir	ng or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):									
Metab <u>olic ga</u>	ins (Table	5), Wat	ts									,	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 69.88	69.88	69.88	69.88	69.88	69.88	69.88	69.88	69.88	69.88	69.88	69.88		(66)
Lighting gair	s (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ilso se	e Table 5					
(67)m= 13.67	12.14	9.87	7.47	5.59	4.72	5.1	6.62	8.89	11.29	13.18	14.05]	(67)
Appliances of	ains (calc	ulated ir	Append	dix L, eq	uation	_13 or L1	3a), a	lso see Ta	ble 5	-	•	•	
(68)m= 120.7	121.96	118.8	112.08	103.6	95.63	90.3	89.0	92.2	98.92	107.41	115.38]	(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L1	or L15a), also	see Table	5		•	•	
(69)m= 29.99	29.99	29.99	29.99	29.99	29.99	29.99	29.99	29.99	29.99	29.99	29.99]	(69)
Pumps and f	ans gains	(Table	5а)			•		-					
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•		•				•	
(71)m= -55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9]	(71)
Water heatin	g gains (T	able 5)				_ !		!	•				
(72)m= 65.08	``	59.07	53.95	50.46	45.75	42.15	47.2	5 49.37	54.64	60.54	63.45	1	(72)
Total intern	al gains =	<u> </u>			(6	_ 6)m + (67)m	n + (68)	m + (69)m +	(70)m + (7	/1)m + (72))m	J	
(73)m= 246.4		234.7	220.47	206.61	193.06	184.52	189.8	8 197.43	211.82	228.08	239.84]	(73)
6. Solar gai	ns:						l		l				
Solar gains are		using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to th	ne applical	ble orientat	tion.		
Orientation:	Access F	actor	Area		FI	ux		g_		FF		Gains	
	Table 6d		m²		Ta	able 6a		Table 6b	T	able 6c		(W)	
Southwest _{0.9}	0.77	X	6.6	88	x	36.79] Г	0.63	х	0.7	=	75.11	(79)
Southwest _{0.9}	0.77	x	6.6	38	x	62.67	įΓ	0.63	x	0.7		127.95	(79)
Southwest _{0.9}	0.77	x	6.6	88	x	85.75	įΓ	0.63	x	0.7	=	175.06	(79)
Southwest _{0.9}		x	6.6	88	x	106.25	į Γ	0.63	x	0.7	=	216.91] (79)
Southwest _{0.9}	0.77	x	6.6	88	_	119.01	j F	0.63	_ x [0.7	= =	242.96	(79)
													_

		_			_					_				_
Southwest _{0.9x}	0.77	X	6.6	8	x	1	18.15		0.63	X	0.7	=	241.2	(79)
Southwest _{0.9x}	0.77	X	6.6	8	x	1	13.91		0.63	X	0.7	=	232.55	(79)
Southwest _{0.9x}	0.77	X	6.6	8	x	1	04.39		0.63	X	0.7	=	213.11	(79)
Southwest _{0.9x}	0.77	X	6.6	8	x	g	2.85		0.63	X	0.7	=	189.56	(79)
Southwest _{0.9x}	0.77	X	6.6	i8	x	6	9.27		0.63	X	0.7	=	141.41	(79)
Southwest _{0.9x}	0.77	X	6.6	8	x	4	4.07		0.63	X	0.7	=	89.97	(79)
Southwest _{0.9x}	0.77	x	6.6	8	x	3	1.49		0.63	X	0.7	=	64.28	(79)
Northwest _{0.9x}	0.77	×	0.7	'1	x	1	1.28	x	0.63	X	0.7	=	2.45	(81)
Northwest _{0.9x}	0.77	×	0.7	'1	x	2	2.97	x	0.63	x	0.7	=	4.98	(81)
Northwest 0.9x	0.77	×	0.7	'1	x [4	1.38	x	0.63	x	0.7	=	8.98	(81)
Northwest _{0.9x}	0.77	×	0.7	<u>'</u> 1	x	6	7.96	x	0.63	x	0.7	=	14.75	(81)
Northwest _{0.9x}	0.77	×	0.7	'1	x	g	1.35	X	0.63	x	0.7	=	19.82	(81)
Northwest _{0.9x}	0.77	×	0.7	1	x	9	7.38	x	0.63	X	0.7	=	21.13	(81)
Northwest _{0.9x}	0.77	×	0.7	<u>'1</u>	x	,	91.1	x	0.63	x	0.7	<u> </u>	19.77	(81)
Northwest _{0.9x}	0.77	×	0.7	1	x [7	2.63	x	0.63	x	0.7		15.76	(81)
Northwest _{0.9x}	0.77	×	0.7	<u>'1</u>	x [5	0.42	x	0.63	x	0.7	=	10.94	(81)
Northwest _{0.9x}	0.77	×	0.7	1	x	2	8.07	x	0.63	x	0.7		6.09	(81)
Northwest _{0.9x}	0.77	×	0.7	1	x		14.2	x	0.63	x	0.7		3.08	(81)
Northwest _{0.9x}	0.77	= x	0.7	1	x	(9.21	X	0.63	×	0.7	=	2	(81)
Solar gains in					$\overline{}$	20.00		Ė	= Sum(74)m			00.00	1	(83)
(83)m= 77.56 Total gains – ii		34.04 Solor	231.66	262.78		32.33	252.31	228	.87 200.5	147.5	93.05	66.28]	(03)
(84)m= 323.98		18.74	452.13	469.39	·	55.39	436.83	418	.75 397.93	359.3	2 321.13	306.12	1	(84)
` '						70.00	400.00	710	.70 007.00	000.0	2 021.10	300.12		(0.)
7. Mean inter	· · · · · · · · · · · · · · · · · · ·		,		_				- : 4 (0.5)					_
Temperature	ŭ	٠.			Ū			ole 9	Th1 (°C)				21	(85)
Utilisation fac	_ _				Ť								1	
Jan		Mar	Apr	May	+	Jun	Jul	 	ug Sep	Oct	-	Dec	1	(06)
(86)m= 0.99	0.99).98	0.96	0.93		0.86	0.77	0.8	8 0.91	0.97	0.99	0.99]	(86)
Mean interna			_ <u> </u>		1		<u> </u>	ī				1	7	
(87)m= 18.08	18.3	8.71	19.29	19.87	20	0.41	20.71	20.	67 20.24	19.49	18.7	18.06]	(87)
Temperature	during hea	ting p	eriods ir	rest of	dwe	elling	from Ta	ble 9	9, Th2 (°C)				-	
(88)m= 18.77	18.78	8.78	18.8	18.81	18	8.83	18.83	18.	84 18.82	18.81	18.8	18.79		(88)
Utilisation fac	tor for gain	s for r	est of d	welling,	h2,ı	m (se	e Table	9a)						
(89)m= 0.99	0.98).97	0.94	0.88	0).74	0.51	0.5	6 0.82	0.95	0.98	0.99		(89)
Mean interna	l temperatu	re in t	he rest	of dwell	ina	T2 (f	ollow ste	eps 3	to 7 in Tab	le 9c)	-	-	_	
(90)m= 16.32		6.95	17.53	18.09	Ť	8.58	18.78	18.		17.73	3 16.95	16.31]	(90)
	<u> </u>			<u> </u>	<u> </u>					fLA = Li	ving area ÷ (4) =	0.85	(91)
Mean interna	l temneratu	re (fo	r the wh	റില ർശമ	lling	n) = fl	Δ x T1	+ (1	_ fl Δ\ × T၁					
(92)m= 17.81		8.45	19.02	19.6	$\overline{}$	0.13	20.42	20.		19.22	18.43	17.8	1	(92)
Apply adjustn					_							<u> </u>	J	, ,
117		•		r				,	F- F-					

17.81 18.04 18.45 19.02 19.6 20.13 20.42 20.38 19.97 19.22 18.43 17.8 (93) Sepace 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
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= 0.99 0.98 0.97 0.95 0.9 0.83 0.72 0.75 0.88 0.95 0.98 0.99 (94) Useful gains, hmGm , W = (94)m x (84)m (95)m= 319.58 369.21 405.3 427.56 424.23 376.38 314.14 313.38 348.68 342.42 314.73 302.54 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) (97)m= 1586.6 1537.12 1392.96 1161.25 903.88 623.55 430.5 447.48 665.41 986.05 1304.33 1574.7 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Utilisation factor for gains, hm:
(94)m= 0.99 0.98 0.97 0.95 0.9 0.83 0.72 0.75 0.88 0.95 0.98 0.99 Useful gains, hmGm , W = (94)m x (84)m (95)m= 319.58 369.21 405.3 427.56 424.23 376.38 314.14 313.38 348.68 342.42 314.73 302.54 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m= 1586.6 1537.12 1392.96 1161.25 903.88 623.55 430.5 447.48 665.41 986.05 1304.33 1574.7 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m
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Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m
(90)11- 942.07 704.03 734.02 320.23 330.07 0 0 0 470.00 712.32 940.49
Total per year (kWh/year) = $Sum(98)_{15912}$ = 5485.31 (98)
Space heating requirement in kWh/m²/year 138.27 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)
Space heating:
Fraction of space heat from secondary/supplementary system 0 (201)
Fraction of space heat from main system(s) $ (202) = 1 - (201) = $
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$ (204)
Efficiency of main space heating system 1 90.3 (206)
Efficiency of secondary/supplementary heating system, %
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above)
942.67 784.83 734.82 528.25 356.87 0 0 0 478.86 712.52 946.49
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ (211)
1043.93 869.14 813.75 585 395.2 0 0 0 0 530.3 789.05 1048.17
Total (kWh/year) = Sum(211) _{15,1012} = 6074.54 (211)
Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0
Total (kWh/year) = Sum(215) _{15,1012} = 0 (215)
Water heating
Output from water heater (calculated above)
155.49 135.82 141.31 125.34 121.35 106.88 102.4 114.15 115.41 131.42 140.28 151.84
Efficiency of water heater 81 (216)
(217)m= 88.86 88.8 88.66 88.35 87.74 81 81 81 81 88.12 88.63 88.89 (217)
Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m
(219)m= 174.99 152.96 159.39 141.86 138.3 131.95 126.42 140.92 142.48 149.13 158.29 170.81
Total = $Sum(219a)_{112}$ = 1787.5 (219)
Annual totals kWh/year kWh/year Space heating fuel used, main system 1 6074.54
Opace ficating fuel used, finalli system 1

Water heating fuel used				1787.5]
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
Total electricity for the above, kWh/year	sum of (230	0a)(230g) =		30	(231)
Electricity for lighting				241.36	(232)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	1312.1	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	386.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1698.2	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting	(232) x	0.519	=	125.27	(268)
Total CO2, kg/year	sui	m of (265)(271) =		1839.04	(272)
Dwelling CO2 Emission Rate	(27	72) ÷ (4) =		46.36	(273)

El rating (section 14)

(274)

			User [etails: _						
Assessor Name:	Chris Hock	nell		Strom	a Nium	hor:		STDO	016363	
Software Name:	Stroma FS			Softwa					on: 1.0.4.26	
Software Name.	Stroma F3/		Droporty					VEISIC	л. т.ט. 4 .20	
A dalue e e .	Flot 4 6 Lin		Property			zxisting				
Address: 1. Overall dwelling dime		dfield Gardens	s, LONDO	JIN, INVVS	000					
1. Overall dwelling dime	ensions.		Λ να	o (m²)		Av. Ua	iaht/m\		Valuma/m²	31
Ground floor				a(m²)	[(10) x		eight(m)	(2a) =	Volume(m ³	<u> </u>
		4.15.74.5			(1a) x		2.5	(2a) -	152.52	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	in) [31.01	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	152.52	(5)
2. Ventilation rate:										
	main heating	seconda heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+	0] = [0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	= +	0		0	x	20 =	0	(6b)
Number of intermittent fa	ans					3	x	10 =	30	(7a)
Number of passive vents	.					0	x	10 =	0	(7b)
·					L		\dashv ,	40 =		= '
Number of flueless gas f	ires					0	^	40 -	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	we flues and fa	ne = (6a)+(6h)+	(7a)+(7h)+((7c) =	Г					_
If a pressurisation test has l					continue fr	30		÷ (5) =	0.2	(8)
Number of storeys in t			cu to (11),	ouner wide (onunae n	om (5) 10	(10)		0	(9)
Additional infiltration	3 (,					[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or	timber frame of	or 0.35 fo	r masoni	ry consti	uction		•	0	(11)
if both types of wall are p	resent, use the val	ue corresponding			•					` ′
deducting areas of openi	• .		0.1 (222)	مما مامم	antar O				_	
If suspended wooden		•	u. i (seai	ea), eise	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors dra	augnt stripped		0.05 [0.0) v (4.4) · · ·	1001 -			0	(14)
Window infiltration				0.25 - [0.2	, ,	_	. (45)		0	(15)
Infiltration rate			_	(8) + (10)					0	(16)
Air permeability value,				•	•	etre of e	envelope	area	10	(17)
If based on air permeabi	•								0.7	(18)
Air permeability value applie		n test has been de	one or a de	gree air pe	rmeability	is being u	sed			–
Number of sides sheltere Shelter factor	ed			(20) = 1 -	IN N75 v (*	10)1 –			2	(19)
Infiltration rate incorpora	ting shalter fact	tor		(20) = 12 (21) = (18)		· •/] =			0.85	(20)
Infiltration rate modified	_			,, (10	, (_)				0.59	(21)
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
			I oui	ı Aug	Гоер	1 000	1 1407	l pec	I	
Monthly average wind sp (22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
(22)11- 0.1 0	7.3 4.4	4.0 0.0] 3.0	J 3.1	"	1 4.5	1 4.0	7./	l	
Wind Factor (22a)m = (2	2)m ÷ 4									
(22a)m- 1.27 1.25		1.00 0.05	0.05	Ι	г .		T	T	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltration	rate (allow	ing for sh	nelter an	ıd wind s	peed) =	: (21a) x	(22a)m					
0.76 0.7	74 0.73	0.65	0.64	0.56	0.56	0.55	0.59	0.64	0.67	0.7]	
Calculate effective	_	rate for t	he appli	cable ca	se						· 	
If mechanical ve		on die N. (O	Ol-) (OO	- \ - \ (.		N/5\\ -4	t (00k) (OO -)			0	(23a
If exhaust air heat pu								o) = (23a)			0	(23b
If balanced with heat	-	-	_								0	(23c
a) If balanced m	1	1		1	- ` ` 	1 ^ ` 	ŕ	 		- `) ÷ 100] 1	10.1
(24a)m= 0 (0	0	0	0	0	0	0	0	0]	(24a
b) If balanced m				1	overy (I	MV) (24k	o)m = (2:	2b)m + (2	23b)		1	
(24b)m = 0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole house if (22b)m < 0			•	•				.5 × (23b))			
(24c)m= 0 (0	0	0	0	0	0	0	0	0	0]	(240
d) If natural vent if (22b)m = 1			•	•				0.5]		•		
(24d)m= 0.79 0.7		0.71	0.7	0.66	0.66	0.65	0.68	0.7	0.72	0.74]	(24d
Effective air cha	nge rate - er	nter (24a	or (24	o) or (24	c) or (24	ld) in bo	x (25)			!	J	
(25)m= 0.79 0.7	 	0.71	0.7	0.66	0.66	0.65	0.68	0.7	0.72	0.74]	(25)
				ı		ı.	ı	ı		L	J	
3. Heat losses an				NI-4 A		Haral		A V I I		le centre.		A V I.
	Gross rea (m²)	Openin m		Net Ar A ,r		U-val W/m2		A X U (W/I	<)	k-value kJ/m²·		A X k kJ/K
Doors				2.2	X	1.8	=	3.96				(26)
Windows Type 1				1.69	x1	/[1/(1.6)+	0.04] =	2.54				(27)
Windows Type 2				3.55	x1	/[1/(1.6)+	0.04] =	5.34				(27)
Windows Type 3				1.39	x1	/[1/(1.6)+	0.04] =	2.09				(27)
Walls Type1	20.15	5.56		14.59) X	0.55	=	8.02				(29)
Walls Type2	28.61	5.24		23.37	, X	0.28	=	6.54	$\overline{}$		$\neg \ $	(29)
Walls Type3	15.55	2.2		13.35	5 X	0.55	=	7.34			= =	(29)
Roof	8.86	0		8.86	x	0.18	_	1.59	₹ i		7 F	(30)
Total area of eleme	ents, m²			73.17	, 							(31)
Party wall				21.72	=	0		0	– [$\neg \vdash$	(32)
Party floor				61.01	=	<u>_</u>		<u>_</u>	L		╡	(32a
Party ceiling				52.15	=				L		╡	(32b
* for windows and roof	vindows. use e	effective wi	ndow I J-v:			g formula 1	/[(1/U-valı	ue)+0.041 a	L Is aiven in	paragranh		(021
** include the areas on						,		,	J	, 9		
Fabric heat loss, W	//K = S (A x	U)				(26)(30) + (32) =				43.71	(33)
Heat capacity Cm	= S(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	11071.	73 (34)
Thermal mass para	ameter (TMI	⊃ = Cm ÷	· TFA) ir	n kJ/m²K			Indica	ntive Value	Medium		250	(35)
For design assessment can be used instead of			construct	ion are not	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridges : \$			using Ap	pendix l	<						10.98	(36)
if details of thermal brid	ging are not kr	nown (36) =	0.05 x (3	11)								

Total fabric he	eat loss							(33) +	(36) =			54.68	(37)
Ventilation he	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × ((25)m x (5)	'		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 39.51	38.96	38.41	35.85	35.37	33.13	33.13	32.72	33.99	35.37	36.34	37.35		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 94.2	93.64	93.09	90.53	90.05	87.81	87.81	87.4	88.67	90.05	91.02	92.03		
Heat loss para	ameter (F	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) _{1.}	12 /12=	90.52	(39)
(40)m= 1.54	1.53	1.53	1.48	1.48	1.44	1.44	1.43	1.45	1.48	1.49	1.51		
Number of da	ys in mo	nth (Tab	le 1a)			•	•	,	Average =	Sum(40) ₁ .	12 /12=	1.48	(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)
							•					l	
4. Water hea	iting ene	rgy regui	irement:								kWh/ye	ear:	
Assumed occi if TFA > 13.			[1 - exn	(<u>-</u> 0 0003	40 v (TF	-Δ -13 Θ	1211 + 0 (0013 x (Γ F Δ - 13	2.	01		(42)
if TFA £ 13.		· 1.70 A	τι - σχρ	(-0.0000	л х (11	A-10.5	<i>)</i> 2)] · 0.0) X 010 X (II A - 10.	.0)			
Annual averaç	-		•	•	•	_	,				.25		(43)
Reduce the annu not more that 125	_				-	-	to acnieve	a water us	se target o	Ť			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	l .			,	-	l .		Seh	Oct	INOV	Dec		
(44)m= 94.88	91.43	87.98	84.53	81.08	77.63	77.63	81.08	84.53	87.98	91.43	94.88		
		l .						-	Γotal = Su	m(44) ₁₁₂ =		1035.01	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,n	n x nm x E	OTm / 3600	kWh/mon	th (see Ta	ables 1b, 1	c, 1d)		
(45)m= 140.7	123.06	126.98	110.71	106.23	91.66	84.94	97.47	98.63	114.95	125.48	136.26		
If in atomtom and the			- f (amtau O in	havea (46)		Total = Su	m(45) ₁₁₂ =		1357.07	(45)
If instantaneous v			,		• /-	1		` ′		ı		ı	(40)
(46)m= 21.1 Water storage	18.46 1055	19.05	16.61	15.93	13.75	12.74	14.62	14.8	17.24	18.82	20.44		(46)
Storage volun) includir	ng any so	olar or W	/WHRS	storage	within sa	me ves	sel		0		(47)
If community I	` '					•							, ,
Otherwise if n	•			-			. ,	ers) ente	er '0' in (47)			
Water storage												ı	
a) If manufac				or is kno	wn (kWh	n/day):					0		(48)
Temperature											0		(49)
Energy lost fro		_	-		:+		(48) x (49)	=			0		(50)
b) If manufacHot water stor			-								0		(51)
If community I	_			- (.,	.,					J		(01)
Volume factor	from Ta	ble 2a									0		(52)
Temperature	factor fro	m Table	2b								0		(53)
Energy lost from		_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or	(54) in (5	55)									0		(55)

vvalor	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	m Table	- 3							0		(58)
	-	loss cal	•			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	48.35	42.08	44.83	41.68	41.32	38.28	39.56	41.32	41.68	44.83	45.09	48.35		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	189.05	165.14	171.81	152.39	147.54	129.95	124.5	138.79	140.32	159.78	170.56	184.61		(62)
Solar DH		calculated	using App	endix G or	Appendix	: H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	WHRS	applies	, see Ap	pendix (€)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter			•	•	•				•		
(64)m=	189.05	165.14	171.81	152.39	147.54	129.95	124.5	138.79	140.32	159.78	170.56	184.61		
								Outp	out from w	ater heate	r (annual) ₁	12	1874.43	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	1	_
(65)m=	58.87	51.44					. ,	. ,			. ,	. ,		
		31.44	53.43	47.23	45.65	40.05	38.13	42.74	43.22	49.43	52.99	57.39		(65)
inclu		ļ.	!			ļ	<u> </u>	ļ			ļ		eating	(65)
	ıde (57)	m in calc	culation (of (65)m	only if c	ļ	<u> </u>	ļ			ļ	57.39 munity h	eating	(65)
5. Int	ide (57) ternal ga	m in cald ains (see	culation of Table 5	of (65)m and 5a	only if c	ļ	<u> </u>	ļ			ļ		eating	(65)
5. Int	ide (57) ernal ga olic gain	m in calc ains (see as (Table	culation of Table 5	of (65)m and 5a	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	(65)
5. Int	de (57) ernal ga olic gain Jan	m in cald ains (see	culation of Table 5	of (65)m and 5a	only if c	ļ	<u> </u>	ļ			ļ	munity h	eating	(65)
5. Int Metabo (66)m=	ternal ga olic gain Jan 100.5	m in cald ains (see s (Table Feb 100.5	ETable 5 5), Wat Mar	of (65)m 5 and 5a ts Apr 100.5	only if constant of the consta	Jun	Jul	Aug	Sep	ater is fr Oct	om com	munity h	eating	
5. Int Metabo (66)m= Lightin	ernal gan olic gain Jan 100.5	m in calc ains (see s (Table Feb 100.5	Table 5 2 5), Wat Mar 100.5	of (65)m and 5a ts Apr 100.5	only if constant of the consta	Jun 100.5	Jul 100.5 r L9a), a	Aug 100.5	Sep 100.5	Oct	Nov	Dec 100.5	eating	(66)
5. Int Metabo (66)m= Lightin (67)m=	cernal gar olic gain Jan 100.5 g gains	m in calc ains (see s (Table Feb 100.5 (calcula	Table 5 5), Wat Mar 100.5 ted in Ap	of (65)m and 5a ts Apr 100.5 ppendix 10.95	only if constant of the consta	Jun 100.5 ion L9 o	Jul 100.5 r L9a), a	Aug 100.5 Iso see	Sep 100.5 Table 5	Oct 100.5	om com	munity h	eating	
5. Int Metabo (66)m= Lightin (67)m= Appliar	de (57) ernal ga olic gain Jan 100.5 g gains 20.03	m in calc ains (see s (Table Feb 100.5 (calcula 17.79 ins (calc	Evaluation of Table 5 (a) Wat Mar 100.5 (b) ted in April 14.47 (b) ulated in	of (65)m s and 5a ts Apr 100.5 ppendix 10.95 Append	May 100.5 L, equat 8.19 dix L, eq	Jun 100.5 ion L9 of 6.91 uation L	Jul 100.5 r L9a), a 7.47	Aug 100.5 Iso see 9.71 3a), also	Sep 100.5 Table 5 13.03 see Ta	Oct 100.5	Nov 100.5	Dec 100.5	eating	(66)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m=	lde (57) ernal ga olic gain Jan 100.5 g gains 20.03 nces ga	m in calc ains (see s (Table Feb 100.5 (calcula 17.79 ins (calc	Table 5 2 5), Wat Mar 100.5 ted in Ap 14.47 ulated ir 172.72	ts Apr 100.5 ppendix 10.95 Appendix 162.95	May 100.5 L, equat 8.19 dix L, eq	Jun 100.5 ion L9 o 6.91 uation L	Jul 100.5 r L9a), a 7.47 13 or L1	Aug 100.5 Iso see 9.71 3a), also	Sep 100.5 Table 5 13.03 see Ta	Oct 100.5 16.54 ble 5 143.82	Nov	Dec 100.5	eating	(66)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin	de (57) ernal ga olic gain Jan 100.5 g gains 20.03 nces ga 175.49	m in calc	Table 5 5), Wat Mar 100.5 ted in Ap 14.47 ulated ir 172.72	of (65)m and 5a ts Apr 100.5 ppendix 10.95 Appendix 162.95 ppendix	May 100.5 L, equat 8.19 dix L, eq 150.62 L, equat	Jun 100.5 ion L9 of 6.91 uation L 139.03	Jul 100.5 r L9a), a 7.47 13 or L1 131.28 or L15a	Aug 100.5 Iso see 9.71 3a), also 129.46), also se	Sep 100.5 Table 5 13.03 see Ta 134.05 ee Table	Oct 100.5 16.54 ble 5 143.82	Nov 100.5 19.31	Dec 100.5 20.58	eating	(66) (67)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m=	de (57) dernal ga olic gain Jan 100.5 g gains 20.03 nces ga 175.49 ng gains 33.05	m in calc ains (see s (Table Feb 100.5 (calcula 17.79 ins (calc 177.31 (calcula 33.05	Table 5 5), Wat Mar 100.5 ted in Ap 14.47 ulated ir 172.72 ted in A 33.05	of (65)m ts Apr 100.5 ppendix 10.95 Append 162.95 ppendix 33.05	May 100.5 L, equat 8.19 dix L, eq	Jun 100.5 ion L9 o 6.91 uation L	Jul 100.5 r L9a), a 7.47 13 or L1	Aug 100.5 Iso see 9.71 3a), also	Sep 100.5 Table 5 13.03 see Ta	Oct 100.5 16.54 ble 5 143.82	Nov 100.5	Dec 100.5	eating	(66)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps	lde (57) lernal garolic gain Jan 100.5 g gains 20.03 nces ga 175.49 ng gains 33.05 s and fai	m in calc ains (see s (Table Feb 100.5 (calcula 17.79 ins (calc 177.31 (calcula 33.05 ns gains	Table 5 5), Wat Mar 100.5 ted in Ap 14.47 ulated in 172.72 ted in A 33.05 (Table 5	of (65)m s and 5a ts Apr 100.5 ppendix 10.95 Appendix 162.95 ppendix 33.05	May 100.5 L, equat 8.19 dix L, eq 150.62 L, equat 33.05	Jun 100.5 ion L9 o 6.91 uation L 139.03 ion L15 33.05	Jul 100.5 r L9a), a 7.47 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 9.71 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 13.03 see Ta 134.05 ee Table 33.05	Oct 100.5 16.54 ble 5 143.82 5 33.05	Nov 100.5 19.31 156.15	Dec 100.5 20.58 167.74	eating	(66) (67) (68)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m=	olic gain Jan 100.5 g gains 20.03 nces ga 175.49 ng gains 33.05 s and fai	m in calc ains (see s (Table Feb 100.5 (calcula 17.79 ins (calc 177.31 (calcula 33.05 ns gains	ted in Audited in Audi	of (65)m and 5a ts Apr 100.5 ppendix 10.95 Appendix 33.05 5a) 3	May 100.5 L, equat 8.19 dix L, eq 150.62 L, equat 33.05	Jun 100.5 ion L9 of 6.91 uation L 139.03 tion L15 33.05	Jul 100.5 r L9a), a 7.47 13 or L1 131.28 or L15a	Aug 100.5 Iso see 9.71 3a), also 129.46), also se	Sep 100.5 Table 5 13.03 see Ta 134.05 ee Table	Oct 100.5 16.54 ble 5 143.82	Nov 100.5 19.31	Dec 100.5 20.58	eating	(66) (67) (68)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses	de (57) dernal ga olic gain Jan 100.5 g gains 20.03 nces ga 175.49 ng gains 33.05 s and fai	m in calc ains (see s (Table Feb 100.5 (calcula 17.79 ins (calc 177.31 (calcula 33.05 ns gains 3	ted in Apulated in	of (65)m ts Apr 100.5 ppendix 10.95 Appendix 162.95 ppendix 33.05 5a) 3 tive value	only if construction only if c	Jun 100.5 ion L9 of 6.91 uation L 139.03 iion L15 33.05	Jul 100.5 r L9a), a 7.47 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 9.71 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 13.03 see Ta 134.05 ee Table 33.05	Oct 100.5 16.54 ble 5 143.82 5 33.05	Nov 100.5 19.31 156.15 33.05	Dec 100.5 20.58 167.74 33.05	eating	(66) (67) (68) (69)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	polic gain Jan 100.5 g gains 20.03 nces ga 175.49 ng gains 33.05 s and fai 3 s e.g. ev	m in calc ains (see s (Table Feb 100.5 (calcula 17.79 ins (calc 177.31 (calcula 33.05 ns gains 3 raporatio -80.4	ted in Apulated in	of (65)m and 5a ts Apr 100.5 ppendix 10.95 Appendix 33.05 5a) 3	May 100.5 L, equat 8.19 dix L, eq 150.62 L, equat 33.05	Jun 100.5 ion L9 of 6.91 uation L 139.03 tion L15 33.05	Jul 100.5 r L9a), a 7.47 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 9.71 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 13.03 see Ta 134.05 ee Table 33.05	Oct 100.5 16.54 ble 5 143.82 5 33.05	Nov 100.5 19.31 156.15	Dec 100.5 20.58 167.74	eating	(66) (67) (68)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	de (57) ernal ga olic gain Jan 100.5 g gains 20.03 nces ga 175.49 ng gains 33.05 s and fai 3 s e.g. ev -80.4 heating	m in calc ains (see s (Table Feb 100.5 (calcula 17.79 ins (calc 177.31 (calcula 33.05 ns gains 3 raporatio -80.4 gains (T	ted in Ap 172.72 ted in Ap 33.05 (Table 5 3 on (negarable 5)	of (65)m ts Apr 100.5 ppendix 10.95 Appendix 33.05 5a) 3 tive valu -80.4	only if construction only if c	Jun 100.5 ion L9 of 6.91 uation L 139.03 iion L15 33.05	Jul 100.5 r L9a), a 7.47 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 9.71 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 13.03 see Ta 134.05 ee Table 33.05	Oct 100.5 16.54 ble 5 143.82 5 33.05	Nov 100.5 19.31 156.15 33.05	Dec 100.5 20.58 167.74 33.05	eating	(66) (67) (68) (69) (70)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	de (57) dernal ga olic gain Jan 100.5 g gains 20.03 nces ga 175.49 ng gains 33.05 and fai s e.g. ev -80.4 heating 79.13	m in calc ains (see s (Table Feb 100.5 (calcula 17.79 ins (calc 177.31 (calcula 33.05 ns gains 3 raporatio -80.4 gains (T	ted in Ap 172.72 ted in Ap 172.72 ted in Ap 33.05 (Table § 3 on (negar -80.4	of (65)m ts Apr 100.5 ppendix 10.95 Appendix 162.95 ppendix 33.05 5a) 3 tive value	only if construction only if c	Jun 100.5 ion L9 of 6.91 uation L 139.03 ion L15 33.05 3 le 5) -80.4	Jul 100.5 r L9a), a 7.47 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 9.71 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 13.03 see Ta 134.05 ee Table 33.05	Oct 100.5 16.54 ble 5 143.82 5 33.05 3 -80.4	Nov 100.5 19.31 156.15 33.05	Dec 100.5 20.58 167.74 33.05 3	eating	(66) (67) (68) (69)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	de (57) dernal ga olic gain Jan 100.5 g gains 20.03 nces ga 175.49 ng gains 33.05 and fai s e.g. ev -80.4 heating 79.13	m in calc ains (see s (Table Feb 100.5 (calcula 17.79 ins (calc 177.31 (calcula 33.05 ns gains 3 raporatio -80.4 gains (T	ted in Ap 172.72 ted in Ap 172.72 ted in Ap 33.05 (Table § 3 on (negar -80.4	of (65)m ts Apr 100.5 ppendix 10.95 Appendix 33.05 5a) 3 tive valu -80.4	only if construction only if c	Jun 100.5 ion L9 of 6.91 uation L 139.03 ion L15 33.05 3 le 5) -80.4	Jul 100.5 r L9a), a 7.47 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 9.71 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 13.03 see Ta 134.05 ee Table 33.05	Oct 100.5 16.54 ble 5 143.82 5 33.05 3 -80.4	Nov 100.5 19.31 156.15 33.05	Dec 100.5 20.58 167.74 33.05 3	eating	(66) (67) (68) (69) (70)

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

Orientation: Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b	-	FF Table 6c		Gains (W)	
Northeast _{0.9x} 0.77	X	1.69	x	11.28	x	0.63	x [0.7	= [5.83	(75)
Northeast _{0.9x} 0.77	X	3.55	x	11.28	x	0.63	= x	0.7	<u> </u>	12.24	(75)
Northeast 0.9x 0.77	X	1.69	x	22.97	X	0.63	_ x [0.7	= [11.86	(75)
Northeast _{0.9x} 0.77	X	3.55	x	22.97	x	0.63	_ x [0.7	=	24.92	(75)
Northeast _{0.9x} 0.77	X	1.69	x	41.38	X	0.63	x	0.7	=	21.37	(75)
Northeast 0.9x 0.77	X	3.55	x	41.38	X	0.63	x	0.7	= [44.89	(75)
Northeast _{0.9x} 0.77	X	1.69	X	67.96	X	0.63	x	0.7	= [35.1	(75)
Northeast _{0.9x} 0.77	X	3.55	x	67.96	X	0.63	x	0.7	= [73.73	(75)
Northeast _{0.9x} 0.77	X	1.69	x	91.35	X	0.63	x [0.7	= [47.18	(75)
Northeast _{0.9x} 0.77	X	3.55	x	91.35	X	0.63	x [0.7	= [99.1	(75)
Northeast _{0.9x} 0.77	X	1.69	x	97.38	X	0.63	x [0.7	= [50.3	(75)
Northeast _{0.9x} 0.77	X	3.55	x	97.38	X	0.63	x [0.7	= [105.65	(75)
Northeast _{0.9x} 0.77	X	1.69	x	91.1	X	0.63	x [0.7	= [47.05	(75)
Northeast _{0.9x} 0.77	X	3.55	x	91.1	X	0.63	x [0.7	=	98.84	(75)
Northeast _{0.9x} 0.77	X	1.69	x	72.63	X	0.63	x	0.7	= [37.51	(75)
Northeast _{0.9x} 0.77	X	3.55	X	72.63	X	0.63	x	0.7	= [78.79	(75)
Northeast _{0.9x} 0.77	X	1.69	x	50.42	X	0.63	x	0.7	= [26.04	(75)
Northeast _{0.9x} 0.77	X	3.55	x	50.42	X	0.63	x	0.7	=	54.7	(75)
Northeast _{0.9x} 0.77	X	1.69	x	28.07	X	0.63	x [0.7	=	14.5	(75)
Northeast _{0.9x} 0.77	X	3.55	x	28.07	X	0.63	x [0.7	= [30.45	(75)
Northeast _{0.9x} 0.77	X	1.69	x	14.2	X	0.63	x	0.7	= [7.33	(75)
Northeast _{0.9x} 0.77	X	3.55	x	14.2	X	0.63	x	0.7	= [15.4	(75)
Northeast _{0.9x} 0.77	X	1.69	x	9.21	X	0.63	x [0.7	= [4.76	(75)
Northeast _{0.9x} 0.77	X	3.55	x	9.21	X	0.63	x [0.7	= [10	(75)
Northwest 0.9x 0.77	X	1.39	x	11.28	X	0.63	x [0.7	=	19.17	(81)
Northwest 0.9x 0.77	X	1.39	x	22.97	X	0.63	x [0.7	=	39.03	(81)
Northwest 0.9x 0.77	X	1.39	x	41.38	X	0.63	x [0.7	= [70.31	(81)
Northwest 0.9x 0.77	X	1.39	x	67.96	X	0.63	x [0.7	=	115.47	(81)
Northwest 0.9x 0.77	X	1.39	X	91.35	X	0.63	x [0.7	=	155.22	(81)
Northwest 0.9x 0.77	X	1.39	x	97.38	X	0.63	x [0.7	=	165.48	(81)
Northwest 0.9x 0.77	X	1.39	X	91.1	X	0.63	x [0.7	=	154.8	(81)
Northwest 0.9x 0.77	X	1.39	X	72.63	X	0.63	x [0.7	=	123.41	(81)
Northwest 0.9x 0.77	X	1.39	X	50.42	X	0.63	x [0.7	=	85.68	(81)
Northwest 0.9x 0.77	X	1.39	X	28.07	X	0.63	x [0.7	=	47.69	(81)
Northwest 0.9x 0.77	X	1.39	x	14.2	X	0.63	x [0.7	= [24.12	(81)
Northwest 0.9x 0.77	X	1.39	x	9.21	X	0.63	x [0.7	= [15.66	(81)
Solar gains in watts, calcula	$\overline{}$		_			n = Sum(74)m .		, , , , , ,			
(83)m= 37.24 75.8 136.4		224.3 301.5		21.43 300.69	239	.71 166.42	92.64	46.86	30.41		(83)
Total gains – internal and so		` ' 	Ť		1	40 400 == 1	0== ==	10-0	050 55		(0.4)
(84)m= 368.03 403.59 451.	/3	519.95 577.8	1 5	79.14 546.85	492	.48 429.68	375.59	352.07	352.03		(84)

Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	٦
	(85)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	_
(86)m= 1 1 0.99 0.98 0.92 0.8 0.65 0.72 0.92 0.99 1 1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
(87)m= 19.27 19.41 19.7 20.15 20.56 20.85 20.95 20.93 20.68 20.18 19.67 19.27	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	
(88)m= 19.65 19.66 19.67 19.7 19.71 19.73 19.73 19.74 19.72 19.71 19.69 19.68	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
(89)m= 1 0.99 0.99 0.96 0.88 0.7 0.49 0.56 0.86 0.98 0.99 1	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
(90)m= 18.1 18.25 18.55 19.01 19.4 19.66 19.72 19.72 19.54 19.05 18.54 18.13	(90)
$fLA = Living area \div (4) = 0.4$	(91)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2	_
(92)m= 18.57 18.71 19.01 19.46 19.86 20.14 20.21 20.2 19.99 19.5 18.99 18.59	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	
(93)m= 18.57 18.71 19.01 19.46 19.86 20.14 20.21 20.2 19.99 19.5 18.99 18.59	(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	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm:	
(94)m= 1 0.99 0.99 0.96 0.89 0.73 0.55 0.63 0.88 0.98 0.99 1	(94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 366.52 401 445.61 499.77 513.4 423.86 303.01 308.78 376.86 366.72 349.7 350.85	(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= 1343.96 1293.36 1164.18 956.1 734.82 486.23 317.25 332.19 522.54 801.23 1082.39 1323.92	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m	
(98)m= 727.21 599.67 534.62 328.55 164.74 0 0 0 0 323.27 527.54 723.96	٦,,,,,
Total per year (kWh/year) = Sum(98) _{15,912} = 3929.55	(98)
Space heating requirement in kWh/m²/year 64.41	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
	_
Space heating: Fraction of chace heat from secondary/supplementary system	(201)
Fraction of space heat from secondary/supplementary system 0	(201)
Fraction of space heat from secondary/supplementary system O Fraction of space heat from main system(s) (202) = 1 - (201) = 1	(202)
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) $(202) = 1 - (201) = 1$ Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$	(202)
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) 0 1	(202)

												•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heatin	ř	,	r						000 07	507.54	700.00		
727.21	599.67	534.62	328.55	164.74	0	0	0	0	323.27	527.54	723.96		(244)
(211)m = {[(98 805.33)m x (20 664.08	4)] } X 1 592.04	00 ÷ (20 363.85	182.44	0	0	0	0	357.99	584.2	801.73		(211)
000.00	004.00	002.04	000.00	102.77	U U					211) _{15,1012}		4351.66	(211)
Space heatin	a fuel (s	econdar	v). kWh/	month						10,1012	•		J` ′
= {[(98)m x (20	• ,		• •										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating		tor (oolo	ulated a	hovo)									
Output from w	165.14	171.81	152.39	147.54	129.95	124.5	138.79	140.32	159.78	170.56	184.61		
Efficiency of w	ater hea	iter	<u> </u>			<u> </u>	l	<u> </u>	l .	l .	l .	81	(216)
(217)m= 88.21	88.12	87.85	87.13	85.65	81	81	81	81	87	87.84	88.24		(217)
Fuel for water	•											•	
(219)m = (64) (219)m = 214.31	m x 100) ÷ (217) 195.58	m 174.9	172.25	160.43	153.7	171.34	173.23	183.66	194.18	209.21		
()	<u> </u>		<u> </u>				l	I = Sum(2	19a) ₁₁₂ =			2190.22	(219)
Annual totals									k\	Wh/year	•	kWh/year	J` ′
Space heating	fuel use	ed, main	svstem	1								4351.66	1
		,	- ,									4551.00	╛
Water heating	fuel use		- ,									2190.22]
Water heating Electricity for p		d			t]
	oumps, f	d ans and			t						30		(230c)
Electricity for p	oumps, f	d ans and :	electric	keep-ho	t		sum	of (230a).	(230g) =		30		(230c) (231)
Electricity for p	oumps, for the	d ans and :	electric	keep-ho	t		sum	of (230a).	(230g) =		30	2190.22	, <i>′</i>
Electricity for posterior central heating Total electricity Electricity for li	oumps, for the ighting	d ans and : above, I	electric <wh td="" yea<=""><td>keep-hoʻ r</td><td></td><td>uding mi</td><td></td><td></td><td>(230g) =</td><td></td><td>30</td><td>2190.22</td><td>(231)</td></wh>	keep-hoʻ r		uding mi			(230g) =		30	2190.22	(231)
Electricity for posterior central heating	oumps, for the ighting	d ans and : above, I	electric <wh td="" yea<=""><td>keep-hoʻ r</td><td>ems inclu</td><td></td><td></td><td></td><td></td><td></td><td></td><td>2190.22 30 353.7</td><td>(231)</td></wh>	keep-hoʻ r	ems inclu							2190.22 30 353.7	(231)
Electricity for posterior central heating Total electricity Electricity for li	oumps, for the ighting	d ans and : above, I	electric <wh td="" yea<=""><td>keep-hoʻ r</td><td>ems inclu</td><td>ergy</td><td></td><td></td><td>Emiss</td><td>ion fac</td><td></td><td>30 353.7 Emissions</td><td>(231)</td></wh>	keep-hoʻ r	ems inclu	ergy			Emiss	ion fac		30 353.7 Emissions	(231)
Electricity for procentral heating. Total electricity. Electricity for limits.	oumps, fing pump y for the gighting	d ans and : above, I	electric «Wh/yea ual heati	keep-hoʻ r	ems inclu En kW				Emiss kg CO	ion fac 2/kWh		30 353.7 Emissions kg CO2/yea	(231) (232)
Electricity for procentral heating Total electricity Electricity for li 12a. CO2 em	oumps, fing pump y for the ighting issions (main s	d ans and above, I Individ	electric «Wh/yea ual heati	keep-hoʻ r	ems inclu En kW (211	ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	30 353.7 Emissions kg CO2/yea](231)](232) arr](261)
Electricity for procentral heating Total electricity Electricity for li 12a. CO2 em Space heating Space heating	oumps, fing pump y for the ighting issions (main s	d ans and above, I Individ	electric «Wh/yea ual heati	keep-hoʻ r	ems inclu En kW (211	ergy /h/year l) x			Emiss kg CO2	ion fac 2/kWh 16	tor = =	30 353.7 Emissions kg CO2/yea 939.96](231)](232) lur](261)](263)
Electricity for procentral heating. Total electricity. Electricity for life. 12a. CO2 em. Space heating. Space heating. Water heating.	oumps, fing pump y for the ighting issions (main s	d ans and above, I Individ ystem 1	electric «Wh/yea ual heati	keep-hoʻ r	En kW (211 (215 (219	ergy /h/year l) x 5) x	cro-CHF		Emiss kg CO	ion fac 2/kWh 16	tor =	30 353.7 Emissions kg CO2/yea 939.96 0 473.09	[(231)] (232) [(261)] (263) (264)
Electricity for procentral heating. Total electricity for little Electricity for little 12a. CO2 em Space heating. Space heating. Water heating. Space and was	oumps, fing pump y for the ighting issions (main s (second	d ans and above, I Individ ystem 1 dary)	electric kWh/yea ual heati	keep-ho	En kW (211 (215 (219 (261	ergy /h/year i) x 5) x 9) x			Emiss kg CO2 0.2 0.5 0.2	ion fac 2/kWh 16 19 16	tor = = =	30 353.7 Emissions kg CO2/yea 939.96 0 473.09](231)](232)](261)](263)](264)](265)
Electricity for procentral heating. Total electricity for little Electricity for little 12a. CO2 em Space heating. Space heating. Water heating. Space and was Electricity for procentral procentral ending.	oumps, fing pump y for the ighting issions (main s (second ter heati	d ans and above, I Individ ystem 1 dary)	electric kWh/yea ual heati	keep-ho	ems inclu En kW (211 (215 (219 (261	ergy /h/year 1) x 5) x 9) x 1) + (262)	cro-CHF		Emiss kg CO2 0.2 0.5 0.5	ion fac 2/kWh 16 19 16	tor = = =	30 353.7 Emissions kg CO2/yea 939.96 0 473.09 1413.05	(231) (232) (232) (261) (263) (264) (265) (267)
Electricity for procentral heating. Total electricity for life the second secon	oumps, fing pump y for the ighting issions (main s (second ter heati bumps, finighting	d ans and above, I Individ ystem 1 dary)	electric kWh/yea ual heati	keep-ho	ems inclu En kW (211 (215 (219 (261	ergy /h/year i) x 5) x 9) x	cro-CHF	264) =	Emiss kg CO: 0.2 0.5 0.5 0.5	ion fac 2/kWh 16 19 16	tor = = =	30 353.7 Emissions kg CO2/yea 939.96 0 473.09	(231) (232) (232) (261) (263) (264) (265) (267) (268)
Electricity for procentral heating. Total electricity for life the second secon	oumps, fing pump y for the ighting issions (main s (second ter heati bumps, finighting /year	d ans and above, I Individ ystem 1 dary) ng ans and	electric kWh/yea ual heati	keep-ho	ems inclu En kW (211 (215 (219 (261	ergy /h/year 1) x 5) x 9) x 1) + (262)	cro-CHF	264) = sum o	Emiss kg CO: 0.2 0.5 0.5 0.5 f (265)(2	ion fac 2/kWh 16 19 16	tor = = =	30 353.7 Emissions kg CO2/yea 939.96 0 473.09 1413.05	[231] (232) (232) (261) (263) (264) (265) (267) (268) (272)
Electricity for procentral heating. Total electricity for life the second secon	oumps, fing pump y for the ighting issions (main s (second ter heati bumps, finighting /year	d ans and above, I Individ ystem 1 dary) ng ans and	electric kWh/yea ual heati	keep-ho	ems inclu En kW (211 (215 (219 (261	ergy /h/year 1) x 5) x 9) x 1) + (262)	cro-CHF	264) = sum o	Emiss kg CO: 0.2 0.5 0.5 0.5	ion fac 2/kWh 16 19 16	tor = = =	30 353.7 Emissions kg CO2/yea 939.96 0 473.09 1413.05 15.57 183.57	(231) (232) (232) (261) (263) (264) (265) (267) (268)

			User D)etails:						
Assessor Name:	Chris Hock	nell		Strom	a Nive	hor:		QTD()	016363	
Software Name:	Stroma FS			Softwa					on: 1.0.4.26	
Software Name:	Stroma ro		D					versio	JII. 1.0. 4 .20	
A 1.1			Property			=xisting				
Address :		ndfield Gardens	s, LONDO	JN, NVV3	6PU					
1. Overall dwelling dime	ensions:		_	4 0						. .
One word file an				a(m²)	l., ,		eight(m)	٦,,	Volume(m ³	<u>.</u>
Ground floor				64.3	(1a) x		2.5	(2a) =	160.75	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	64.3	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	160.75	(5)
2. Ventilation rate:										
	main heating	seconda heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+	0] = [0	X	40 =	0	(6a)
Number of open flues	0	+ 0	= +	0	Ī = Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ans					3	x	10 =	30	(7a)
Number of passive vents	S				Ĺ	0	x	10 =	0	(7b)
Number of flueless gas f					F	0	x	40 =	0	(7c)
..					L					(,
								Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fa	ans = $(6a)+(6b)+$	(7a)+(7b)+((7c) =	Г	30		÷ (5) =	0.19	(8)
If a pressurisation test has b	peen carried out or	is intended, proce	ed to (17),	otherwise o	continue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns	5)							0	(9)
Additional infiltration							[(9))-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber frame of	or 0.35 fo	r masoni	ry consti	uction			0	(11)
if both types of wall are p deducting areas of openi			to the great	ter wall are	a (after					
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dra	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic metr	es per ho	our per s	quare m	etre of e	envelope	area	10	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20] +$	(8), otherw	rise (18) = ((16)				0.69	(18)
Air permeability value applie	es if a pressurisatio	on test has been de	one or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x ([*]	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18) x (20) =				0.58	(21)
Infiltration rate modified	for monthly win	d speed							-	
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a)m = (2	2\m ÷ 1									
Wind Factor (22a)m = $(2^{2})^{2}$		1.00 0.05	0.05	T 0.02			1	1	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltration rate (allowing for shelter a	and wind spe	ed) = (21a) x	(22a)m					
0.74 0.73 0.71 0.64 0.63	0.55 0	0.55 0.54	0.58	0.63	0.66	0.69		
Calculate effective air change rate for the app	olicable case	•	•			•		
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (2	20) v Fmv (0 gua	stion (NE)) other	muiaa (22h	.) = (225)			0	(23a)
) – (23a)			0	(23b)
If balanced with heat recovery: efficiency in % allowing	-			OL)	201)	4 (00)	0	(23c)
a) If balanced mechanical ventilation with h	eat recovery	` 	í `	 	23b) × [``	÷ 100] I	(24a
, , , , , , , , , , , , , , , , , , , ,			0	0		0		(2 1 a
b) If balanced mechanical ventilation without		- ` ` ` ` ` ` ` 	í `	r Ó			1	(24b)
(24b)m= 0 0 0 0 0	0	0 0	0	0	0	0		(240)
c) If whole house extract ventilation or posi if (22b)m < 0.5 × (23b), then (24c) = (23b)	•			5 x (23h	.\			
(24c)m =	0	0 0	0	0	0	0		(24c)
d) If natural ventilation or whole house posi			<u> </u>					,
if (22b)m = 1, then (24d)m = (22b)m ot				0.5]				
(24d)m= 0.78 0.77 0.76 0.71 0.7	0.65 0	0.65 0.65	0.67	0.7	0.72	0.74		(24d)
Effective air change rate - enter (24a) or (2	4b) or (24c) o	or (24d) in bo	x (25)			•	•	
(25)m= 0.78 0.77 0.76 0.71 0.7	0.65 0	0.65 0.65	0.67	0.7	0.72	0.74		(25)
2 11-41		•						
3. Heat losses and heat loss parameter: ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-val W/m2		A X U (W/ł	〈)	k-value kJ/m²·l		A X k kJ/K
Doors	2.2	x 1.8	=	3.96	Ĺ			(26)
Windows Type 1	3.55	x1/[1/(1.6)+	0.04] =	5.34				(27)
Windows Type 2	1.39	x1/[1/(1.6)+	0.04] =	2.09				(27)
Windows Type 3	1.39		0.04] =	2.09				(27)
Windows Type 4	0.72		0.04] =	1.08				(27)
Windows Type 5	0.52	X1/[1/(1.6)+		0.78				(27)
Windows Type 6	0.72	X1/[1/(1.6)+		1.08				(27)
Walls Type1 23.74 3.87	19.87	x 0.55		10.93	=			(29)
Walls Type2 26.23 6.33	19.9	x 0.28	=	5.57	믁 ¦		╡ 누	(29)
W " - 0		┤ ├──	=	1.39	ᆿ ¦		╡	
Total area of elements, m ²								(29)
Total area of elements, in	2.52] × [0.55		1.00				(24)
	54.69							(31)
Party wall	54.69 45.69	x 0	=	0	_			(32)
Party wall Party floor	54.69				_ ; □ []			(32) (32a
Party wall Party floor Party ceiling	54.69 45.69 64.3	x	=	0] []]]			(32) (32a)
Party wall Party floor Party ceiling * for windows and roof windows, use effective window U	54.69 45.69 64.3 64.3	x	=	0	[[s given in	paragraph	3.2	(32) (32a
Party wall Party floor Party ceiling * for windows and roof windows, use effective window Use ** include the areas on both sides of internal walls and p	54.69 45.69 64.3 64.3	x	= 	0	[[s given in	paragraph		(32) (32a) (32b)
Party wall Party floor Party ceiling * for windows and roof windows, use effective window Uses include the areas on both sides of internal walls and p Fabric heat loss, W/K = S (A x U)	54.69 45.69 64.3 64.3	x 0	= /[(1/U-valu) + (32) =	0 ue)+0.04] a			37.18	(32) (32a) (32b)
Party wall Party floor Party ceiling * for windows and roof windows, use effective window United the areas on both sides of internal walls and p	54.69 45.69 64.3 64.3 -value calculated artitions	x 0	= /[(1/U-valu) + (32) = ((28).	0	2) + (32a).			(32) (32a) (32b)

can be used inst	ead of a de	tailed calcı	ulation.										
Thermal bridge				using Ap	pendix l	K						8.2	(36)
if details of thern	•	,		• •	•								(2.2)
Total fabric h								(33) +	(36) =			45.39	(37)
Ventilation he	eat loss ca	alculated	l monthl	y				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 41.21	40.64	40.08	37.46	36.96	34.68	34.68	34.25	35.56	36.96	37.96	39		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 86.6	86.03	85.47	82.84	82.35	80.07	80.07	79.64	80.95	82.35	83.35	84.39		
Heat loss par	ameter (l	HLP), W/	m²K			-			Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	82.84	(39)
(40)m= 1.35	1.34	1.33	1.29	1.28	1.25	1.25	1.24	1.26	1.28	1.3	1.31		
Number of da	ays in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.29	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•			•	•	•			•			•	
4. Water hea	ating ene	rgy requi	irement:								kWh/y	ear:	
Assumed occ	cupancy,	N								2	2.1	1	(42)
if TFA > 13	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		···	1	()
if TFA £ 13 Annual avera	,	ater usac	ne in litre	es ner da	av Vd av	erage =	(25 x N)	+ 36		90	3.51	1	(43)
Reduce the annu	ual average	hot water	usage by	5% if the a	lwelling is	designed			se target o		J.J 1		(40)
not more that 12	5 litres per _l	person per	day (all w	ater use, l	hot and co	ld)						-	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	ın litres per	day for ea	ach month	Vd,m = ta	ctor from	l able 1c x	·					1	
(44)m= 97.36	93.82	90.28	86.74	83.2	79.66	79.66	83.2	86.74	90.28	93.82	97.36		–
Energy content of	of hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1062.07	(44)
(45)m= 144.38	126.27	130.3	113.6	109	94.06	87.16	100.02	101.21	117.95	128.76	139.82]	
				ı	l				Total = Su	m(45) ₁₁₂ =	=	1392.55	(45)
If instantaneous	water heati	ng at point		hot water	r storage),	enter 0 in	boxes (46,) to (61)			•	•	
(46)m= 21.66	18.94	19.55	17.04	16.35	14.11	13.07	15	15.18	17.69	19.31	20.97		(46)
Water storage Storage volume) includin	ng anv se	olar or W	/WHRS	storage	within sa	ame ves	sel		0	1	(47)
If community	` '					Ū					<u> </u>		(,
Otherwise if r	_			_			. ,	ers) ente	er '0' in ((47)			
Water storage	e loss:												
a) If manufac	cturer's de	eclared l	oss facto	or is kno	wn (kWl	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost fr		_	-		an la 4	len a	(48) x (49)) =			0]	(50)
b) If manufact Hot water sto			-								0	1	(51)
If community	_			L C (NVV	, u e/uc	4 y /					0	J	(51)
Volume facto	_										0]	(52)
Temperature	factor fro	m Table	2b								0]	(53)

Energy lost from w Enter (50) or (54)	•	e, kWh/ye	ear			(47) x (51)) x (52) x (5	53) =		0		(54) (55)
Water storage loss		for each	month			((56)m = (55) × (41)r	n		o		(00)
(56)m= 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedi	ated solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss	(annual) fro	om Table	e 3							0		(58)
Primary circuit loss	calculated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified by fact	or from Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinder	thermo	stat)		ı	
(59)m= 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calcula	ed for each	month ((61)m =	(60) ÷ 36	65 × (41)m			_			
(61)m= 49.61 43.	8 46	42.77	42.4	39.28	40.59	42.4	42.77	46	46.27	49.61		(61)
Total heat required	for water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 193.99 169	45 176.31	156.37	151.4	133.34	127.75	142.41	143.99	163.96	175.02	189.43		(62)
Solar DHW input calcula	ted using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no solaı	contributi	ion to wate	er heating)		
(add additional line	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	eater											
(64)m= 193.99 169	45 176.31	156.37	151.4	133.34	127.75	142.41	143.99	163.96	175.02	189.43		
						Outp	out from wa	ater heater	r (annual)₁	12	1923.44	(64)
Heat gains from wa	ter heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	[(46)m	+ (57)m	+ (59)m]	
(65)m= 60.41 52.	8 54.83	48.47	46.84	41.1	39.13	43.86	44.35	50.72	54.38	58.89		(65)
include (57)m in	calculation	of (65)m	only if c	ا ما ما ما ا								
5. Internal gains		()	Offiny if C	yımder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
	see Table :			yımder i	s in the d	dwelling	or hot w	ater is fr	om com	munity h	eating	
Metabolic gains (Ta		5 and 5a		ylinder i	s in the d	dwelling	or hot w	ater is fr	om com	munity h	eating	
Metabolic gains (Ta	ble 5), Wa	5 and 5a		Jun	Jul	Aug	or hot w	ater is fr	om com	munity h	eating	
	ble 5), Wa b Mar	5 and 5a):								eating	(66)
Jan F	ble 5), Wa b Mar 01 105.01	5 and 5a tts Apr 105.01	May	Jun 105.01	Jul 105.01	Aug 105.01	Sep 105.01	Oct	Nov	Dec	eating	(66)
(66)m= Jan Fo	ble 5), Wa b Mar 105.01 ulated in A	5 and 5a tts Apr 105.01	May	Jun 105.01	Jul 105.01	Aug 105.01	Sep 105.01	Oct	Nov	Dec	eating	(66) (67)
Jan Foot 105.01 105	ble 5), War b Mar 105.01 ulated in A	tts Apr 105.01 ppendix 11.7	May 105.01 L, equati	Jun 105.01 on L9 of 7.38	Jul 105.01 r L9a), a	Aug 105.01 Iso see	Sep 105.01 Table 5	Oct 105.01	Nov 105.01	Dec 105.01	eating	
Jan Footnote Footnote Jan Footnote Jan Footnote Jan Ja	ble 5), War b Mar 105.01 ulated in A 15.45 alculated ii	tts Apr 105.01 ppendix 11.7	May 105.01 L, equati	Jun 105.01 on L9 of 7.38	Jul 105.01 r L9a), a	Aug 105.01 Iso see	Sep 105.01 Table 5	Oct 105.01	Nov 105.01	Dec 105.01	eating	
Jan Foot 105.01 105	ble 5), War b Mar 1105.01 ulated in A 15.45 alculated in 55 180.75	Apr 105.01 ppendix 11.7 Appendix 170.53	May 105.01 L, equati 8.74 dix L, equ 157.62	Jun 105.01 on L9 o 7.38 uation L 145.49	Jul 105.01 r L9a), a 7.98 13 or L1	Aug 105.01 Iso see 10.37 3a), also	Sep 105.01 Table 5 13.91 see Tal	Oct 105.01 17.67 ole 5 150.51	Nov 105.01 20.62	Dec 105.01 21.98	eating	(67)
Jan Foot 105.01 105	ble 5), War b Mar 01 105.01 ulated in A 15.45 alculated ii 55 180.75	Apr 105.01 ppendix 11.7 Appendix 170.53	May 105.01 L, equati 8.74 dix L, equ 157.62	Jun 105.01 on L9 o 7.38 uation L 145.49	Jul 105.01 r L9a), a 7.98 13 or L1	Aug 105.01 Iso see 10.37 3a), also	Sep 105.01 Table 5 13.91 see Tal	Oct 105.01 17.67 ole 5 150.51	Nov 105.01 20.62	Dec 105.01 21.98	eating	(67)
Jan Fe	ble 5), War b Mar 01 105.01 ulated in A 15.45 alculated in 55 180.75 culated in A 5 33.5	Apr 105.01 ppendix 11.7 Append 170.53 ppendix 33.5	May 105.01 L, equati 8.74 dix L, equ 157.62 L, equat	Jun 105.01 on L9 of 7.38 uation L 145.49 ion L15	Jul 105.01 r L9a), a 7.98 13 or L1 137.39 or L15a	Aug 105.01 Iso see 10.37 3a), also 135.48), also se	Sep 105.01 Table 5 13.91 o see Tal 140.29 ee Table	Oct 105.01 17.67 ole 5 150.51	Nov 105.01 20.62 163.41	Dec 105.01 21.98 175.54	eating	(67) (68)
Jan Formal Service (66)m= 105.01 105 Lighting gains (calcondress) 105.01 105 Lighting gains (calcondress) 105.01 105 Appliances gains (calcondress) 185 Cooking gains (calcondress) 185	ble 5), War b Mar 01 105.01 ulated in A 15.45 alculated in 55 180.75 culated in A 5 33.5	Apr 105.01 ppendix 11.7 Append 170.53 ppendix 33.5	May 105.01 L, equati 8.74 dix L, equ 157.62 L, equat	Jun 105.01 on L9 of 7.38 uation L 145.49 ion L15	Jul 105.01 r L9a), a 7.98 13 or L1 137.39 or L15a	Aug 105.01 Iso see 10.37 3a), also 135.48), also se	Sep 105.01 Table 5 13.91 o see Tal 140.29 ee Table	Oct 105.01 17.67 ole 5 150.51	Nov 105.01 20.62 163.41	Dec 105.01 21.98	eating	(67) (68)
Jan Fe	ble 5), War b Mar 01 105.01 ulated in A 15.45 alculated ii 55 180.75 ulated in A 5 33.5 ins (Table	Apr 105.01 ppendix 11.7 Appendix 170.53 ppendix 33.5 5a)	May 105.01 L, equati 8.74 dix L, equ 157.62 L, equat 33.5	Jun 105.01 fon L9 of 7.38 uation L 145.49 ion L15 33.5	Jul 105.01 r L9a), a 7.98 13 or L1 137.39 or L15a) 33.5	Aug 105.01 Iso see 10.37 3a), also 135.48), also se 33.5	Sep 105.01 Table 5 13.91 o see Tal 140.29 ee Table 33.5	Oct 105.01 17.67 ole 5 150.51 5 33.5	Nov 105.01 20.62 163.41 33.5	Dec 105.01 21.98 175.54 33.5	eating	(67) (68) (69)
Jan Fe (66)m= 105.01 105 Lighting gains (calc (67)m= 21.39 19 Appliances gains (calc (68)m= 183.65 185 Cooking gains (calc (69)m= 33.5 33 Pumps and fans ga (70)m= 3 3 Losses e.g. evapor	ble 5), War b Mar 105.01 ulated in A 15.45 alculated in A 5 33.5 ins (Table 3 ation (nega	Apr 105.01 ppendix 11.7 Appendix 170.53 ppendix 33.5 5a)	May 105.01 L, equati 8.74 dix L, equ 157.62 L, equat 33.5	Jun 105.01 fon L9 of 7.38 uation L 145.49 ion L15 33.5	Jul 105.01 r L9a), a 7.98 13 or L1 137.39 or L15a) 33.5	Aug 105.01 lso see 10.37 3a), also 135.48), also se 33.5	Sep 105.01 Table 5 13.91 o see Tal 140.29 ee Table 33.5	Oct 105.01 17.67 ole 5 150.51 5 33.5	Nov 105.01 20.62 163.41 33.5	Dec 105.01 21.98 33.5	eating	(67) (68) (69)
Jan Fe (66)m= 105.01 105 Lighting gains (calc (67)m= 21.39 11 Appliances gains (calc (68)m= 183.65 185 Cooking gains (calc (69)m= 33.5 33 Pumps and fans ga (70)m= 3 3 Losses e.g. evapor (71)m= -84.01 -84	ble 5), War b Mar 105.01 ulated in A 15.45 alculated in A 55 180.75 culated in A 33.5 ins (Table 3 ation (negan	Apr 105.01 ppendix 11.7 Append 170.53 ppendix 33.5 5a) 3	May 105.01 L, equati 8.74 dix L, equ 157.62 L, equati 33.5 3 es) (Tab	Jun 105.01 fon L9 of 7.38 uation L 145.49 ion L15 33.5	Jul 105.01 r L9a), a 7.98 13 or L1 137.39 or L15a) 33.5	Aug 105.01 Iso see 10.37 3a), also 135.48), also se 33.5	Sep 105.01 Table 5 13.91 o see Tal 140.29 ee Table 33.5	Oct 105.01 17.67 ole 5 150.51 5 33.5	Nov 105.01 20.62 163.41 33.5	Dec 105.01 21.98 175.54 33.5	eating	(67) (68) (69) (70)
Jan Fe (66)m= 105.01 105 Lighting gains (calc (67)m= 21.39 11 Appliances gains (calc (68)m= 183.65 185 Cooking gains (calc (69)m= 33.5 33 Pumps and fans ga (70)m= 3 3 Losses e.g. evapor (71)m= -84.01 -84 Water heating gain	ble 5), War b Mar 01 105.01 ulated in A 15.45 alculated in A 5 33.5 ins (Table 3 ation (nega	Apr 105.01 ppendix 11.7 Append 170.53 ppendix 33.5 5a) 3 tive valu -84.01	May 105.01 L, equati 8.74 dix L, equati 157.62 L, equati 33.5 3 es) (Tab	Jun 105.01 fon L9 of 7.38 uation L 145.49 ion L15 33.5 3 le 5) -84.01	Jul 105.01 r L9a), a 7.98 13 or L1 137.39 or L15a) 33.5	Aug 105.01 lso see 10.37 3a), also 135.48), also se 33.5	Sep 105.01 Table 5 13.91 See Tal 140.29 See Table 33.5	Oct 105.01 17.67 ole 5 150.51 5 33.5	Nov 105.01 20.62 163.41 33.5	Dec 105.01 21.98 33.5	eating	(67) (68) (69) (70)
Jan Foundament Foundament Foundament	ble 5), War b Mar 105.01 ulated in A 15.45 alculated in A 5 180.75 culated in A 5 33.5 ins (Table 180.01 ation (negation (nega	Apr 105.01 ppendix 11.7 Append 170.53 ppendix 33.5 5a) 3	May 105.01 L, equati 8.74 dix L, equ 157.62 L, equati 33.5 3 es) (Tab	Jun 105.01 fon L9 of 7.38 uation L 145.49 ion L15 33.5 3 le 5) -84.01	Jul 105.01 r L9a), a 7.98 13 or L1 137.39 or L15a) 33.5	Aug 105.01 Iso see 10.37 3a), also 135.48), also se 33.5 3	Sep 105.01 Table 5 13.91 o see Tal 140.29 ee Table 33.5 3	Oct 105.01 17.67 ole 5 150.51 5 33.5 3 -84.01	Nov 105.01 20.62 163.41 33.5 3	Dec 105.01 21.98 175.54 33.5 3 -84.01	eating	(67) (68) (69) (70) (71)
Jan Fe	ble 5), War b Mar ol 105.01 ulated in A	Apr 105.01 ppendix 11.7 Appendix 170.53 ppendix 33.5 5a) 3 tive valu -84.01	May 105.01 L, equati 8.74 dix L, equ 157.62 L, equat 33.5 3 es) (Tab -84.01	Jun 105.01 on L9 of 7.38 uation L 145.49 ion L15 33.5 3 le 5) -84.01	Jul 105.01 r L9a), a 7.98 13 or L1 137.39 or L15a) 33.5 3	Aug 105.01 Iso see 10.37 3a), also 135.48), also se 33.5 3 -84.01 58.95 1 + (68)m	Sep 105.01 Table 5 13.91 5 see Tall 140.29 ee Table 33.5 3 -84.01 61.59 + (69)m + (Oct 105.01 17.67 ole 5 150.51 5 33.5 3 -84.01 68.17 70)m + (7	Nov 105.01 20.62 163.41 33.5 3 -84.01 75.53 1)m + (72)	Dec 105.01 21.98 33.5 3 -84.01 79.16	eating	(67) (68) (69) (70) (71) (72)
Jan Fe (66)m= 105.01 105 Lighting gains (calc (67)m= 21.39 19 Appliances gains (calc (68)m= 183.65 185 Cooking gains (calc (69)m= 33.5 33 Pumps and fans ga (70)m= 3 3 Losses e.g. evapor (71)m= -84.01 -84 Water heating gain (72)m= 81.19 78.	ble 5), War b Mar ol 105.01 ulated in A	Apr 105.01 ppendix 11.7 Append 170.53 ppendix 33.5 5a) 3 tive valu -84.01	May 105.01 L, equati 8.74 dix L, equati 157.62 L, equati 33.5 3 es) (Tab	Jun 105.01 fon L9 of 7.38 uation L 145.49 ion L15 33.5 3 le 5) -84.01	Jul 105.01 r L9a), a 7.98 13 or L1 137.39 or L15a) 33.5	Aug 105.01 Iso see 10.37 3a), also 135.48), also se 33.5 3	Sep 105.01 Table 5 13.91 o see Tal 140.29 ee Table 33.5 3	Oct 105.01 17.67 ole 5 150.51 5 33.5 3 -84.01	Nov 105.01 20.62 163.41 33.5 3	Dec 105.01 21.98 175.54 33.5 3 -84.01	eating	(67) (68) (69) (70) (71)

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

Orientation: Access Fac Table 6d	tor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	x	3.55	x	11.28	x	0.63	x	0.7	=	12.24	(75)
Northeast _{0.9x} 0.77	×	0.72	x	11.28	x	0.63	х	0.7	=	2.48	(75)
Northeast 0.9x 0.77	X	3.55	x	22.97	x	0.63	х	0.7	=	24.92	(75)
Northeast 0.9x 0.77	x	0.72	x	22.97	x	0.63	x	0.7] =	5.05	(75)
Northeast _{0.9x} 0.77	X	3.55	x	41.38	x	0.63	х	0.7	=	44.89	(75)
Northeast 0.9x 0.77	X	0.72	x	41.38	x	0.63	х	0.7	=	9.11	(75)
Northeast _{0.9x} 0.77	X	3.55	x	67.96	X	0.63	х	0.7	=	73.73	(75)
Northeast _{0.9x} 0.77	X	0.72	x	67.96	x	0.63	x	0.7	=	14.95	(75)
Northeast _{0.9x} 0.77	X	3.55	x	91.35	x	0.63	x	0.7] =	99.1	(75)
Northeast _{0.9x} 0.77	X	0.72	x	91.35	x	0.63	x	0.7	=	20.1	(75)
Northeast _{0.9x} 0.77	X	3.55	x	97.38	x	0.63	x	0.7	=	105.65	(75)
Northeast _{0.9x} 0.77	X	0.72	x	97.38	x	0.63	x	0.7	=	21.43	(75)
Northeast _{0.9x} 0.77	X	3.55	x	91.1	x	0.63	x	0.7	=	98.84	(75)
Northeast _{0.9x} 0.77	X	0.72	x	91.1	x	0.63	x	0.7	=	20.05	(75)
Northeast _{0.9x} 0.77	X	3.55	x	72.63	x	0.63	x	0.7	=	78.79	(75)
Northeast _{0.9x} 0.77	X	0.72	x	72.63	x	0.63	x	0.7	=	15.98	(75)
Northeast _{0.9x} 0.77	X	3.55	x	50.42	x	0.63	x	0.7	=	54.7	(75)
Northeast _{0.9x} 0.77	X	0.72	x	50.42	x	0.63	x	0.7	=	11.09	(75)
Northeast _{0.9x} 0.77	X	3.55	x	28.07	x	0.63	x	0.7	=	30.45	(75)
Northeast _{0.9x} 0.77	x	0.72	x	28.07	x	0.63	х	0.7	=	6.18	(75)
Northeast _{0.9x} 0.77	X	3.55	x	14.2	x	0.63	х	0.7	=	15.4	(75)
Northeast _{0.9x} 0.77	X	0.72	x	14.2	x	0.63	x	0.7	=	3.12	(75)
Northeast _{0.9x} 0.77	X	3.55	x	9.21	x	0.63	x	0.7	=	10	(75)
Northeast _{0.9x} 0.77	X	0.72	x	9.21	x	0.63	x	0.7	=	2.03	(75)
Southeast 0.9x 0.77	X	1.39	x	36.79	x	0.63	X	0.7	=	31.26	(77)
Southeast 0.9x 0.77	X	1.39	x	36.79	X	0.63	X	0.7	=	15.63	(77)
Southeast 0.9x 0.77	X	0.52	X	36.79	x	0.63	X	0.7	=	11.69	(77)
Southeast 0.9x 0.77	X	1.39	X	62.67	X	0.63	X	0.7	=	53.25	(77)
Southeast 0.9x 0.77	X	1.39	x	62.67	X	0.63	X	0.7	=	26.62	(77)
Southeast 0.9x 0.77	X	0.52	x	62.67	x	0.63	X	0.7	=	19.92	(77)
Southeast 0.9x 0.77	X	1.39	X	85.75	X	0.63	X	0.7	=	72.86	(77)
Southeast 0.9x 0.77	X	1.39	x	85.75	X	0.63	X	0.7	=	36.43	(77)
Southeast 0.9x 0.77	X	0.52	x	85.75	X	0.63	X	0.7	=	27.26	(77)
Southeast 0.9x 0.77	X	1.39	X	106.25	X	0.63	X	0.7	=	90.27	(77)
Southeast 0.9x 0.77	X	1.39	x	106.25	x	0.63	x	0.7	=	45.14	(77)
Southeast 0.9x 0.77	X	0.52	x	106.25	x	0.63	x	0.7	=	33.77	(77)
Southeast 0.9x 0.77	X	1.39	x	119.01	x	0.63	x	0.7	=	101.11	(77)
Southeast 0.9x 0.77	X	1.39	x	119.01	x	0.63	x	0.7	=	50.56	(77)
Southeast 0.9x 0.77	X	0.52	×	119.01	×	0.63	X	0.7] =	37.83	(77)

		_												
Southeast _{0.9x}	0.77	X	1.39	9	X	11	8.15	X	0.63	X	0.7	=	100.38	(77)
Southeast _{0.9x}	0.77	X	1.39	9	X	11	8.15	X	0.63	X	0.7	=	50.19	(77)
Southeast _{0.9x}	0.77	X	0.52	2	X	11	8.15	X	0.63	X	0.7	=	37.55	(77)
Southeast _{0.9x}	0.77	X	1.39	9	X	11	3.91	X	0.63	x	0.7	=	96.78	(77)
Southeast _{0.9x}	0.77	X	1.39	9	X	11	3.91	X	0.63	X	0.7	=	48.39	(77)
Southeast _{0.9x}	0.77	X	0.5	2	x	11	3.91	X	0.63	x	0.7	=	36.2	(77)
Southeast 0.9x	0.77	×	1.39	9	x	10	4.39	X	0.63	x	0.7	=	88.69	(77)
Southeast _{0.9x}	0.77	X	1.39	9	X	10	4.39	X	0.63	x	0.7	=	44.35	(77)
Southeast _{0.9x}	0.77	×	0.52	2	X	10	4.39	X	0.63	X	0.7	=	33.18	(77)
Southeast 0.9x	0.77	X	1.39	9	X	9:	2.85	X	0.63	x	0.7	=	78.89	(77)
Southeast _{0.9x}	0.77	X	1.39	9	x	9:	2.85	x	0.63	x	0.7	=	39.44	(77)
Southeast _{0.9x}	0.77	X	0.52	2	x	9:	2.85	x	0.63	x	0.7	=	29.51	(77)
Southeast _{0.9x}	0.77	X	1.39	9	x	69	9.27	x	0.63	x	0.7	=	58.85	(77)
Southeast _{0.9x}	0.77	X	1.39	9	x	69	9.27	x	0.63	x	0.7	=	29.43	(77)
Southeast _{0.9x}	0.77	X	0.5	2	X	6	9.27	x	0.63	×	0.7	=	22.02	(77)
Southeast _{0.9x}	0.77	X	1.39	9	x	4	4.07	x	0.63	x	0.7	=	37.44	(77)
Southeast _{0.9x}	0.77	X	1.39	9	x	4	4.07	x	0.63	x	0.7	=	18.72	(77)
Southeast _{0.9x}	0.77	X	0.52	2	x	4	4.07	x	0.63	x	0.7	=	14.01	(77)
Southeast _{0.9x}	0.77	×	1.39	9	x	3	1.49	x	0.63	x	0.7	=	26.75	(77)
Southeast _{0.9x}	0.77	X	1.39	9	x	3	1.49	X	0.63	x	0.7	<u> </u>	13.38	(77)
Southeast 0.9x	0.77	X	0.52	2	x	3	1.49	X	0.63	x	0.7	=	10.01	(77)
Southwest _{0.9x}	0.77	×	0.72	2	x	3(6.79		0.63	X	0.7		8.1	(79)
Southwest _{0.9x}	0.77	×	0.72	2	x	6:	2.67		0.63	x	0.7	=	13.79	(79)
Southwest _{0.9x}	0.77	×	0.72	2	x	8	5.75		0.63	x	0.7	=	18.87	(79)
Southwest _{0.9x}	0.77	×	0.72	2	x	10	6.25		0.63	X	0.7		23.38	(79)
Southwest _{0.9x}	0.77	×	0.72	2	x	11	9.01		0.63	x	0.7	=	26.19	(79)
Southwest _{0.9x}	0.77	×	0.72	2	x	11	8.15		0.63	x	0.7	=	26	(79)
Southwest _{0.9x}	0.77	×	0.72	2	x	11	3.91		0.63	X	0.7	=	25.06	(79)
Southwest _{0.9x}	0.77	X	0.72	2	x	10	4.39		0.63	x	0.7	<u> </u>	22.97	(79)
Southwest _{0.9x}	0.77	X	0.72	2	x	9:	2.85	j i	0.63	X	0.7	=	20.43	(79)
Southwest _{0.9x}	0.77	X	0.72	2	x	69	9.27	j i	0.63	= x	0.7	=	15.24	(79)
Southwest _{0.9x}	0.77	X	0.72	2	x	4	4.07	j	0.63	×	0.7	=	9.7	(79)
Southwest _{0.9x}	0.77	X	0.72	2	x	3	1.49	i i	0.63	T x	0.7	=	6.93	(79)
_														
Solar gains in v	watts, calcu	lated	for each	mont	h			(83)m	= Sum(74)m .	(82)m				
(83)m= 81.4	143.55 20	9.41	281.24	334.88	3	41.21	325.32	283	.96 234.07	162.16	98.39	69.09		(83)
Total gains – ir	ternal and	solar	(84)m =	(73)m	+ (8	83)m ,	watts		-				_	
(84)m= 425.14	484.15 53	36.8	588.28	621.71	6	08.66	580.78	546	26 507.37	456.01	415.46	403.28		(84)
7. Mean interr	nal tempera	iture (heating	seaso	n)									
Temperature	•	`				area f	rom Tab	ole 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	s for li	ving are	a, h1,r	n (s	ee Tal	ble 9a)							
Jan	Feb N	Mar	Apr	May		Jun	Jul	Aı	ug Sep	Oct	Nov	Dec		

(86)m=	1	0.99	0.99	0.96	0.9	0.75	0.58	0.63	0.86	0.97	0.99	1		(86)
Mean i	internal	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	' in Tabl	e 9c)					
(87)m=	19.56	19.72	20	20.38	20.7	20.92	20.98	20.97	20.83	20.41	19.94	19.56		(87)
Tempe	erature	durina h	eating n	eriods ir	rest of	dwelling	from Ta	ble 9 T	h2 (°C)				l	
(88)m=	19.8	19.81	19.82	19.85	19.86	19.88	19.88	19.89	19.87	19.86	19.84	19.83		(88)
Litiliaat	tion foot	or for a	nina for I	rest of d	volling	h2 m /oc	L Tabla	00)			l			
(89)m=	1	0.99	0.98	0.95	0.85	0.65	0.45	9a) 0.5	0.79	0.96	0.99	1		(89)
	1						<u> </u>	<u> </u>		<u> </u>	0.00	·		()
Г		18.68	18.95	the rest	of dwelli 19.65	ng 12 (fo	ollow ste	ps 3 to 19.88	7 in Tabl _{19.78}	e 9c) 19.39	18.92	10.52		(90)
(90)m=	18.51	10.00	10.95	19.33	19.00	19.00	19.00	19.00		l	g area ÷ (4	18.53	0.20	(91)
									'	LA - LIVIII	g arca · (-	·, -	0.38	(91)
	1			r the wh		· · · · ·		· `	.A) × T2	1			İ	
(92)m=	18.9	19.07	19.35	19.74	20.05	20.25	20.29	20.29	20.17	19.78	19.3	18.92		(92)
				r			r		ere appro	 			1	(00)
(93)m=	18.9	19.07	19.35	19.74	20.05	20.25	20.29	20.29	20.17	19.78	19.3	18.92		(93)
			uirement				44.6	T		. —	7 0\			
				mperatuı using Ta		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Г	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Utilisat			ains, hm	<u> </u>	iviay	oun	Juli	Aug	ОСР	001	1101	Dec		
(94)m=	0.99	0.99	0.98	0.95	0.86	0.69	0.5	0.55	0.81	0.96	0.99	1		(94)
· · ·		hmGm .	W = (94	1)m x (84	4)m									
	422.89	479.37	525.48	556.18	535.06	417.32	289.65	300.47	411.26	437.35	411.33	401.6		(95)
∟ Monthl	ly avera	ige exte	rnal tem	perature	from Ta	able 8					1			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat Id	oss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]			l	
(97)m=	1264.73	1219.23	1098	897.94	687.57	452.39	295.8	309.99	491.55	755.79	1017.15	1242.03		(97)
Space	heating	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	626.32	497.18	425.96	246.06	113.47	0	0	0	0	236.92	436.19	625.28		
								Tota	l per year	(kWh/year	·) = Sum(9	8) _{15,912} =	3207.38	(98)
Space	heating	g require	ement in	kWh/m²	/year								49.88	(99)
9a Ene	rav rea	uiremer	nts – Indi	ividual h	eating sy	vstems i	ncluding	micro-C	:HP)					
	heatin		no ma	ividadi ii	oamig o	yotorno r	nordanig	1111010 C	,					
•		_	t from s	econdar	y/supple	mentary	system						0	(201)
Fractio	n of sp	ace hea	t from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
				main sys	` ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
			•	ing syste				(-) (- / [(/1				(206)
	•	•					- 0/						90.3	╡
Επιcier	ncy of s	econda	ry/suppi	ementar	y neating	g system	1, % 						0	(208)
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
· -	— i		<u> </u>	alculate			1	1		1		ī 1	1	
L	626.32	497.18	425.96	246.06	113.47	0	0	0	0	236.92	436.19	625.28		
(211)m	''' i			00 ÷ (20									ı	(211)
L	693.6	550.59	471.71	272.5	125.65	0	0	0	0	262.37	483.04	692.45		_
								Tota	i (kWh/yea	ar) =Sum(2	211) _{15,1012}	Ē	3551.92	(211)

Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)									
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		_
			Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating									_
Output from water heater (calculated above)								I	
	133.34	127.75	142.41	143.99	163.96	175.02	189.43		٦،۵،۵
Efficiency of water heater	T							81	(216)
(217)m= 87.91 87.74 87.36 86.44 84.74	81	81	81	81	86.25	87.43	87.95		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	164.62	157.72	175.82	177.76	190.1	200.2	215.38		
			Tota	I = Sum(2	19a) ₁₁₂ =		l	2256.77	(219)
Annual totals					k\	Wh/year	•	kWh/year	_
Space heating fuel used, main system 1								3551.92	
Water heating fuel used								2256.77]
Electricity for pumps, fans and electric keep-hot							·		_
central heating pump:							30		(230c)
central heating pump: Total electricity for the above, kWh/year			sum	of (230a).	(230g) =		30	30	(230c) (231)
• ,			sum	of (230a).	(230g) =		30	30 377.71	_
Total electricity for the above, kWh/year	ns includ	ding mid			(230g) =		30		(231)
Total electricity for the above, kWh/year Electricity for lighting	Ene					ion fac			(231)
Total electricity for the above, kWh/year Electricity for lighting	Ene	ergy n/year			Emiss	ion fac 2/kWh		377.71 Emissions	(231)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	Ene kWh	e rgy n/year			Emiss kg CO	ion fac 2/kWh	tor	377.71 Emissions kg CO2/yea	(231) (232)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	Ene kWh	ergy n/year x			Emiss kg CO	ion fac 2/kWh 16	tor	Emissions kg CO2/yea	(231) (232) (232)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Ene kWh (211) (215) (219)	ergy n/year x			Emiss kg CO2	ion fac 2/kWh 16	tor = =	377.71 Emissions kg CO2/yea 767.21	(231) (232) (232) (261) (263)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Ene kWh (211) (215) (219)	ergy n/year x x x + (262) +	cro-CHP		Emiss kg CO2	ion fac 2/kWh 16 19	tor = =	377.71 Emissions kg CO2/yea 767.21 0 487.46	(231) (232) (232) (261) (263) (264)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Ene kWh (211) (215) (219) (261)	ergy n/year x x x + (262) +	cro-CHP		Emiss kg CO2 0.2 0.5 0.2	ion fac 2/kWh 16 19	tor	377.71 Emissions kg CO2/yea 767.21 0 487.46 1254.68	(231) (232) (232) (261) (263) (264) (265)

 $(272) \div (4) =$

Dwelling CO2 Emission Rate

El rating (section 14)

(273)

(274)

			User D) otoilo:						
Assessor Name: Software Name:	Chris Hocknell Stroma FSAP 2			Strom Softwa	are Vei	sion:			0016363 on: 1.0.4.26	
Address :	Flat 6, 6, Lindfield		i i	Address		Existing				
1. Overall dwelling dim		d Gardens,	LONDO	JIN, INVVO	01 0					
			Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				<u> </u>	(1a) x		2.5	(2a) =	154.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+((1e)+(1r	n)	61.76	(4)			_		
Dwelling volume		. , .	´)+(3c)+(3c	d)+(3e)+	(3n) =	154.4	(5)
									134.4	
2. Ventilation rate:	main	seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating +	heating 0	- + -	0	1 = [0	x	40 =	0	(6a)
Number of open flues			_]			20 =		= ``
·	U	0	J . L	0	J ⊨	0			0	(6b)
Number of intermittent t					L	3		10 =	30	(7a)
Number of passive ven	ts					0	X	10 =	0	(7b)
Number of flueless gas	fires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our.
Infiltration due to chimn	ove flues and fons -	(6a)+(6b)+(7	7a\+/7b\+/	70) =	Г					_
Infiltration due to chimn If a pressurisation test has	•				continue fr	30 om (9) to		÷ (5) =	0.19	(8)
Number of storeys in		, proces	u 10 (11),	0.1.101111100		om (0) 10 ((10)		0	(9)
Additional infiltration	J ,						[(9)	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or timbe	er frame or	0.35 fo	r masoni	y constr	uction			0	(11)
	present, use the value cor nings); if equal user 0.35	responding to	the great	ter wall are	a (after					
If suspended wooder	- ' '	ealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e		,	`	,,					0	(13)
Percentage of window	ws and doors draught	t stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value			•	•	•	etre of e	envelope	area	10	(17)
If based on air permeat						ia haina u	and		0.69	(18)
Air permeability value appl Number of sides shelte		nas been dor	ie or a deg	gree air pei	ттеаршіу	is being u	seu		1	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorpor	ating shelter factor			(21) = (18) x (20) =				0.64	(21)
Infiltration rate modified	for monthly wind spe	eed								
Jan Feb	Mar Apr Ma	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind s	speed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (22\m ÷ <i>4</i>									
$\frac{\text{(22a)m} = 1.27}{\text{(22a)m}} = \frac{1.25}{\text{(22a)m}}$	1.23 1.1 1.08	3 0.95	0.95	0.92	1	1.08	1.12	1.18	1	
,	1.00								J	

Adjusted infiltra	ation rate (allow	ing for sh	nelter an	ıd wind s	speed) =	: (21a) x	(22a)m					
0.82	0.8 0.79	0.71	0.69	0.61	0.61	0.59	0.64	0.69	0.72	0.75]	
	ctive air change	rate for t	he appli	cable ca	se				!			
	al ventilation: eat pump using App	ondiv N (2	13h) - (23a	a) v Emy (aguation (NEV otho	anvico (23h	v) = (23a)			0	(23a)
	heat recovery: effic)) = (23a)			0	(23b)
		-	_					Ob.) (006) [4 (00-)	0	(23c)
(24a)m= 0	d mechanical v	entilation 0	with ne	at recove	ery (MV)	HR) (248	a)m = (2. 0	2b)m + (. 0	23b) × [1	1 – (23c)) ÷ 100]]	(24a)
` ′										0	J	(2 4 a)
· · ·	d mechanical v	entilation 0	without	neat red	overy (i	VIV) (241 T 0	o)m = (22 0	2b)m + (<i>i</i>	23D) 0	0	1	(24b)
` '		ļ.	ļ	<u> </u>				1 0			J	(240)
,	ouse extract ve $1 < 0.5 \times (23b)$,		•					5 × (23h))			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0	1	(24c)
	ventilation or wh	nole hous	L nositiv	<u> </u>	ventilati	on from					J	, ,
,	n = 1, then (24d		•	•				0.5]				
(24d)m= 0.84	0.82 0.81	0.75	0.74	0.69	0.69	0.68	0.71	0.74	0.76	0.78		(24d)
Effective air	change rate - e	nter (24a) or (24k	o) or (24	c) or (24	ld) in bo	x (25)			•	-	
(25)m= 0.84	0.82 0.81	0.75	0.74	0.69	0.69	0.68	0.71	0.74	0.76	0.78]	(25)
3 Heat losses	s and heat loss	naramete	or:								•	
ELEMENT	Gross	Openin		Net Ar	ea	U-val	ue	AXU		k-value	<u>.</u>	ΑΧk
	area (m²)	m		A ,r		W/m2		(W/I	K)	kJ/m²·		kJ/K
Doors				2.2	X	1.8	=	3.96				(26)
Windows Type	:1			5.42	x1	/[1/(1.6)+	0.04] =	8.15				(27)
Windows Type	2			0.53	x1	/[1/(1.6)+	0.04] =	0.8				(27)
Windows Type	: 3			0.45	<u></u>	/[1/(1.6)+	0.04] =	0.68				(27)
Windows Type	: 4			2.85	x1	/[1/(1.6)+	0.04] =	4.29	=			(27)
Walls Type1	56.44	11.29	9	45.15	5 X	0.55		24.83	= [(29)
Walls Type2	16.52	2.2		14.32	_	0.55	=	7.88	F i			(29)
Total area of e	lements, m²			72.96	<u> </u>							(31)
Party wall	,			24.38	=	0		0	— [(32)
Party floor				61.76	=						ᆿ 늗	(32a)
Party ceiling				61.76	=				L T			(32b)
,	roof windows, use	effective wi	ndow U-va			n formula 1	1/[(1/Ll-valı	ле)+0 041 а	L as aiven in	naragranh		(320)
	as on both sides of i				atou domig	, rommana i	n _L (no valo	<i>10)</i> 10.0 1 ₁ 0	io givoii iii	paragrapi	, 0.2	
Fabric heat los	ss, W/K = S (A x	(U)				(26)(30) + (32) =				53.6	5 (33)
Heat capacity	$Cm = S(A \times k)$						((28).	(30) + (32	2) + (32a).	(32e) =	12139.	63 (34)
Thermal mass	parameter (TM	P = Cm ÷	+ TFA) ir	n kJ/m²K			Indica	ative Value	: Medium		250	(35)
For design assess	ments where the de	etails of the	construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
	ad of a detailed cald											
can be used instea		culation.			K						10.94	4 (36)
can be used instead Thermal bridge	ad of a detailed cald	culation. Iculated ι	using Ap	pendix I	K						10.94	(36)

Ventila	ition hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	42.56	41.89	41.24	38.19	37.62	34.96	34.96	34.47	35.98	37.62	38.77	39.98		(38)
Heat tr	ansfer o	coefficie	nt, W/K	•		•	•	•	(39)m	= (37) + (37)	38)m	•		
(39)m=	107.15	106.48	105.83	102.78	102.21	99.55	99.55	99.06	100.57	102.21	103.36	104.57		
Heat Id	oss para	meter (H	HLP), W	/m²K				•		Average = = (39)m ÷		12 /12=	102.78	(39)
(40)m=	1.73	1.72	1.71	1.66	1.65	1.61	1.61	1.6	1.63	1.65	1.67	1.69		
Numbe	er of day	s in mo	nth (Tab	le 1a)			•	•		Average =	Sum(40) ₁	12 /12=	1.66	(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 heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Accum	ned occu	inanov	NI									20		(42)
if TF		9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.		03		(42)
		•	ater usaç	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		86	5.77		(43)
		-	hot water			-	-	to achieve	a water us	se target o	f			
not more			person per											
Hot wate	Jan ar usaga ir	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
				·		1		· <i>′</i>	1 05 04			05.45		
(44)m=	95.45	91.98	88.51	85.04	81.57	78.1	78.1	81.57	85.04	88.51	91.98	95.45	4044.00	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600		Total = Su oth (see Ta			1041.28	(44)
(45)m=	141.55	123.8	127.75	111.38	106.87	92.22	85.46	98.06	99.23	115.65	126.24	137.08		_
If instant	taneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1365.28	(45)
(46)m=	21.23	18.57	19.16	16.71	16.03	13.83	12.82	14.71	14.88	17.35	18.94	20.56		(46)
	storage		داد داد داد		. \ \	/\// IDC	_4			1				(4-)
•		` ') includir	•			•		ame ves	sei		0		(47)
Otherw	-	stored	nd no ta hot wate		•			` '	ers) ente	er '0' in (47)			
	•		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
•			m Table			,	• • • • • • • • • • • • • • • • • • • •					0		(49)
			storage		ear			(48) x (49) =			0		(50)
			eclared o	-		or is not		. , ,				0		()
		_	factor fr		e 2 (kW	h/litre/da	ay)					0		(51)
	munity h e factor	_	ee secti	on 4.3										(50)
			่อเe ∠a m Table	2h								0		(52) (53)
•			storage		aar			(47) x (51) v (52) v (53) -				
	(50) or (•	, EVVII/Y	zai			(11) X (31	, ^ (JZ) X (JJ) –		0		(54) (55)
	` '	. , .	culated t	for each	month			((56)m = (55) × (41)	m		·		(30)
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
(50)111-			<u> </u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	ı		(00)

		u solal sto	rage, (01)	11 (00)111	x [(50) – (/- \	,	()	m where (1111/15/110	m Append	lix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circui	t loss (ar	nual) fro	m Table	3							0		(58)
Primary circui	t loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				•	
(modified b	y factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	alculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 48.64	42.34	45.1	41.94	41.57	38.51	39.8	41.57	41.94	45.1	45.36	48.64		(61)
Total heat red	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 190.19	166.14	172.85	153.31	148.43	130.73	125.25	139.63	141.17	160.75	171.6	185.72		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add additiona	al lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from v	/ater hea	ter											
(64)m= 190.19	166.14	172.85	153.31	148.43	130.73	125.25	139.63	141.17	160.75	171.6	185.72		
							Outp	out from wa	ater heate	r (annual) ₁	12	1885.78	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	1] + 0.8 >	([(46)m	+ (57)m	+ (59)m]	
(65)m= 59.23	51.75	53.75	47.52	45.93	40.29	38.36	43	43.48	49.73	53.31	57.74		(65)
include (57	m in cal	culation o	of (65)m	only if c	ylinder is	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal g	ains (see	Table 5	and 5a):									
Metabolic gai	ns (Table	5), Wat	ts									_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 101.55	101.55	101.55	101.55	101.55	101.55	101.55	101.55	101.55	101.55	101.55	101.55		(66)
Lighting gains	(calcula	ted in Ap	nendiv	eguati	ion I 9 oi	r I Oo\ o							(00)
(67)m= 20.14	47.00		pendix	_, 0 q a a .		Lea), a	lso see	Table 5				_	(00)
	17.89	14.55	11.01	8.23	6.95	7.51	9.76	Table 5	16.64	19.42	20.7		(67)
Appliances ga	ļ		11.01	8.23	6.95	7.51	9.76	13.1	ļ	19.42	20.7		
Appliances ga (68)m= 177.36	ins (calc		11.01	8.23	6.95	7.51	9.76	13.1	ļ	19.42 157.82	20.7]	
	179.2	ulated in	11.01 Append 164.69	8.23 dix L, equ	6.95 uation L 140.51	7.51 13 or L1 132.69	9.76 3a), also 130.85	13.1 see Ta 135.49	ble 5 145.36	<u> </u>	<u> </u>		(67)
(68)m= 177.36	179.2	ulated in	11.01 Append 164.69	8.23 dix L, equ	6.95 uation L 140.51	7.51 13 or L1 132.69	9.76 3a), also 130.85	13.1 see Ta 135.49	ble 5 145.36	<u> </u>	<u> </u>]]	(67)
(68)m= 177.36 Cooking gains	179.2 s (calcula 33.15	ulated in 174.57 Ited in Ap	11.01 Append 164.69 opendix 33.15	8.23 dix L, equat 152.23 L, equat	6.95 uation L 140.51 ion L15	7.51 13 or L1 132.69 or L15a	9.76 3a), also 130.85), also se	13.1 see Ta 135.49 ee Table	ble 5 145.36	157.82	169.54		(67) (68)
(68)m= 177.36 Cooking gain: (69)m= 33.15	179.2 s (calcula 33.15	ulated in 174.57 Ited in Ap	11.01 Append 164.69 opendix 33.15	8.23 dix L, equat 152.23 L, equat	6.95 uation L 140.51 ion L15	7.51 13 or L1 132.69 or L15a	9.76 3a), also 130.85), also se	13.1 see Ta 135.49 ee Table	ble 5 145.36	157.82	169.54]]]	(67) (68)
(68)m= 177.36 Cooking gain: (69)m= 33.15 Pumps and fa	ains (calcula 179.2 s (calcula 33.15 nns gains	ulated in 174.57 ated in April 33.15 (Table 5	11.01 Append 164.69 opendix 33.15 5a)	8.23 dix L, eq 152.23 L, equat 33.15	6.95 uation L 140.51 ion L15 33.15	7.51 13 or L1 132.69 or L15a) 33.15	9.76 3a), also 130.85), also se 33.15	13.1 see Ta 135.49 ee Table 33.15	ble 5 145.36 5 33.15	157.82 33.15	169.54 33.15		(67) (68) (69)
(68)m= 177.36 Cooking gains (69)m= 33.15 Pumps and fa (70)m= 3	179.2 s (calcula 33.15 uns gains 3 vaporatio	ulated in 174.57 ated in April 33.15 (Table 5	11.01 Append 164.69 opendix 33.15 5a)	8.23 dix L, eq 152.23 L, equat 33.15	6.95 uation L 140.51 ion L15 33.15	7.51 13 or L1 132.69 or L15a) 33.15	9.76 3a), also 130.85), also se 33.15	13.1 see Ta 135.49 ee Table 33.15	ble 5 145.36 5 33.15	157.82 33.15	169.54 33.15		(67) (68) (69)
(68)m= 177.36 Cooking gain: (69)m= 33.15 Pumps and fa (70)m= 3 Losses e.g. e	ains (calculations) (ulated in 174.57 ated in April 33.15 (Table 5 3 on (negative)	11.01 Appendix 164.69 Dependix 33.15 Sa) 3 tive valu	8.23 dix L, equal 152.23 L, equal 33.15 3 es) (Tab	6.95 uation L 140.51 ion L15 33.15 3 le 5)	7.51 13 or L1 132.69 or L15a) 33.15	9.76 3a), also 130.85), also se 33.15	13.1 see Ta 135.49 ee Table 33.15	ble 5 145.36 5 33.15	33.15 3	33.15 3		(67) (68) (69) (70)
(68)m= 177.36 Cooking gains (69)m= 33.15 Pumps and fa (70)m= 3 Losses e.g. e (71)m= -81.24	ains (calculations) (ulated in 174.57 ated in April 33.15 (Table 5 3 on (negative)	11.01 Appendix 164.69 Dependix 33.15 Sa) 3 tive valu	8.23 dix L, equal 152.23 L, equal 33.15 3 es) (Tab	6.95 uation L 140.51 ion L15 33.15 3 le 5)	7.51 13 or L1 132.69 or L15a) 33.15	9.76 3a), also 130.85), also se 33.15	13.1 see Ta 135.49 ee Table 33.15	ble 5 145.36 5 33.15	33.15 3	33.15 3		(67) (68) (69) (70)
(68)m= 177.36 Cooking gains (69)m= 33.15 Pumps and fa (70)m= 3 Losses e.g. e (71)m= -81.24 Water heating	ins (calcular street) (calcula	ulated in 174.57 ated in April 33.15 (Table 5 are 1.24 are 1.24 are 1.25 ar	11.01 Append 164.69 ppendix 33.15 5a) 3 tive valu -81.24	8.23 dix L, equat 152.23 L, equat 33.15 3 es) (Tab	6.95 uation L 140.51 ion L15 33.15 3 le 5) -81.24	7.51 13 or L1 132.69 or L15a) 33.15 3 -81.24	9.76 3a), also 130.85), also se 33.15 3 -81.24	13.1 o see Ta 135.49 ee Table 33.15 3	ble 5 145.36 5 33.15 3 -81.24	33.15 3 -81.24 74.05	33.15 3 -81.24		(67) (68) (69) (70) (71)
(68)m= 177.36 Cooking gain: (69)m= 33.15 Pumps and fa (70)m= 3 Losses e.g. e (71)m= -81.24 Water heating (72)m= 79.6	ains (calculations) (ulated in 174.57 ated in April 33.15 (Table 5 are 1.24 are 1.24 are 1.25 ar	11.01 Append 164.69 ppendix 33.15 5a) 3 tive valu -81.24	8.23 dix L, equat 152.23 L, equat 33.15 3 es) (Tab	6.95 uation L 140.51 ion L15 33.15 3 le 5) -81.24	7.51 13 or L1 132.69 or L15a) 33.15 3 -81.24	9.76 3a), also 130.85), also se 33.15 3 -81.24	13.1 2 see Ta 135.49 2 ee Table 33.15 3 -81.24 60.39	ble 5 145.36 5 33.15 3 -81.24	33.15 3 -81.24 74.05	33.15 3 -81.24		(67) (68) (69) (70) (71)
(68)m= 177.36 Cooking gains (69)m= 33.15 Pumps and fa (70)m= 3 Losses e.g. e (71)m= -81.24 Water heating (72)m= 79.6 Total interna	ains (calculations) (ulated in 174.57 ated in April 33.15 (Table 5 are 1.24 able 5) 72.25	11.01 Append 164.69 opendix 33.15 5a) 3 tive valu -81.24	8.23 dix L, eq 152.23 L, equat 33.15 3 es) (Tab -81.24	6.95 uation L 140.51 ion L15 33.15 3 le 5) -81.24 55.96 (66)	7.51 13 or L1 132.69 or L15a) 33.15 3 -81.24 51.56 m + (67)m	9.76 3a), also 130.85), also se 33.15 3 -81.24 57.79 1 + (68)m +	13.1 2 see Ta 135.49 2 ee Table 33.15 3 -81.24 60.39 + (69)m + (ble 5 145.36 5 33.15 3 -81.24 66.84 (70)m + (7	33.15 3 -81.24 74.05 1)m + (72	33.15 3 -81.24 77.61		(67) (68) (69) (70) (71) (72)
(68)m= 177.36 Cooking gains (69)m= 33.15 Pumps and fa (70)m= 3 Losses e.g. e (71)m= -81.24 Water heating (72)m= 79.6 Total interna (73)m= 333.57	ains (calculations) (ulated in 174.57 ated in April 33.15 (Table 5 are 1.24 able 5) 72.25 at 317.82	11.01 14.69 164.69 1756a) 18 18 18 18 18 18 18 18 18 18 18 18 18	8.23 dix L, equator 152.23 L, equator 33.15 as (Tab -81.24) 61.73	6.95 uation L 140.51 ion L15 33.15 3 le 5) -81.24 55.96 (66) 259.89	7.51 13 or L1 132.69 or L15a) 33.15 3 -81.24 51.56 m + (67)m 248.23	9.76 3a), also 130.85), also se 33.15 3 -81.24 57.79 1+(68)m+ 254.86	13.1 2 see Ta 135.49 2 ee Table 33.15 3 -81.24 60.39 + (69)m + (265.44	ble 5 145.36 5 33.15 3 -81.24 66.84 (70)m + (7 285.3	33.15 3 -81.24 74.05 1)m + (72	33.15 3 -81.24 77.61		(67) (68) (69) (70) (71) (72)

Table 6b

Table 6c

Table 6a

m²

Table 6d

(W)

o		-		1		_		1		1		_
Southwest _{0.9x}	0.77	X	5.42	X	36.79	Ļ	0.63	X	0.7] =	60.95	(79)
Southwest _{0.9x}	0.77	X	0.53	X	36.79		0.63	X	0.7	=	23.84	(79)
Southwest _{0.9x}	0.77	X	0.45	X	36.79		0.63	X	0.7	=	10.12	(79)
Southwest _{0.9x}	0.77	X	2.85	X	36.79		0.63	X	0.7	=	32.05	(79)
Southwest _{0.9x}	0.77	X	5.42	X	62.67		0.63	X	0.7	=	103.81	(79)
Southwest _{0.9x}	0.77	X	0.53	X	62.67		0.63	X	0.7	=	40.61	(79)
Southwest _{0.9x}	0.77	X	0.45	X	62.67		0.63	X	0.7	=	17.24	(79)
Southwest _{0.9x}	0.77	X	2.85	X	62.67		0.63	X	0.7] =	54.59	(79)
Southwest _{0.9x}	0.77	X	5.42	X	85.75		0.63	X	0.7	=	142.04	(79)
Southwest _{0.9x}	0.77	X	0.53	x	85.75		0.63	X	0.7	=	55.56	(79)
Southwest _{0.9x}	0.77	X	0.45	x	85.75		0.63	X	0.7	=	23.59	(79)
Southwest _{0.9x}	0.77	X	2.85	x	85.75		0.63	X	0.7	=	74.69	(79)
Southwest _{0.9x}	0.77	X	5.42	x	106.25		0.63	x	0.7] =	176	(79)
Southwest _{0.9x}	0.77	X	0.53	x	106.25		0.63	X	0.7] =	68.84	(79)
Southwest _{0.9x}	0.77	X	0.45	x	106.25		0.63	X	0.7	=	29.22	(79)
Southwest _{0.9x}	0.77	X	2.85	x	106.25		0.63	X	0.7] =	92.54	(79)
Southwest _{0.9x}	0.77	X	5.42	x	119.01	Ī	0.63	x	0.7] =	197.13	(79)
Southwest _{0.9x}	0.77	X	0.53	x	119.01		0.63	x	0.7	=	77.11	(79)
Southwest _{0.9x}	0.77	X	0.45	x	119.01	Ī	0.63	x	0.7] =	32.73	(79)
Southwest _{0.9x}	0.77	X	2.85	x	119.01	Ī	0.63	x	0.7	j =	103.66	(79)
Southwest _{0.9x}	0.77	X	5.42	x	118.15	Ī	0.63	x	0.7	Ī =	195.71	(79)
Southwest _{0.9x}	0.77	X	0.53	x	118.15	Ī	0.63	x	0.7	j =	76.55	(79)
Southwest _{0.9x}	0.77	X	0.45	x	118.15	Ī	0.63	x	0.7	j =	32.5	(79)
Southwest _{0.9x}	0.77	X	2.85	x	118.15	Ī	0.63	x	0.7	j =	102.91	(79)
Southwest _{0.9x}	0.77	X	5.42	x	113.91	Ī	0.63	x	0.7	j =	188.68	(79)
Southwest _{0.9x}	0.77	X	0.53	x	113.91	Ī	0.63	x	0.7	j =	73.8	(79)
Southwest _{0.9x}	0.77	X	0.45	x	113.91	Ī	0.63	x	0.7	j =	31.33	(79)
Southwest _{0.9x}	0.77	x	2.85	x	113.91	Ī	0.63	х	0.7	j =	99.21	(79)
Southwest _{0.9x}	0.77	X	5.42	x	104.39	Ī	0.63	x	0.7] =	172.91	(79)
Southwest _{0.9x}	0.77	X	0.53	x	104.39	Ē	0.63	х	0.7] =	67.63	(79)
Southwest _{0.9x}	0.77	X	0.45	x	104.39	Ī	0.63	х	0.7	=	28.71	(79)
Southwest _{0.9x}	0.77	X	2.85	x	104.39	Ī	0.63	x	0.7] =	90.92	(79)
Southwest _{0.9x}	0.77	X	5.42	x	92.85	Ē	0.63	х	0.7	j =	153.8	(79)
Southwest _{0.9x}	0.77	X	0.53	x	92.85	Ē	0.63	x	0.7	j =	60.16	(79)
Southwest _{0.9x}	0.77	X	0.45	x	92.85	F	0.63	x	0.7	j =	25.54	(79)
Southwest _{0.9x}	0.77	X	2.85	×	92.85	F	0.63	X	0.7	j =	80.87	(79)
Southwest _{0.9x}	0.77	X	5.42	x	69.27	F	0.63	x	0.7	j =	114.74	(79)
Southwest _{0.9x}	0.77	X	0.53	×	69.27	F	0.63	X	0.7] =	44.88	(79)
Southwest _{0.9x}	0.77	X	0.45	X	69.27	F	0.63	X	0.7] =	19.05	(79)
Southwest _{0.9x}	0.77	X	2.85	x	69.27	F	0.63	X	0.7] =	60.33	(79)
Southwest _{0.9x}	0.77	X	5.42	X	44.07	F	0.63	X	0.7] =	73	(79)
L		_		1		<u> </u>		1		1		

Southwest _{0.9x} 0.77	X	0.5	i3	x	44.07	7		0.63	X	0.7	=	28.55	(79)
Southwest _{0.9x} 0.77	x	0.4	.5	x	44.07	7		0.63	x	0.7	=	12.12	(79)
Southwest _{0.9x} 0.77	x	2.8	55	х	44.07	7		0.63	x	0.7	=	38.39	(79)
Southwest _{0.9x} 0.77	x	5.4	2	х	31.49	9		0.63	x	0.7	=	52.16	(79)
Southwest _{0.9x} 0.77	x	0.5	i3	x	31.49	9		0.63	_ x [0.7	=	20.4	(79)
Southwest _{0.9x} 0.77	x	0.4	-5	x	31.49	9		0.63	x	0.7	=	8.66	(79)
Southwest _{0.9x} 0.77	x	2.8	55	x	31.49	9		0.63	x	0.7	=	27.43	(79)
	<u>_</u>			•									_
Solar gains in watts, c	alculated	for eacl	n month				(83)m = \$	Sum(74)m .	(82)m				
(83)m= 126.95 216.25	295.88	366.61	410.63	40	7.66 39	3.03	360.19	320.37	239	152.06	108.64		(83)
Total gains – internal a	and solar	(84)m =	(73)m	+ (8	33)m , wa	atts						•	
(84)m= 460.52 546.81	613.7	664.77	689.28	66	64 64	1.25	615.05	585.81	524.3	459.81	432.95		(84)
7. Mean internal temp	oerature ((heating	season)									
Temperature during h	neating p	eriods ir	the livi	ng a	area fron	n Tab	ole 9, Tl	า1 (°C)				21	(85)
Utilisation factor for g	ains for I	iving are	ea, h1,m	(se	ee Table	9a)							
Jan Feb	Mar	Apr	May	,	Jun .	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.99 0.99	0.98	0.95	0.9	0	.78 0).62	0.66	0.85	0.96	0.99	1		(86)
Mean internal temper	rature in I	iving are	ea T1 (fo	ollo	w steps :	3 to 7	' in Tab	le 9c)					
(87)m= 19.17 19.38	19.71	20.15	20.54	20	0.83 20	0.95	20.93	20.73	20.22	19.64	19.17		(87)
Temperature during h	neating p	eriods ir	rest of	dw	ellina fro	m Ta	ble 9 1	h2 (°C)					
(88)m= 19.52 19.52	19.53	19.57	19.57	Г	<u>`</u> _	9.6	19.61	19.59	19.57	19.56	19.55		(88)
	L laine for r	oot of d	volling	h2 i	m /ooo T		00)	!	<u> </u>				
Utilisation factor for g	0.97	0.93	0.85	Г).45	9a) 0.5	0.77	0.95	0.99	0.99		(89)
	!									0.00	0.00		(00)
Mean internal temper	1			T -		I		1		T 40.4	47.00	1	(90)
(90)m= 17.9 18.12	18.45	18.91	19.27		9.53 19	9.59	19.59	19.45	18.99	18.4 ng area ÷ (4	17.92	0.44	(90)
									ILA - LIVII	ig area · (·	·) –	0.41	(91)
Mean internal temper	- `-			_				1	i	1	ı	1	(00)
(92)m= 18.42 18.64	18.97	19.42	19.79	<u> </u>		0.15	20.14	19.98	19.49	18.91	18.43		(92)
Apply adjustment to t	1			1					, 	10.04	40.40		(93)
(93)m= 18.42 18.64	18.97	19.42	19.79		0.06 20	0.15	20.14	19.98	19.49	18.91	18.43		(93)
8. Space heating req		nneratur	e obtair	had	at sten 1	11 of	Table (h so tha	t Ti m-/	76\m an	d re calc	vulate	
the utilisation factor for				icu	at step	1101	i abic s	, so illa	it 11,111—((10)III ali	u ie-caic	uiale	
Jan Feb	Mar	Apr	May	Ι,	Jun .	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for g	ains, hm	:			,			•					
(94)m= 0.99 0.98	0.97	0.93	0.86	0	.71 0).52	0.57	0.8	0.94	0.98	0.99		(94)
Useful gains, hmGm	, W = (94	l)m x (84	4)m	_								•	
(95)m= 456.43 537.61	593.87	619.66	590.56			36.6	348.29	466.87	494.74	452.49	429.89		(95)
Monthly average exte	1					1		T				1	(00)
(96)m= 4.3 4.9	6.5	8.9	11.7			6.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for me (97)m= 1513.35 1463.17			erature, 826.7	1		9)m > 3.29	x [(93)n 370.79	- ` ´ 	909.07	1220.60	1488.29		(97)
Space heating requir											1400.29		(31)
(98)m= 786.35 621.98	540.01	332.2	175.69	vvn/	$\frac{\text{month}}{0} =$	0.02	4 X [(9)	r)m = (95 0	308.26	553.08	787.45		
(00)111- 100.33 021.90	340.01	JJZ.Z	173.08	<u> </u>	<u> </u>	٠			300.20	333.00	107.43		

											_
					Tota	l per year	(kWh/yeaı	r) = Sum(9	8)15,912 =	4105.01	(98)
Space heating requirement	in kWh/m	²/year								66.47	(99)
9a. Energy requirements – In	dividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heating:	aaaandan	v/auppla	monton	ovotom							7(201)
Fraction of space heat from Fraction of space heat from			memary	•	(202) = 1	_ (201) =				0	(201)
Fraction of total heating from	-					02) × [1 –	(203)1 =			1	(202)
Efficiency of main space he	•				(204) (2	02) ~ [1	(200)]			90.3	(206)
Efficiency of secondary/sup			a systen	ո %						0	(208)
		·		Jul	Δυα	Sep	Oct	Nov	Doc		 _`
Jan Feb Mai	<u> </u>	May d above	Jun)	Jui	Aug	Sep	Oct	Nov	Dec	kWh/ye	zai
786.35 621.98 540.0	` 	175.69	0	0	0	0	308.26	553.08	787.45		
(211) m = {[(98)m x (204)] } x	100 ÷ (20	06)									(211)
870.82 688.79 598.02	367.88	194.56	0	0	0	0	341.38	612.49	872.04		
					Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	4545.97	(211)
Space heating fuel (second	• ,	month/									
$= \{[(98)\text{m x } (201)]\} \text{ x } 100 \div (201)$	208) 0	0	0	0	0	0	0	0	0		
(210)111- 0 0						l (kWh/yea				0	(215)
Water heating											` ′
Output from water heater (ca	lculated a	bove)						_		•	
190.19 166.14 172.89	153.31	148.43	130.73	125.25	139.63	141.17	160.75	171.6	185.72		7,0,0
Efficiency of water heater (217)m= 88.32 88.17 87.85	1 07.44	05.70		0.4	0.4		00.00	07.04	00.00	81	(216)
(217)m= 88.32 88.17 87.85 Fuel for water heating, kWh/r		85.79	81	81	81	81	86.88	87.91	88.36		(217)
(219) m = (64) m x $100 \div (21)$	7)m		_				_			_	
(219)m= 215.33 188.44 196.75	175.94	173.02	161.4	154.63		174.28		195.2	210.18		_
					Tota	ıl = Sum(2				2202.57	(219)
Annual totals Space heating fuel used, ma	n system	1					K'	Wh/yeaı	ſ	kWh/yea 4545.97	<u>r</u>
Water heating fuel used	cycloiii									2202.57	╡
Electricity for pumps, fans an	d alastria	kaan ha	+							2202.31	
	u electric	кеер-по	ι							1	(000)
central heating pump:									30		(230c)
Total electricity for the above	, kWh/yea	ar			sum	of (230a).	(230g) =			30	(231)
Electricity for lighting										355.65	(232)
12a. CO2 emissions – Indiv	dual heat	ing syste	ems inclu	uding mi	cro-CHF						
				ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions	
Space heating (main system	1)		(21	1) x			0.2	16	=	981.93	(261)
Space heating (secondary)	,		(21	5) x			0.5		=	0	(263)
Trace freating (coochadily)			`	•			L0.5	1.0		L	(200)

Water heating	(219) x	0.216	=	475.76	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1457.69	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting	(232) x	0.519	=	184.58	(268)
Total CO2, kg/year	sum	of (265)(271) =		1657.84	(272)
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =		26.84	(273)
El rating (section 14)				79	(274)

			User D	etails: _						
Assessor Name:	Chris Hocki	nell		Strom	a Nium	hor:		STDO	016363	
Software Name:	Stroma FSA			Softwa					on: 1.0.4.26	
Software Name:	Suoma ro							versic)II. 1.U.4.20	
Adduses			Property			=xisting				
Address:		dfield Gardens	, LONDC	JIN, INVVS	6PU					
1. Overall dwelling dime	ensions.		Δ	o (m²)		Av. Ua	iaht/m\		Valuma/m	31
Ground floor				a(m²)	(1a) v		eight(m)	_	Volume(m	<u> </u>
					(1a) x	1	1.86	(2a) =	69.94	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	37.6	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	69.94	(5)
2. Ventilation rate:										
	main heating	seconda heating	ıry	other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [0] = [0	х	40 =	0	(6a)
Number of open flues	0	+ 0		0	ī = Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ans	J [」	2	×	10 =	20	(7a)
Number of passive vents					L			10 =		= ' '
•					Ļ	0			0	(7b)
Number of flueless gas f	ires					0	X	40 =	0	(7c)
								Δir ch	anges per h	our
Letter Construction to the second	6	(C-) (Ch) ((7 -),(7 5),((7 -) -	_					_
Infiltration due to chimne If a pressurisation test has be					ontinuo fr	20		÷ (5) =	0.29	(8)
Number of storeys in t			eu 10 (17), (ourerwise (onunue n	om (9) to	(10)		0	(9)
Additional infiltration	ne awaming (no	/					[(9])-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or	timber frame o	or 0.35 fo	r masoni	v constr	uction	L(°,	, .,	0	(11)
if both types of wall are p					•				Ŭ	(\/
deducting areas of openi	• ,									_
If suspended wooden		•).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors dra	aught stripped		0.05 10.0	(4.4)	1001			0	(14)
Window infiltration				0.25 - [0.2		_	. (45) -		0	(15)
Infiltration rate	50			(8) + (10)					0	(16)
Air permeability value,					•	etre of e	envelope	e area	10	(17)
If based on air permeabi Air permeability value applie	•					ia haina u	and		0.79	(18)
Number of sides sheltere		n lest nas been do	nie or a deg	gree air pe	тпеаршцу	is being u	Sea		2	(19)
Shelter factor	Su			(20) = 1 -	[0.075 x (1	19)] =			0.85	$ \frac{(13)}{(20)}$
Infiltration rate incorpora	ting shelter fact	or		(21) = (18) x (20) =				0.67	(21)
Infiltration rate modified	_								0.01	` ′
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		- 1	1				1	1	1	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
, ,			1		<u> </u>		1		I	
Wind Factor (22a)m = (2	2)m ÷ 4									
(22a)m 1 27 1 25	1 22 1 1	1.00 0.05	0.05	0.00					I	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

	tion rate (allow	ing for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.85	0.84 0.82	0.73	0.72	0.63	0.63	0.62	0.67	0.72	0.75	0.78]	
Calculate effect	_	rate for th	ne applic	cable ca	se		!					
If mechanical	ventilation: at pump using App	aandiy N (2°	2h) - (22a) v Emy (c	auation (N	JE)) otho	nuico (22h	\ = (22a)			0	(23a)
) – (23a)			0	(23b)
	heat recovery: effi		_					21. \	201.) [.	4 (00)	0	(23c)
· -	l mechanical v					- ^ ` 	ŕ	 		``) ÷ 100] 1	(242)
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0	J	(24a)
· -	l mechanical v		-			- ` ` - 	í `	r Ó		Ι ,	1	(24h)
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0	J	(24b)
,	suse extract ve $< 0.5 \times (23b)$,		•	•				5 x (23h	.\			
(24c)m = 0	0 0.5 (256),	0	0	0	0	0	0	0	0	0	1	(24c)
` '	entilation or wh					<u> </u>					J	(= : -)
,	= 1, then (24d		•	•				0.5]				
(24d)m= 0.86	0.85 0.83	0.77	0.76	0.7	0.7	0.69	0.72	0.76	0.78	0.81]	(24d)
Effective air c	hange rate - e	nter (24a)	or (24b	o) or (24	c) or (24	d) in box	· (25)				•	
(25)m= 0.86	0.85 0.83	0.77	0.76	0.7	0.7	0.69	0.72	0.76	0.78	0.81]	(25)
3. Heat losses	and heat less!	paramete	or:							•		
ELEMENT	Gross	Opening		Net Ar	ea	U-val	Ie.	AXU		k-value	<u>a</u>	ΑΧk
	area (m²)	m		A ,n		W/m2		(W/ł	<)	kJ/m ² ·l		kJ/K
Doors				2.2	Х	1.8	= [3.96				(26)
Windows Type	1			3.63	x1.	/[1/(1.6)+	0.04] =	5.46				(27)
Windows Type 2	2			2.67	x1.	/[1/(1.6)+	0.04] =	4.02				(27)
Rooflights								4.040	=			
Walls Type1	40.05			0.82	^ ''	/[1/(1.6) +	0.04] =	1.312				(27b)
Walls Type2	10.35	6.3		4.05	x	/[1/(1.6) + 0.55	0.04] = [2.23	_			(27b)
				4.05	×	0.55		2.23				(29)
Roof Type1	16.58	2.2		4.05	x x	0.55	= [2.23 7.91				(29)
Roof Type1	16.58	1.64		4.05 14.38 33.98	x x x	0.55 0.55 0.18	= [= [= [2.23 7.91 6.12				(29) (29) (30)
Roof Type2	16.58 35.62 13.82	2.2		4.05 14.38 33.98 13.82	x x x x x	0.55	= [2.23 7.91				(29) (29) (30) (30)
Roof Type2 Total area of ele	16.58 35.62 13.82	1.64		4.05 14.38 33.98 13.82 76.37	x x x x x	0.55 0.55 0.18 0.18		2.23 7.91 6.12 2.49				(29) (29) (30) (30) (31)
Roof Type2 Total area of ele Party wall	16.58 35.62 13.82	1.64		4.05 14.38 33.98 13.82 76.37	x x x x x	0.55 0.55 0.18	= [= [= [2.23 7.91 6.12				(29) (29) (30) (30) (31) (32)
Roof Type2 Total area of ele Party wall Party floor	16.58 35.62 13.82 ements, m ²	2.2 1.64 0	adow H-ve	4.05 14.38 33.98 13.82 76.37 15.11	x x x x x x x x x	0.55 0.55 0.18 0.18		2.23 7.91 6.12 2.49		naragranh		(29) (29) (30) (30) (31)
Roof Type2 Total area of ele Party wall	16.58 35.62 13.82 ements, m²	2.2 1.64 0		4.05 14.38 33.98 13.82 76.37 15.11 37.6	x x x x x x x x x	0.55 0.55 0.18 0.18		2.23 7.91 6.12 2.49	s given in	paragraph		(29) (29) (30) (30) (31) (32)
Roof Type2 Total area of ele Party wall Party floor * for windows and re	16.58 35.62 13.82 ements, m² coof windows, use of on both sides of i	2.2 1.64 0		4.05 14.38 33.98 13.82 76.37 15.11 37.6	x x x x x x x x atted using	0.55 0.55 0.18 0.18	= [= [= [] = [2.23 7.91 6.12 2.49	s given in	paragraph	34.64	(29) (29) (30) (30) (31) (32) (32a)
Roof Type2 Total area of ele Party wall Party floor * for windows and ro ** include the areas	16.58 35.62 13.82 ements, m² coof windows, use of the coop of	2.2 1.64 0		4.05 14.38 33.98 13.82 76.37 15.11 37.6	x x x x x x x x atted using	0.55 0.55 0.18 0.18	= [= [= [= [- [(1/U-value) + (32) =	2.23 7.91 6.12 2.49				(29) (29) (30) (30) (31) (32) (32a)
Roof Type2 Total area of ele Party wall Party floor * for windows and ro ** include the areas Fabric heat loss	16.58 35.62 13.82 ements, m² coof windows, use of the condition both sides of its set of its se	2.2 1.64 0 effective win internal walls	s and part	4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calculations	x x x x x x x x x x x x x x x x x x x	0.55 0.55 0.18 0.18	= [= [= [] = [] = [] = [] + (32) = ((28)	2.23 7.91 6.12 2.49 0	?) + (32a).		34.64	(29) (29) (30) (30) (31) (32) (32a)
Roof Type2 Total area of electric Party wall Party floor * for windows and re ** include the areas Fabric heat loss Heat capacity C	16.58 35.62 13.82 ements, m² con both sides of it is, W/K = S (A x k) carameter (TM) ments where the de-	2.2 1.64 0 effective win internal walls (U) IP = Cm ÷	s and part	4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calculations	x x x x x x atted using	0.55 0.55 0.18 0.18 0 formula 1 (26)(30	= [= [= [] = [2.23 7.91 6.12 2.49 0 0 ne)+0.04] a	2) + (32a). Medium	(32e) =	34.64	(29) (29) (30) (30) (31) (32) (32a) (33) (7) (34)
Roof Type2 Total area of electric Party wall Party floor * for windows and re ** include the areas Fabric heat loss Heat capacity Content of the capac	16.58 35.62 13.82 ements, m² con both sides of it is, W/K = S (A x k) carameter (TM) ments where the ded of a detailed calculation.	2.2 1.64 0 effective win internal walls (U) IP = Cm ÷ letails of the coulation.	s and part TFA) in	4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calculations kJ/m²K on are not	x x x x x x x x x x x x x x x x x x x	0.55 0.55 0.18 0.18 0 formula 1 (26)(30	= [= [= [] = [2.23 7.91 6.12 2.49 0 0 ne)+0.04] a	2) + (32a). Medium	(32e) =	34.64	(29) (29) (30) (30) (31) (32) (32a) (33) (7) (34) (35)
Roof Type2 Total area of electric Party wall Party floor * for windows and rot* include the areas Fabric heat loss Heat capacity C Thermal mass processing assessments as a second control of the control	16.58 35.62 13.82 ements, m² con both sides of it is, W/K = S (A x k) con a S (A x k) con a S (A x k) con a detailed calcons: S (L x Y) calcons	2.2 1.64 0 effective win internal walls (U) IP = Cm ÷ details of the coulation.	s and part TFA) in constructi	4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calculations kJ/m²K fon are not	x x x x x x x x x x x x x x x x x x x	0.55 0.55 0.18 0.18 0 formula 1 (26)(30	= [= [= [] = [2.23 7.91 6.12 2.49 0 0 ne)+0.04] a	2) + (32a). Medium	(32e) =	34.64 3906.2 250	(29) (29) (30) (30) (31) (32) (32a) (33a) (7) (34) (35)

Ventila	ation hea	at 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=	19.91	19.59	19.27	17.77	17.49	16.19	16.19	15.95	16.69	17.49	18.06	18.65		(38)
Heat tr	ansfer o	coefficie	nt, W/K	!			!	!	(39)m	= (37) + (38)m	!		
(39)m=	66.01	65.68	65.36	63.87	63.59	62.28	62.28	62.04	62.79	63.59	64.15	64.75		
Heat Id	oss para	meter (l	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	63.87	(39)
(40)m=	1.76	1.75	1.74	1.7	1.69	1.66	1.66	1.65	1.67	1.69	1.71	1.72		
Numbe	er of day	s in mo	nth (Tab	le 1a)			•			Average =	Sum(40) ₁	12 /12=	1.7	(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 heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assum	ned occu	inancy	N								1	34		(42)
if TF		9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		.54		(42)
			ater usaç									9.6		(43)
		-	hot water person per			-	-	to achieve	a water us	se target o	f			
									Con	Oct	Nov	Doo		
Hot wate	Jan er usage ir	Feb n litres per	Mar day for ea	Apr ach month	May Vd,m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	76.56	73.78	70.99	68.21	65.43	62.64	62.64	65.43	68.21	70.99	73.78	76.56		
(4-7)111	70.00	70.70	10.00	00.21	00.40	02.04	02.04	00.40			m(44) ₁₁₂ =	l	835.23	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600					000.20	` /
(45)m=	113.54	99.3	102.47	89.34	85.72	73.97	68.55	78.66	79.6	92.76	101.26	109.96		
If instant	taneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1095.12	(45)
(46)m=	17.03	14.9	15.37	13.4	12.86	11.1	10.28	11.8	11.94	13.91	15.19	16.49		(46)
	storage													
•		` ') includir	•			•		ame ves	sel		0		(47)
	•	_	and no ta hot wate		_			. ,	ore) onto	or 'O' in <i>(</i>	47)			
	storage		not wate	וו פוווט) וכ	iciuues i	iistaiitai	ieous cc	ווטט וטווות	cis) ciil	51 0 111 (41)			
	•		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	y lost fro	m water	storage	, kWh/ye	ear			(48) x (49) =			0		(50)
•			eclared o	-										
		_	factor free section		e 2 (kW	h/litre/da	ay)					0		(51)
	e factor	_		011 4.3								0		(52)
			m Table	2b								0		(53)
			storage		ear			(47) x (51) x (52) x (53) =		0		(54)
	(50) or (-	, y .				. , (, (-)(,	-	0		(55)
	• • •	. , .	culated 1	for each	month			((56)m = (55) × (41)	m				• •
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
V 97		-	<u> </u>	<u> </u>			<u> </u>		<u> </u>	<u> </u>	<u> </u>	-		` '

If cylinder cont	ains dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circ	uit loss (ar	nual) fro	om Table	e 3	-	-	-	-			0		(58)
Primary circ				,	,	` '	, ,					•	
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)		1	
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss	calculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 39.0	2 33.96	36.18	33.64	33.34	30.89	31.92	33.34	33.64	36.18	36.38	39.02		(61)
Total heat re	equired 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= 152.5	56 133.26	138.65	122.98	119.06	104.86	100.47	112	113.23	128.94	137.64	148.97		(62)
Solar DHW inp	ut calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add additio	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter											
(64)m= 152.5	56 133.26	138.65	122.98	119.06	104.86	100.47	112	113.23	128.94	137.64	148.97		_
							Outp	out from wa	ater heate	r (annual)₁	12	1512.63	(64)
Heat gains t	from water	heating,	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	א 8.0 + [ר	(46)m	+ (57)m	+ (59)m]	
(65)m= 47.5	1 41.51	43.12	38.11	36.84	32.32	30.77	34.49	34.88	39.89	42.76	46.32		(65)
include (5	7)m in cal	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic g	ains (Table	e 5), Wat	ts										
Jai		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 67.2	1 67.21	67.21	67.21	67.21	67.21	67.21	67.21	67.21	67.21	67.21	67.21		(66)
Lighting gai	ns (calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 12.8	8 11.44	9.3	7.04	5.26	4.44	4.8	6.24	8.38	10.64	12.41	13.23		(67)
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5	-	-	•	
(68)m= 115.5	55 116.75	113.73	107.29	99.17	91.54	86.44	85.24	88.27	94.7	102.82	110.45		(68)
Cooking gai	ns (calcula	ated in A	ppendix	L, equat	tion L15	or L15a)), also se	ee Table	5			•	
(69)m= 29.7	2 29.72	29.72	29.72	29.72	29.72	29.72	29.72	29.72	29.72	29.72	29.72		(69)
Pumps and	fans gains	(Table 5	 5а)									•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporation	n (nega	tive valu	es) (Tab	le 5)							•	
(71)m= -53.7	76 -53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76		(71)
Water heati	ng gains (⅂	rable 5)	!	!	!	!	!			!	!	•	
(72)m= 63.8	5 61.77	57.95	52.94	49.51	44.89	41.36	46.36	48.44	53.61	59.39	62.25		(72)
Total intern	nal gains =	:	•		(66)	m + (67)m	ı + (68)m +	+ (69)m + ((70)m + (7	1)m + (72))m	•	
(73)m= 238.4	14 236.11	227.14	213.43	200.11	187.03	178.77	184	191.24	205.11	220.79	232.1		(73)
6. Solar ga	ins:	•	•				•						
Solar gains a	re calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	nvert to th	e applicat	ole orientat	ion.		
Orientation:	Access F	actor	Area		Flu	X		g_		FF		Gains	

		,						_ ,				_
Northeast _{0.9x}	0.77	X	3.63	X	11.28	X	0.63	×	0.7	=	12.52	(75)
Northeast _{0.9x}	0.77	X	3.63	X	22.97	X	0.63	X	0.7	=	25.48	(75)
Northeast _{0.9x}	0.77	X	3.63	X	41.38	X	0.63	X	0.7	=	45.9	(75)
Northeast _{0.9x}	0.77	X	3.63	X	67.96	X	0.63	X	0.7	=	75.39	(75)
Northeast _{0.9x}	0.77	x	3.63	X	91.35	X	0.63	X	0.7	=	101.34	(75)
Northeast _{0.9x}	0.77	x	3.63	X	97.38	X	0.63	x	0.7	=	108.04	(75)
Northeast _{0.9x}	0.77	x	3.63	X	91.1	X	0.63	X	0.7	=	101.07	(75)
Northeast _{0.9x}	0.77	x	3.63	x	72.63	X	0.63	X	0.7	=	80.57	(75)
Northeast _{0.9x}	0.77	x	3.63	x	50.42	X	0.63	X	0.7	=	55.94	(75)
Northeast _{0.9x}	0.77	x	3.63	x	28.07	X	0.63	x	0.7	=	31.14	(75)
Northeast _{0.9x}	0.77	x	3.63	X	14.2	X	0.63	X	0.7	=	15.75	(75)
Northeast _{0.9x}	0.77	x	3.63	x	9.21	x	0.63	X	0.7	=	10.22	(75)
Northwest _{0.9x}	0.77	x	2.67	x	11.28	x	0.63	x	0.7	=	9.21	(81)
Northwest _{0.9x}	0.77	x	2.67	x	22.97	x	0.63	X	0.7	=	18.74	(81)
Northwest _{0.9x}	0.77	x	2.67	x	41.38	x	0.63	X	0.7	=	33.76	(81)
Northwest _{0.9x}	0.77	x	2.67	x	67.96	x	0.63	x	0.7	=	55.45	(81)
Northwest _{0.9x}	0.77	x	2.67	x	91.35	x	0.63	X	0.7	=	74.54	(81)
Northwest _{0.9x}	0.77	x	2.67	X	97.38	X	0.63	X	0.7	=	79.46	(81)
Northwest _{0.9x}	0.77	x	2.67	x	91.1	x	0.63	X	0.7	=	74.34	(81)
Northwest _{0.9x}	0.77	x	2.67	X	72.63	X	0.63	X	0.7	=	59.26	(81)
Northwest _{0.9x}	0.77	x	2.67	х	50.42	X	0.63	X	0.7	=	41.14	(81)
Northwest _{0.9x}	0.77	x	2.67	X	28.07	X	0.63	X	0.7	=	22.9	(81)
Northwest _{0.9x}	0.77	x	2.67	x	14.2	X	0.63	x	0.7	=	11.58	(81)
Northwest _{0.9x}	0.77	x	2.67	x	9.21	x	0.63	x	0.7	=	7.52	(81)
Rooflights _{0.9x}	1	x	0.82	x	15.92	x	0.63	x	0.8	=	11.84	(82)
Rooflights _{0.9x}	1	x	0.82	x	32.51	X	0.63	X	0.8	=	24.18	(82)
Rooflights _{0.9x}	1	x	0.82	X	59.5	X	0.63	X	0.8	=	44.26	(82)
Rooflights _{0.9x}	1	x	0.82	X	100.03	X	0.63	x	0.8	=	74.42	(82)
Rooflights _{0.9x}	1	x	0.82	X	136.88	X	0.63	X	0.8	=	101.82	(82)
Rooflights 0.9x	1	x	0.82	X	147.03	X	0.63	X	0.8	=	109.38	(82)
Rooflights _{0.9x}	1	x	0.82	X	137.1	X	0.63	X	0.8	=	101.99	(82)
Rooflights _{0.9x}	1	X	0.82	X	107.76	X	0.63	X	0.8	=	80.17	(82)
Rooflights 0.9x	1	x	0.82	X	73.17	X	0.63	X	0.8	=	54.43	(82)
Rooflights _{0.9x}	1	x	0.82	X	39.91	X	0.63	X	0.8	=	29.69	(82)
Rooflights _{0.9x}	1	X	0.82	X	20.03	X	0.63	X	0.8	=	14.9	(82)
Rooflights _{0.9x}	1	X	0.82	x	13.01	X	0.63	x	0.8	=	9.67	(82)
Solar gains in v				-		Ė	n = Sum(74)m .		-	Ι	1	(22)
(83)m= 33.56			205.25 277.7		96.88 277.39	22	0 151.51	83.73	42.23	27.42		(83)
Total gains – in			$\frac{(84)\text{fff} = (73)\text{ff}}{418.69 477.8}$	`	33.91 456.16	40	4 342.75	288.84	263.02	259.51	1	(84)
` '			I		33.91 450.16	40	4 342.75	288.84	203.02	259.51	j	(04)
7. Mean interr	•	•			_							
Temperature	•	•		•		ole 9	, Ih1 (°C)				21	(85)
Utilisation fact				Ť			6				1	
Stroma ESAP 2012	2 VERSION 1.0	41.246 (s	6AP 9.92) - http://	Ww.	Jun stromal.com/ul	_A	ug Sep	Oct	Nov	Dec	Page	5 of 7

(86)m=	1	0.99	0.98	0.95	0.86	0.71	0.56	0.64	0.87	0.97	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				•	
(87)m=	19.13	19.3	19.64	20.15	20.59	20.87	20.96	20.94	20.69	20.14	19.57	19.12		(87)
Temr	erature	durina h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)		•			
(88)m=	19.5	19.51	19.51	19.54	19.55	19.57	19.57	19.58	19.56	19.55	19.54	19.53		(88)
Litilio	tion foo	tor for a	oine for I	root of d	wolling	h2 m /oc	L Tabla	00)	l			<u> </u>		
(89)m=	0.99	0.99	ains for 0.98	0.93	0.81	0.59	0.4	9a) 0.47	0.79	0.96	0.99	0.99		(89)
								l		<u> </u>	0.00	0.00		()
				r	r	Ť	r	eps 3 to			10.00	47.00	1	(00)
(90)m=	17.85	18.02	18.37	18.88	19.29	19.52	19.56	19.56	19.4	18.88	18.32 ig area ÷ (4	17.86	0.00	(90)
										LA - LIVIII	ig alea + (4	+) -	0.89	(91)
Mean	interna	temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2	r	1		•	
(92)m=	18.99	19.16	19.5	20.01	20.45	20.73	20.81	20.79	20.55	20	19.44	18.99		(92)
				r				4e, whe	· · ·	 			Ī	
(93)m=	18.99	19.16	19.5	20.01	20.45	20.73	20.81	20.79	20.55	20	19.44	18.99		(93)
•		•	uirement											
				•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the u			or gains		ı	1	11	A	0	0-4	l Nieur	D		
Litilia	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.99	ains, hm _{0.98}	0.94	0.84	0.69	0.54	0.62	0.85	0.96	0.99	0.99		(94)
			, W = (9 ²			0.03	0.54	0.02	0.00	0.90	0.99	0.99		(01)
(95)m=	270.08	301.1	342.86	392.5	403.56	333.46	247.6	249.07	291.7	278.67	260.07	257.98		(95)
			rnal tem	l	l			1						()
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	loss rate	for mea	ı an intern	ı ıal tempe	ı erature.	L Lm . W =	<u> </u> =[(39)m :	r [(93)m	<u>ı </u>	<u> </u>	<u> </u>			
(97)m=	969.83	936.79	850.03	709.79	556.66	381.68	262.28	272.36	405.27	597.86	791.38	957.56		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Mh/moni	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	<u>!</u>		
(98)m=	520.62	427.18	377.33	228.45	113.91	0	0	0	0	237.47	382.54	520.49		
				•				Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	2808	(98)
Spac	e heatin	a require	ement in	kWh/m²	²/vear								74.68	(99)
•		• •							\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\				14.00	
			ıts – Indi	ividuai n	eating sy	ystems i	ncluaing	micro-C	HP)					
•	e heatir	•	nt from s	econdar	v/supple	mentary	system						0	(201)
						momary	-	(202) = 1	_ (201) =					≓
			nt from m	-	` '					(000)1			1	(202)
			ng from	-				(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1								90.3	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above))					•			
	520.62	427.18	377.33	228.45	113.91	0	0	0	0	237.47	382.54	520.49		
(211)m	n = {[(98)m x (20	4)] } x 1	00 ÷ (20	06)								-	(211)
	576.54	473.07	417.87	252.99	126.15	0	0	0	0	262.98	423.63	576.4		
							-	Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	=	3109.64	(211)
														_

Space heating fuel (secondary), kWh/mont	1								
$= \{[(98)\text{m x } (201)]\} \text{ x } 100 \div (208)$ $(215)\text{m} = $	0	0	0	0	0	0	0		
` '	<u> </u>		Tota	l I (kWh/yea	ar) =Sum(2	215) _{15,1012}	<u> </u>	0	(215)
Water heating							L		
Output from water heater (calculated above)				i -					
152.56 133.26 138.65 122.98 119.	06 104.86	100.47	112	113.23	128.94	137.64	148.97		_
Efficiency of water heater								81	(216)
(217)m= 88.01 87.9 87.6 86.81 85.	81	81	81	81	86.79	87.64	88.05		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)m= 173.34 151.61 158.28 141.66 139.	59 129.46	124.03	138.27	139.8	148.56	157.06	169.19		
	•	-	Tota	I = Sum(2	19a) ₁₁₂ =			1770.84	(219)
Annual totals					k\	Wh/yeaı		kWh/yea	<u></u>
Space heating fuel used, main system 1								3109.64	
Water heating fuel used								1770.84	
Electricity for pumps, fans and electric keep-	hot								
central heating pump:							30		(230
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			30	(231)
Electricity for lighting							-		
								227.4	(232)
12a. CO2 emissions – Individual heating sy	stems incl	uding mi	cro-CHP)				227.4	(232)
12a. CO2 emissions – Individual heating sy	Er	uding mi nergy Vh/year	cro-CHP		Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/ye	
12a. CO2 emissions – Individual heating sy Space heating (main system 1)	Er kV	nergy	cro-CHP			2/kWh	tor = [Emissions	
	Er kV	nergy Vh/year	cro-CHP		kg CO	2/kWh		Emissions	ar
Space heating (main system 1)	Er kV (21	nergy Vh/year	cro-CHP		kg CO	2/kWh	= [Emissions kg CO2/ye	s ear
Space heating (main system 1) Space heating (secondary)	Er kV (21 (21	nergy Vh/year 1) x 5) x			0.2°	2/kWh	= [Emissions kg CO2/ye	(261)
Space heating (main system 1) Space heating (secondary) Water heating	Er kV (21 (21 (21	nergy Vh/year 1) x 5) x 9) x			0.2°	2/kWh	= [Emissions kg CO2/ye 671.68 0 382.5	(261) (263) (264)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Er kV (21 (21 (21 (26 hot (23	nergy Vh/year 1) x 5) x 9) x			0.2°	2/kWh 16 19 16	= [= [= [Emissions kg CO2/ye 671.68 0 382.5 1054.18	(261) (263) (264) (265)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-	Er kV (21 (21 (21 (26 hot (23	nergy Wh/year 1) x 5) x 9) x 1) + (262)		264) =	0.2 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	2/kWh 16 19 16 19	= [= [= [Emissions kg CO2/ye 671.68 0 382.5 1054.18	(261) (263) (264) (265) (267)

El rating (section 14)

(274)

		User_I	Details:						
Assessor Name: Software Name:	Chris Hocknell Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			016363 on: 1.0.4.26	
Address :	Flat 8, 6, Lindfield Gardens		Address ON. NW3		Existing				
1. Overall dwelling dime	* *	, 2011	311, 11110	7 01 0					
		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor			42.28	(1a) x	2	2.06	(2a) =	87.1	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(In)	42.28	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	87.1	(5)
2. Ventilation rate:									
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	X ·	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	X :	20 =	0	(6b)
Number of intermittent fa	ins				2	X	10 =	20	(7a)
Number of passive vents	3			Ī	0	X	10 =	0	(7b)
Number of flueless gas f	ires			Γ	0	x	40 =	0	(7c)
				_					
				_			Air ch	nanges per h	_
	ys, flues and fans = (6a)+(6b)+ neen carried out or is intended, proce			continue fr	20		÷ (5) =	0.23	(8)
Number of storeys in t		eu 10 (17),	Olliel Wise (continue n	OIII (9) 10	(10)		0	(9)
Additional infiltration	- , ,					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame of			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding	to the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
•	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	. (45) -		0	(15)
Infiltration rate	q50, expressed in cubic met	oc par h	(8) + (10)				aroa	0	(16)
•	lity value, then (18) = [(17) ÷ 20]-	•		•	elle ol e	rivelope	alea	0.73	(17)
•	es if a pressurisation test has been d				is being u	sed		0.70	(```
Number of sides sheltered	ed		(00) 4	FO 07F (4	10)1			2	(19)
Shelter factor	Const. Land.		(20) = 1 -		19)] =			0.85	(20)
Infiltration rate incorpora	•		(21) = (18) X (20) =				0.62	(21)
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		1 oui	1 /lug	Госр	1 000	1101	1 200	l	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
`				1	1		<u> </u>	1	
Wind Factor (22a)m = (2	' 	T 0.05	T 0.00	1 4	I 400	1 440	1 440	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation rate (allo	wing for shelter	and wind spe	eed) = (21a) x	(22a)m					
0.79		1	1	0.59 0.57	0.62	0.67	0.7	0.73		
	_	e rate for the ap	pplicable case	;						
		nnendix N (23h) =	(23a) x Fmv (eq.	uation (N5)) othe	erwise (23h) = (23a)		L		
		., ,	. ,	, ,,	,	, (200)		L T		
	_	-				2h)m + (23	8h) x [[1 _ (23c)		(230
· ·		- I			0	0	0		. 100]	(24a
` '										•
(24b)m= 0	0 0			0 0	0	0	0	0		(24k
c) If whole h		•				5 × (22h)				
<u> </u>		` 	- i	````	í	<u> </u>	0	0		(240
` '						0				(210
						0.5]				
(24d)m= 0.81	0.8 0.79	0.73 0.7	2 0.67	0.67 0.66	0.69	0.72	0.74	0.77		(240
Effective air	change rate -	enter (24a) or (24b) or (24c)	or (24d) in bo	x (25)	•				
(25)m= 0.81	0.8 0.79	0.73 0.7	2 0.67	0.67 0.66	0.69	0.72	0.74	0.77		(25)
3. Heat losses	s and heat los	s parameter:	-							
ELEMENT	If mechanical ventilation Case If mechanical ventilation Case If mechanical ventilation Case Case									
Doors			2.2	x 1.8	= [3.96	7			(26)
Windows			2.73	x1/[1/(1.6)+	0.04] =	4.11	Ī			(27)
Rooflights Type	e 1		0.82	x1/[1/(1.6) +	0.04] =	1.312	Ŧ .			(271
Rooflights Type	e 2		0.82	X1/[1/(1.6) +	0.04] =	1.312	Ŧ			(2 7 b
Rooflights Typ	e 3		0.36	X1/[1/(1.6) +	0.04] =	0.576	ī			(27h
Walls Type1	1.98	0	1.98	X 0.55		1.09	i i		1 F	(29)
Walls Type2	6.4	2.2	4.2	X 0.55	=	2.31	i i		i	(29)
Walls Type3				╡			i i		i	
Roof Type1				╡	-		i i		i	==='
Roof Type2				╡	╡┇		1 1		╡┝	
• •				╡	╡┇				┧╠	==
• •		0.20		^		0.20				
						0	7 [- I	
•				^ ^		0	_		┧╠	
Party floor		<u>.</u>		l ed using formula :	1/[(1/U-valu	e)+0.04] as	L given in	paragraph	3.2	(328
* for windows and ** include the area	as on both sides o	f internal walls and		(26)(30) + (32) =			ſ	27.52	(33)
* for windows and ** include the area Fabric heat los	s on both sides on ss, W/K = S (A	f internal walls and x U)		(26)(30		.(30) + (32)	+ (32a).	(32e) = [==
* for windows and ** include the area Fabric heat los Heat capacity (es on both sides of es, W/K = S (A Cm = S(A x k	f internal walls and x U))	partitions	(26)(30	((28)			(32e) = [4606.9	4 (34)

can he i	used instea	ad of a det	tailed calci	ılation										
					using Ap	pendix I	K						10.53	(36)
	Ū	`	,		= 0.05 x (3	•							10.00	(00)
	abric hea			, ,	·				(33) +	(36) =			38.06	(37)
Ventila	tion hea	t loss ca	alculated	monthly	y				(38)m	= 0.33 × ((25)m x (5))	_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	23.36	23.01	22.67	21.06	20.76	19.36	19.36	19.1	19.9	20.76	21.37	22		(38)
Heat tr	ansfer o	oefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	61.41	61.07	60.72	59.12	58.82	57.42	57.42	57.16	57.96	58.82	59.42	60.06		
Heat lo	oss para	meter (H	HLP), W/	m²K			-			Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	59.12	(39)
(40)m=	1.45	1.44	1.44	1.4	1.39	1.36	1.36	1.35	1.37	1.39	1.41	1.42		
Numbe	er of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.4	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	1	(41)
							•			•		•	_	
4. Wa	ater heat	ing ener	gy requi	rement:								kWh/y	ear:	
٨٥٥١١٣	and annu	nanav I	NI.										1	(40)
if TF	ned occu A > 13.9 A £ 13.9), N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		.47	J	(42)
		•	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		7:	2.7	1	(43)
								to achieve	a water us	se target o	f		J	
riot more	e iriai 125				ater use, f		•		_				7	
Hot wate	Jan er usage ir	Feb	Mar day for ea	Apr	May Vd,m = fa	Jun	Jul Table 1c v	Aug	Sep	Oct	Nov	Dec]	
						1		·	74.05	74.40	77.07	79.97	1	
(44)m=	79.97	77.07	74.16	71.25	68.34	65.43	65.43	68.34	71.25	74.16	77.07 m(44) ₁₁₂ =	Į	872.45	(44)
Energy	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x D	OTm / 3600					672.43	(++/
(45)m=	118.6	103.73	107.04	93.32	89.54	77.27	71.6	82.16	83.14	96.9	105.77	114.86		_
If instan	taneous w	ater heatir	na at naint	of use (no	hot water	r storage)	enter O in	boxes (46)		Total = Su	m(45) ₁₁₂ =	=	1143.92	(45)
										44.50	45.07	47.00	1	(46)
(46)m= Water	17.79 storage	15.56 loss:	16.06	14	13.43	11.59	10.74	12.32	12.47	14.53	15.87	17.23]	(46)
	_		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0]	(47)
If com	munity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)					_	
			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
	storage		ا امسمام	ft-	an ia lena	/L/\^/L	- /-l -> -\.					_	1	(40)
•					or is kno	wn (kvvr	n/day):					0]	(48)
•	erature fa							(40) (40)				0]	(49)
	y lost fro nanufacti		_	-	ear loss fact	or is not	known:	(48) x (49)) =			0]	(50)
•				-	e 2 (kWl							0]	(51)
	munity h	_		on 4.3									- 1	
	e factor erature fa			2h								0	4	(52)
rempe	nature la	acioi IIO	III I ADIC	20								0	J	(53)

Enter (50) or (54) in (55) Water storage loss calculated for each month (56)ms 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
If cylinder contains dedicated solar storage. (57)m = (56)m x (50) — (1111) + (50), else (57)m = (56)m where (1111) is from Appendix H (57)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(57)me
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) + 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Primary circuit loss calculated for each month (59)m = (58) + 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (69)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(69)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(61) ms
(61) ms
(62)me
(62)me
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Output from water heater (64)m= 159.35 139.2 144.83 128.46 124.37 109.54 104.94 116.99 118.28 134.69 143.77 155.61 Output from water heater (annual) 159.03 1580.03 1580.03 164) Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 49.62 43.36 45.04 39.81 38.48 33.76 32.14 36.03 36.43 41.67 44.67 48.38 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 14.45 12.84 10.44 7.9 5.91 4.99 5.39 7 9.4 11.94 13.93 14.85 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 127.31 128.63 125.3 118.21 109.27 100.86 95.24 93.92 97.25 104.34 113.28 121.69 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(64)m= 159.35 139.2 144.83 128.46 124.37 109.54 104.94 116.99 118.28 134.69 143.77 155.61 Output from water heater (annual) 1580.03 (64) Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 49.62 43.36 45.04 39.81 38.48 33.76 32.14 36.03 36.43 41.67 44.67 48.38 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 73.41
(64)m= 159.35 139.2 144.83 128.46 124.37 109.54 104.94 116.99 118.28 134.69 143.77 155.61 Output from water heater (annual) 1580.03 (64) Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 49.62 43.36 45.04 39.81 38.48 33.76 32.14 36.03 36.43 41.67 44.67 48.38 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 73.41
Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 49.62 43.36 45.04 39.81 38.48 33.76 32.14 36.03 36.43 41.67 44.67 48.38 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 73.41 7
(65)m=
(65)m=
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 73.41
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m= 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 73.41 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 14.45 12.84 10.44 7.9 5.91 4.99 5.39 7 9.4 11.94 13.93 14.85 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 127.31 128.63 125.3 118.21 109.27 100.86 95.24 93.92 97.25 104.34 113.28 121.69 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(67)m= 14.45 12.84 10.44 7.9 5.91 4.99 5.39 7 9.4 11.94 13.93 14.85 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 127.31 128.63 125.3 118.21 109.27 100.86 95.24 93.92 97.25 104.34 113.28 121.69 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(67)m= 14.45 12.84 10.44 7.9 5.91 4.99 5.39 7 9.4 11.94 13.93 14.85 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 127.31 128.63 125.3 118.21 109.27 100.86 95.24 93.92 97.25 104.34 113.28 121.69 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(68)m= 127.31 128.63 125.3 118.21 109.27 100.86 95.24 93.92 97.25 104.34 113.28 121.69 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(68)m= 127.31 128.63 125.3 118.21 109.27 100.86 95.24 93.92 97.25 104.34 113.28 121.69 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
Pumps and fans gains (Table 5a)
(70)m= 3 3 3 3 3 3 3 3 3 3 3 (70)
Losses e.g. evaporation (negative values) (Table 5)
$ (71)m = \begin{bmatrix} -58.73 & -58.73 & -58.73 & -58.73 & -58.73 & -58.73 & -58.73 & -58.73 & -58.73 & -58.73 & -58.73 & -58.73 & -58.73 \end{bmatrix} $
Water heating gains (Table 5)
(72)m= 66.7 64.52 60.53 55.3 51.72 46.89 43.2 48.42 50.6 56 62.04 65.03 (72)

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

Orientation: Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x} 0.77	x [2.73	x	11.28	x	0.63	x	0.7	=	9.41	(75)
Northeast _{0.9x} 0.77	x	2.73	x	22.97	x	0.63	x	0.7	=	19.16	(75)
Northeast 0.9x 0.77	x	2.73	х	41.38	x	0.63	x	0.7	=	34.52	(75)
Northeast 0.9x 0.77	x	2.73	x	67.96	x	0.63	x	0.7] =	56.7	(75)
Northeast _{0.9x} 0.77	x	2.73	x	91.35	x	0.63	x	0.7	=	76.21	(75)
Northeast 0.9x 0.77	x	2.73	х	97.38	x	0.63	X	0.7	=	81.25	(75)
Northeast _{0.9x} 0.77	x	2.73	X	91.1	X	0.63	X	0.7	=	76.01	(75)
Northeast _{0.9x} 0.77	x	2.73	x	72.63	X	0.63	X	0.7	=	60.59	(75)
Northeast _{0.9x} 0.77	x	2.73	x	50.42	x	0.63	X	0.7] =	42.07	(75)
Northeast _{0.9x} 0.77	x	2.73	x	28.07	x	0.63	X	0.7	=	23.42	(75)
Northeast _{0.9x} 0.77	x	2.73	x	14.2	x	0.63	x	0.7	=	11.84	(75)
Northeast _{0.9x} 0.77	x	2.73	x	9.21	x	0.63	X	0.7	=	7.69	(75)
Rooflights 0.9x 1	x	0.82	x	15.92	x	0.63	X	0.8	=	11.84	(82)
Rooflights 0.9x 1	x	0.82	x	40.5	x	0.63	x	0.8	=	30.13	(82)
Rooflights 0.9x 1	x	0.36	x	26	x	0.63	X	0.8	=	4.25	(82)
Rooflights 0.9x 1	x	0.82	x	32.51	x	0.63	X	0.8	=	24.18	(82)
Rooflights 0.9x 1	x	0.82	x	73.74	x	0.63	X	0.8	=	54.86	(82)
Rooflights 0.9x 1	x	0.36	x	54	x	0.63	X	0.8	=	8.82	(82)
Rooflights 0.9x 1	x	0.82	x	59.5	X	0.63	X	0.8	=	44.26	(82)
Rooflights 0.9x 1	x	0.82	x	111.06	x	0.63	X	0.8	=	82.61	(82)
Rooflights 0.9x 1	x	0.36	x	96	x	0.63	x	0.8	=	15.68	(82)
Rooflights 0.9x 1	x	0.82	x	100.03	X	0.63	X	0.8	=	74.42	(82)
Rooflights 0.9x 1	x	0.82	x	150.59	x	0.63	x	0.8	=	112.02	(82)
Rooflights 0.9x 1	x	0.36	x	150	x	0.63	X	0.8	=	24.49	(82)
Rooflights 0.9x 1	x	0.82	x	136.88	x	0.63	x	0.8	=	101.82	(82)
Rooflights 0.9x 1	x	0.82	x	177.61	X	0.63	X	0.8	=	132.12	(82)
Rooflights 0.9x 1	x	0.36	X	192	X	0.63	X	0.8	=	31.35	(82)
Rooflights 0.9x 1	x	0.82	X	147.03	X	0.63	X	0.8	=	109.38	(82)
Rooflights 0.9x 1	x	0.82	X	179.47	X	0.63	X	0.8	=	133.51	(82)
Rooflights 0.9x 1	x	0.36	X	200	X	0.63	X	0.8	=	32.66	(82)
Rooflights 0.9x 1	x	0.82	X	137.1	X	0.63	X	0.8	=	101.99	(82)
Rooflights 0.9x 1	x	0.82	X	171.77	X	0.63	X	0.8	=	127.78	(82)
Rooflights 0.9x 1	x	0.36	x	189	x	0.63	x	0.8	=	30.86	(82)
Rooflights 0.9x 1	x	0.82	x	107.76	x	0.63	x	0.8	=	80.17	(82)
Rooflights 0.9x 1	x	0.82	x	151.65	x	0.63	X	0.8] =	112.82	(82)
Rooflights 0.9x 1	x	0.36	x	157	x	0.63	x	0.8] =	25.64	(82)
Rooflights 0.9x 1	x	0.82	x	73.17	x	0.63	x	0.8] =	54.43	(82)
Rooflights 0.9x 1	x	0.82	x	125.02	x	0.63	x	0.8] =	93.01	(82)
Rooflights 0.9x 1	X	0.36	X	115	×	0.63	X	0.8	=	18.78	(82)

Rooflig	hts _{0.9x}	1	X	3.0	32	x	3	9.91	X		0.63	x	0.8	=	29.69	(82)
Rooflig	hts _{0.9x}	1	X	3.0	32	x	8	4.48	X		0.63	x	0.8	=	62.84	(82)
Rooflig	hts _{0.9x}	1	X	0.3	36	x		66	X		0.63	x	0.8		10.78	(82)
Rooflig	hts _{0.9x}	1	X	3.0	32	x	2	0.03	x		0.63	x	0.8	=	14.9	(82)
Rooflig	hts _{0.9x}	1	х	3.0	32	x	4	9.44	X		0.63	x	0.8	-	36.78	(82)
Rooflig	hts _{0.9x}	1	X	0.3	36	x		33	x		0.63	x	0.8	-	5.39	(82)
Rooflig	hts _{0.9x}	1	X	3.0	32	x	1	3.01	x		0.63	x	0.8	=	9.67	(82)
Rooflig	hts _{0.9x}	1	X	3.0	32	x	3	4.03	x		0.63	x	0.8		25.31	(82)
Rooflig	hts _{0.9x}	1	X	0.3	36	x		21	x		0.63	x	0.8		3.43	(82)
	_					•										
Solar	gains in	watts, ca	alculated	l for eac	h month				(83)m	n = St	ım(74)m .	(82)m				
(83)m=	55.63	107.02	177.08	267.63	341.51	35	56.79	336.64	279	.21	208.28	126.73	68.91	46.11		(83)
Total g	jains – i	nternal a	and solar	(84)m =	= (73)m	+ (8	33)m	, watts					-		_	
(84)m=	312.11	361.03	421.37	497.06	556.43	55	57.55	528.5	476	.58	413.55	347.03	306.19	295.7		(84)
7. Me	an inter	nal temp	perature	(heating	season)										
		•	neating p	,			area f	rom Tal	ole 9.	. Th′	1 (°C)				21	(85)
-		_	ains for l			•				,	(- /					` ′
0	Jan	Feb	Mar	Apr	May	r	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	:	
(86)m=	1	0.99	0.98	0.93	0.81	\vdash).62	0.47	0.5		0.8	0.96	0.99	1	┪	(86)
Moon	intorno	l tompor	oturo in	living or	oo T1 /f/	حالم	w oto	no 2 to 3	l 7 in T	L	, 00)		1	<u> </u>		
(87)m=	19.49	19.68	ature in	20.46	20.79	_	0.95	20.99	20.	_	20.85	20.41	19.89	19.49	7	(87)
					<u> </u>				l	I		20.41	10.00	10.40		(0.)
•			neating p			_				$\overline{}$			1		¬	(00)
(88)m=	19.72	19.73	19.74	19.76	19.77	1	19.8	19.8	19	.8	19.79	19.77	19.76	19.75		(88)
Utilisa	ation fac	tor for g	ains for i	rest of d	welling,	h2,	m (se	e Table	9a)						_	
(89)m=	0.99	0.99	0.97	0.9	0.74	C).52	0.35	0.4	4	0.71	0.94	0.99	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ina	T2 (fc	ollow ste	eps 3	3 to 7	' in Tabl	e 9c)				
(90)m=	18.38	18.57	18.9	19.35	19.64		9.78	19.79	19		19.71	19.32	18.8	18.39	7	(90)
					!						f	LA = Livi	ng area ÷ (4	4) =	0.88	(91)
M		1 4		41		II:	\ _ £I	Λ Τ.1	. /4	£I	A) TO					
	19.36	19.54	ature (fo	20.32	20.65	_	g) = τι 0.81	_A × 11	+ (1 20.		A) × 12 20.71	20.27	19.76	10.25	7	(92)
(92)m=					<u> </u>	Ц_							19.76	19.35		(92)
(93)m=	19.36	19.54	he mean 19.87	20.32	20.65	_	0.81	20.84	20.		20.71	20.27	19.76	19.35	7	(93)
			uirement		20.00		0.01	20.04	20.	<u> </u>	20.71	20.21	13.70	13.55		(00)
		•			re obtair	ممط	at eta	an 11 of	Tabl	la Oh	so tha	t Ti m-	(76)m an	d re ca	lculate	
			or gains	•		icu	at Sit	5p 11 01	ıabı	IC 31.	, so illa	. 11,111–	(10)III aII	u 16-68	liculate	
	Jan	Feb	Mar	Apr	May	Ι,	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	:	
Utilisa	ation fac	tor for g	ains, hm		, ,					<u> </u>	•				_	
(94)m=	0.99	0.99	0.97	0.91	0.79		0.6	0.45	0.5	52	0.78	0.95	0.99	0.99	7	(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (8	4)m				•						_	
(95)m=	309.91	356.24	408.25	453.48	439.03	33	36.79	239.16	245	.99	323.3	329.87	302.33	294.03	3	(95)
Month	nly aver	age exte	rnal tem	perature	from T	able	e 8		•				•	•	_	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	14.6	16.6	16	.4	14.1	10.6	7.1	4.2	7	(96)
Heat	loss rate	for me	an intern	al tempe	erature,	Lm	, W =	=[(39)m	x [(9	3)m-	- (96)m]			_	
(97)m=	924.75	894.27	812.05	675.19	526.28	35	56.41	243.54	253	3.5	383.2	568.97	752.14	910.08	3	(97)

Space heatin (98)m= 457.44	g require 361.56	300.42	159.63	64.92	0	0.02	0	0 10	177.89	323.86	458.34		
(98)m= 457.44	301.30	300.42	159.63	04.92	U			l per year	<u> </u>			2304.07	(98)
Space heatin	a requir	ament in	k\Mh/m²	lyear			Tota	ii pei yeai	(KVVII/yCai) – Guill(3	O)15,912 —	54.5	(99)
·	• .			•)			L	54.5	(99)
9a. Energy rec Space heatir		ıts – Inai	viduai n	eating sy	ystems i	nciuaing	micro-C	HP)					
Fraction of sp	•	at from se	econdar	y/supple	mentary	system					Γ	0	(201)
Fraction of sp	ace hea	at from m	ain syst	em(s)			(202) = 1 -	- (201) =			Ī	1	(202)
Fraction of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		Ī	1	(204)
Efficiency of I	main spa	ace heat	ing syste	em 1								90.3	(206)
Efficiency of	seconda	ry/supple	ementar	y heating	g systen	ո, %					Ī	0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	— ear
Space heatin		- `	alculate	d above))	1		1	1	1			
457.44	361.56	300.42	159.63	64.92	0	0	0	0	177.89	323.86	458.34		
(211)m = {[(98						1		1	ı				(211)
506.58	400.4	332.69	176.78	71.89	0	0	0 Tota	0 II (kWh/yea	197	358.65	507.57	0	7(044)
0	. / -		\ //- /	41-			TOIA	ii (KVVII/yea	ar) –Surri(2	2 1 1) _{15,1012}		2551.57	(211)
Space heatin = {[(98)m x (20	•		• • •	montn									
(215)m = 0	0	0	0	0	0	0	0	0	0	0	0		
					<u>.</u>	!	Tota	l (kWh/yea	ar) =Sum(2	215),5,1012	=	0	(215)
Water heating	I										-		
Output from w	ater hea 139.2		ulated al	oove) 124.37	109.54	104.94	116.99	118.28	134.69	143.77	155.61		
Efficiency of w		144.83 Iter	120.40	124.37	109.54	104.94	110.99	110.20	134.09	143.77	100.01	81	(216)
(217)m= 87.7	87.51	87.05	85.9	83.97	81	81	81	81	86.04	87.22	87.75	01	(217)
Fuel for water	L heating,	kWh/mo	onth			ļ	l	ļ					, ,
(219)m = (64)	m x 100) ÷ (217)	m			l		l					
(219)m= 181.71	159.07	166.38	149.54	148.12	135.23	129.56	144.43	146.02 II = Sum(2	156.53	164.84	177.34	4050 ==	7,0,0
Annual totals							Tota	ii – Suiii(2		Mhhaar	. L	1858.77	(219)
Space heating	fuel use	ed, main	system	1					K)	Wh/year		kWh/yea 2551.57	<u>'</u>
Water heating			•									1858.77	=
Electricity for p			electric l	keen-ho	t						L		
central heatin	•		2.200101		-						30		(2300
	•		ΛΛ/b /ν.o.=	-			eum	of (230a).	(230a) -				
Total electricity Electricity for li		above, r	kvvii/yea	I			Sulli	oi (200a).	(200g) –		Ĺ	30	(231)
	abtioa											255.21	(232)

Energy kWh/year

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Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	551.14	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	401.49	(264)
Space and water heating	(261) + (262) + (263) + (264) =			952.63	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting	(232) x	0.519	=	132.46	(268)
Total CO2, kg/year	sum	of (265)(271) =		1100.66	(272)
Dwelling CO2 Emission Rate	(272)) ÷ (4) =		26.03	(273)
El rating (section 14)				83	(274)

			l lear F	Details:						
Assessor Name:	Chris Hock	nell	OSCITE	Strom	a Nium	hor:		STDO	016363	
Software Name:	Stroma FS			Softwa					on: 1.0.4.26	
Software Name:	Stroma FS	AP 2012	Dunantu					versic	JII. 1.U.4.20	
A 11		ماداما ۵ مسامی	Property			=xisting				
Address:		ndfield Garden	s, LONDO	JN, NVV3	6 6 P U					
1. Overall dwelling dime	ensions:		A	- (²)		A., 11a	: l- 4/ \		Malaura a (ma	81
Ground floor				a(m²) 66.9	(1a) x		eight(m) 2.05	(2a) =	Volume(m ³	(3a)
Total floor area TFA = (1	a)+(1h)+(1c)+(1d)+(1e)+ (66.9	(4)				107.14	(\/
Dwelling volume	a) · (15) · (16) · (14)*(15)*(,	00.9)+(3c)+(3c	d)+(3e)+	(3n) =	137.14	— (5)
					(64)*(65) (00) (00	u) · (00) ·	(011)	137.14	(5)
2. Ventilation rate:	main	second		other		total			m³ per hou	ır
Number of chimneys	heating 0	heating + 0	g 	0	7 = [0	×	40 =	0	(6a)
Number of open flues	0	+ 0	╡ ₊ ┝	0		0	×	20 =	0	(6b)
Number of intermittent fa					_	3	x	10 =	30	(7a)
Number of passive vents	S				L	0	x	10 =	0	(7b)
Number of flueless gas f					L	0	x	40 =	0	(7c)
Transcr of haciess gas i					L	0			U	(/'C)
								Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fa	ans = (6a)+(6b)	+(7a)+(7b)+	(7c) =	Γ	30		÷ (5) =	0.22	(8)
If a pressurisation test has t			eed to (17),	otherwise (continue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns	5)							0	(9)
Additional infiltration							[(9))-1]x0.1 =	0	(10)
Structural infiltration: 0					•	ruction			0	(11)
if both types of wall are p deducting areas of openi			to the grea	ter wall are	a (after					
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic met	res per ho	our per s	quare m	etre of e	envelope	area	10	(17)
If based on air permeabi			•	•	•		·		0.72	(18)
Air permeability value applie	•					is being u	sed		· · · ·	` ′
Number of sides sheltered	ed								1	(19)
Shelter factor				(20) = 1 -	[0.075 x ([*]	19)] =			0.92	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18) x (20) =				0.66	(21)
Infiltration rate modified	for monthly win	d speed						_	,	
Jan Feb	Mar Apr	May Jur	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 7							_	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4									
(22a)m 1 27 1 25		100 005	1 0.05	T 0.02	Γ.	1 4 00	1 446	1 40	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.85	0.83	0.81	0.73	0.71	0.63	0.63	0.61	0.66	0.71	0.75	0.78		
Calculate effec		_	rate for ti	he appli	cable ca	se							
If mechanication of the street			andiv N (2	3h) = (23a	a) x Emy (e	auation (1	NSN othe	nwise (23h	n) = (23a)			0	(2
If balanced with									, (20 4)			0	(2
a) If balance		-		_					2h)m + ('	23h) x [1 – (23c)		(2
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	ed mech	anical ve	ntilation	without	heat red	covery (N	л ЛV) (24b)m = (22	2b)m + (2	23b)		l	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse ex	tract ver	ntilation c	r positiv	ve input v	/entilatio	n from o	utside				•	
if (22b)n	n < 0.5 ×	(23b), t	hen (24c	c) = (23b	o); other	vise (24	c) = (22h	o) m + 0.	.5 × (23b)		-	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural				•	•				0 51				
If (22b)n 24d)m= 0.86	$n = 1, tn_0$ 0.85	en (24a) _{0.83}	m = (220)	0.76	erwise (2 	4a)m = _{0.7}	0.5 + [(2	2b)m² x 0.72	0.5]	0.78	0.81	1	(2
Effective air									0.70	0.76	0.01		(-
5)m= 0.86	0.85	0.83	0.77	0.76	0,01 (24)	0.7	0.69	0.72	0.76	0.78	0.81	1	(2
<i>'</i>	l .] ",	0.7	0.00	0.72	0.70	0.70	0.01		
B. Heat losse	s and he	eat loss p											
LEMENT	Gros area		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/ł	<)	k-value kJ/m²·l		A X k kJ/K
oors	J., J.,	()			2.2	 x	1.8	=	3.96	-, -		•	(
/indows Type	e 1				1.78	_{x1}	/[1/(1.6)+	0.04] =	2.68				(
indows Type					1.75		/[1/(1.6)+	0.04] =	2.63				(
indows Type					1.55	=	/[1/(1.6)+		2.33	=			(
ooflights Typ					0.82	_	/[1/(1.6) +		1.312	=			(:
ooflights Typ					0.82	_	/[1/(1.6) +		1.312	=			(:
ooflights Typ					0.36		/[1/(1.6) +		0.576	╡			(
alls Type1	32.0	13	6.83		25.2	X	0.55		13.86	=			· (
alls Type2	17.0	_	2.2	=	14.86	=	0.55	╡ :	8.17	╡ ¦		╡	(
alls Type3	3.9		0	=	3.91	X	0.28	╡ :	1.09	╡ ¦		╡	(
oof Type1	49.4		4.1	=	45.33	=		╡┇	8.16	╡ ¦		╡	(
oof Type2	25.6		0.72	\dashv	24.95	=	0.18	- 	4.49	╡ ¦		╡	(
oof Type3	13.0		0.72	_	13.6) ^ x	0.18	- - =	2.45	╡ ¦		╡ 누	(
otal area of e						=	U.18		2.43) (
arty wall	,iciticitis	, 111			141.7	=		— _ I	0	-			
arty Wall					18.94	×	0	=	0			╡	(
or windows and	l roof wind	ows use e	ffective wir	ndow I I-ve	66.9	ated using	ı formula 1	/[(1/L-val)	ıe)+0 041 a	s aiven ir	n naragranh		(
			iternal wall			a usii iy		LI O Valu	.5, · 0.0+j a	- g.voii II	. paragraph	- 	
include the area	10///	= S (Δ x	Ш				(26)(30)	+ (32) =				59.7	(
	SS, VV/K	- 0 (// /	0)										
abric heat los leat capacity		•	O)					((28).	(30) + (32	?) + (32a)	(32e) =	6881.4	5 (3

can be used instead of a detailed calculation.		
Thermal bridges : S (L x Y) calculated using Appendix K	21.26	(36)
if details of thermal bridging are not known (36) = 0.05 x (31)		(**)
Total fabric heat loss (33) + (36) =	80.96	(37)
Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$		
JanFebMarAprMayJunJulAugSepOctNovDec		
(38)m= 38.89 38.26 37.64 34.73 34.19 31.66 31.66 31.19 32.63 34.19 35.29 36.44		(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m		
(39)m= 119.85 119.22 118.6 115.69 115.15 112.62 112.62 112.15 113.59 115.15 116.25 117.4		
Average = Sum(39) ₁₁₂ /12= Heat loss parameter (HLP), W/m ² K $ (40)m = (39)m \div (4) $	115.69	(39)
(40)m= 1.79 1.78 1.77 1.73 1.72 1.68 1.68 1.68 1.7 1.72 1.74 1.75		
Average = Sum(40) ₁₁₂ /12= Number of days in month (Table 1a)	1.73	(40)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
(41)m= 31 28 31 30 31 30 31 30 31 30 31		(41)
4. Water heating energy requirement: kWh/yea	ar:	
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1		(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36		(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= 99.24 95.63 92.02 88.41 84.8 81.19 81.19 84.8 88.41 92.02 95.63 99.24		
Total = Sum(44) ₁₁₂ =	1082.57	(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= 147.16 128.71 132.82 115.79 111.11 95.88 88.84 101.95 103.17 120.23 131.24 142.52		
Total = Sum(45) ₁₁₂ =	1419.42	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)		(40)
(46)m= 22.07 19.31 19.92 17.37 16.67 14.38 13.33 15.29 15.48 18.03 19.69 21.38 Water storage loss:		(46)
Storage volume (litres) including any solar or WWHRS storage within same vessel 0		(47)
If community heating and no tank in dwelling, enter 110 litres in (47)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)		
Water storage loss:		
a) If manufacturer's declared loss factor is known (kWh/day):		(48)
Temperature factor from Table 2b		(49)
Energy lost from water storage, kWh/year (48) x (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 Temperature factor from Table 2b 0		(52) (53)
Temperature factor from Table 2b		

L Dtor (5(1) or (5(1) in (55)	ear		(47) x (51) x (52) x (53) =		0		(54)
Enter (50) or (54) in (55) Water storage loss calculated for each	month		((56)m = ((55) × (41)r	n		0		(55)
	0 0	0	0	0	0	0	0	I	(56)
(56)m= 0 0 0 0 If cylinder contains dedicated solar storage, (57)				-				İ ix H	(30)
(57)m= 0 0 0 0	0 0	0	0	0	0	0	0		(57)
(*)			1 -		-		ļ		(58)
Primary circuit loss (annual) from Table Primary circuit loss calculated for each		- (58) ÷ 3(35 × (11)	ım			0		(30)
(modified by factor from Table H5 if t	` '	` '	` '		thermo	stat)			
(59)m= 0 0 0 0	0 0	0	0	0	0	0	0		(59)
Combi loss calculated for each month	(61)m = (60) ÷	365 × (41)m	•				•	
(61)m= 50.57 44.01 46.89 43.6	43.21 40.0		43.21	43.6	46.89	47.16	50.57		(61)
Total heat required for water heating ca	alculated for e	ach month	(62)m =	: 0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 197.73 172.73 179.71 159.39	154.32 135.9		145.16	146.77	167.12	178.4	193.09		(62)
Solar DHW input calculated using Appendix G or	r Appendix H (neg	ative quantit	y) (enter '0	' if no sola	contributi	on to wate	r heating)		
(add additional lines if FGHRS and/or \	NWHRS appli	es, see Ap	pendix (3)					
(63)m= 0 0 0 0	0 0	0	0	0	0	0	0		(63)
Output from water heater		•	•	•				•	
(64)m= 197.73 172.73 179.71 159.39	154.32 135.9	2 130.22	145.16	146.77	167.12	178.4	193.09		
		•	Out	out from wa	ater heate	r (annual)₁	12	1960.56	(64)
Heat gains from water heating, kWh/m	onth 0.25 ' [0.	35 × (45)m	n + (61)n	n] + 0.8 x	[(46)m	+ (57)m	+ (59)m]	
(65)m= 61.57 53.8 55.88 49.4	47.75 41.8	39.88	44.7	45.2	51.7	55.43	60.03		(65)
include (57)m in calculation of (65)m	only if cylinde	r is in the	dwelling	or hot w	ater is fr	om com	munity b	ootina	
5. Internal gains (see Table 5 and 5a					ater is ii	OIII COIII	mumity i	leating	
):					OIII COIII	munity n	leating	
Metabolic gains (Table 5), Watts):						mumity n	eaung	
Metabolic gains (Table 5), Watts Jan Feb Mar Apr): May Jui	n Jul	Aug	Sep	Oct	Nov	Dec	eaung	
			Aug 108.43	ı			,	leaung	(66)
Jan Feb Mar Apr	May Jui	3 108.43	108.43	Sep 108.43	Oct	Nov	Dec	leaung	(66)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43	May Jui	3 108.43 or L9a), a	108.43	Sep 108.43	Oct	Nov	Dec	leaung	(66) (67)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix	May Jui 108.43 108.4 L, equation L9 8.71 7.35	3 108.43 or L9a), a	108.43 also see 10.33	Sep 108.43 Table 5	Oct 108.43	Nov 108.43	Dec 108.43	leaung	
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65	May Jui 108.43 108.4 L, equation L9 8.71 7.35	3 108.43 or L9a), a 7.94 L13 or L1	108.43 also see 10.33	Sep 108.43 Table 5	Oct 108.43	Nov 108.43	Dec 108.43	leaung	
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65 Appliances gains (calculated in Appendix (calcul	May Jui 108.43 108.4 L, equation LS 8.71 7.35 dix L, equation 163.04 150.4	3 108.43 or L9a), a 7.94 L13 or L1 9 142.11	108.43 also see 10.33 3a), also 140.14	Sep 108.43 Table 5 13.86 o see Tal	Oct 108.43 17.6 ole 5 155.68	Nov 108.43 20.54	Dec 108.43	leaung	(67)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65 Appliances gains (calculated in Appendix (68)m= 189.96 191.93 186.96 176.39	May Jui 108.43 108.4 L, equation LS 8.71 7.35 dix L, equation 163.04 150.4	3 108.43 or L9a), a 7.94 L13 or L1 9 142.11 5 or L15a	108.43 also see 10.33 3a), also 140.14	Sep 108.43 Table 5 13.86 o see Tal	Oct 108.43 17.6 ole 5 155.68	Nov 108.43 20.54	Dec 108.43	leaung	(67)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65 Appliances gains (calculated in Appendix (68)m= 189.96 191.93 186.96 176.39 Cooking gains (calculated in Appendix (calculated in Appendi	May Jul 108.43 108.4 L, equation L9 8.71 7.35 dix L, equation 163.04 150.4 L, equation L	3 108.43 or L9a), a 7.94 L13 or L1 9 142.11 5 or L15a	108.43 also see 10.33 3a), also 140.14), also se	Sep 108.43 Table 5 13.86 o see Tal 145.11	Oct 108.43 17.6 ole 5 155.68	Nov 108.43 20.54 169.03	Dec 108.43 21.9 181.58	leaung	(67) (68)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65 Appliances gains (calculated in Appendix (68)m= 189.96 191.93 186.96 176.39 Cooking gains (calculated in Appendix (69)m= 33.84 33.84 33.84 33.84	May Jul 108.43 108.4 L, equation L9 8.71 7.35 dix L, equation 163.04 150.4 L, equation L	3 108.43 or L9a), a 7.94 L13 or L1 9 142.11 5 or L15a	108.43 also see 10.33 3a), also 140.14), also se	Sep 108.43 Table 5 13.86 o see Tal 145.11	Oct 108.43 17.6 ole 5 155.68	Nov 108.43 20.54 169.03	Dec 108.43 21.9 181.58	leating	(67) (68)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65 Appliances gains (calculated in Appendix (68)m= 189.96 191.93 186.96 176.39 Cooking gains (calculated in Appendix (69)m= 33.84 33.84 33.84 33.84 Pumps and fans gains (Table 5a)	May Jun 108.43 108.4 L, equation L9 8.71 7.35 dix L, equation 163.04 150.4 L, equation L2 33.84 33.8	3 108.43 or L9a), a 7.94 L13 or L1 9 142.11 5 or L15a 4 33.84	108.43 also see 10.33 3a), also 140.14), also so 33.84	Sep 108.43 Table 5 13.86 see Tal 145.11 ee Table 33.84	Oct 108.43 17.6 ole 5 155.68 5 33.84	Nov 108.43 20.54 169.03	Dec 108.43 21.9 181.58 33.84	leaung	(67) (68) (69)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65 Appliances gains (calculated in Appendix (68)m= 189.96 191.93 186.96 176.39 Cooking gains (calculated in Appendix (69)m= 33.84 33.84 33.84 33.84 Pumps and fans gains (Table 5a) (70)m= 3 3 3 3	May Jun 108.43 108.4 L, equation L9 8.71 7.35 dix L, equation 163.04 150.4 L, equation L2 33.84 33.8	3 108.43 or L9a), a 7.94 L13 or L1 9 142.11 5 or L15a 4 33.84	108.43 also see 10.33 3a), also 140.14), also so 33.84	Sep 108.43 Table 5 13.86 see Tal 145.11 ee Table 33.84	Oct 108.43 17.6 ole 5 155.68 5 33.84	Nov 108.43 20.54 169.03	Dec 108.43 21.9 181.58 33.84	leating	(67) (68) (69)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65 Appliances gains (calculated in Appendix (68)m= 189.96 191.93 186.96 176.39 Cooking gains (calculated in Appendix (69)m= 33.84 33.84 33.84 33.84 Pumps and fans gains (Table 5a) (70)m= 3 3 3 Losses e.g. evaporation (negative value)	May Jul 108.43 108.4 L, equation L9 8.71 7.35 dix L, equation 163.04 150.4 L, equation L 33.84 33.8 3 3 es) (Table 5)	3 108.43 or L9a), a 7.94 L13 or L1 9 142.11 5 or L15a 4 33.84	108.43 also see 10.33 3a), also 140.14), also se 33.84	Sep 108.43 Table 5 13.86 See Tal 145.11 ee Table 33.84	Oct 108.43 17.6 ole 5 155.68 5 33.84	Nov 108.43 20.54 169.03	Dec 108.43 21.9 181.58 33.84	leating	(67) (68) (69) (70)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65 Appliances gains (calculated in Appendix (68)m= 189.96 191.93 186.96 176.39 Cooking gains (calculated in Appendix (69)m= 33.84 33.84 33.84 33.84 Pumps and fans gains (Table 5a) (70)m= 3 3 3 Losses e.g. evaporation (negative value) (71)m= -86.74 -86.74 -86.74 -86.74 -86.74	May Jul 108.43 108.4 L, equation L9 8.71 7.35 dix L, equation 163.04 150.4 L, equation L 33.84 33.8 3 3 es) (Table 5)	3 108.43 or L9a), a 7.94 L13 or L1 9 142.11 5 or L15a 4 33.84 3	108.43 also see 10.33 3a), also 140.14), also se 33.84	Sep 108.43 Table 5 13.86 See Tal 145.11 ee Table 33.84	Oct 108.43 17.6 ole 5 155.68 5 33.84	Nov 108.43 20.54 169.03	Dec 108.43 21.9 181.58 33.84	leating	(67) (68) (69) (70)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65 Appliances gains (calculated in Appendix (68)m= 189.96 191.93 186.96 176.39 Cooking gains (calculated in Appendix (69)m= 33.84 33.84 33.84 33.84 Pumps and fans gains (Table 5a) (70)m= 3 3 3 Losses e.g. evaporation (negative value) (71)m= -86.74 -86.74 -86.74 -86.74 Water heating gains (Table 5)	May Jui 108.43 108.4 L, equation LS 8.71 7.35 dix L, equation 163.04 150.4 L, equation L 33.84 33.8 3 3 es) (Table 5) -86.74 -86.7	3 108.43 or L9a), a 7.94 L13 or L1 9 142.11 5 or L15a 4 33.84 3	108.43 also see 10.33 3a), also 140.14), also se 33.84 3 -86.74	Sep 108.43 Table 5 13.86 See Tal 145.11 ee Table 33.84 3	Oct 108.43 17.6 ole 5 155.68 5 33.84 3 -86.74	Nov 108.43 20.54 169.03 33.84 3	Dec 108.43 21.9 181.58 33.84 3 -86.74	leating	(67) (68) (69) (70) (71)
Jan Feb Mar Apr (66)m= 108.43 108.43 108.43 108.43 Lighting gains (calculated in Appendix (67)m= 21.3 18.92 15.39 11.65 Appliances gains (calculated in Appendix (68)m= 189.96 191.93 186.96 176.39 Cooking gains (calculated in Appendix (69)m= 33.84 33.84 33.84 33.84 Pumps and fans gains (Table 5a) (70)m= 3 3 3 Losses e.g. evaporation (negative value) (71)m= -86.74 -86.74 -86.74 -86.74 Water heating gains (Table 5) (72)m= 82.76 80.06 75.11 68.61	May Jui 108.43 108.4 L, equation LS 8.71 7.35 dix L, equation 163.04 150.4 L, equation L 33.84 33.8 3 3 es) (Table 5) -86.74 -86.7	3 108.43 or L9a), a 7.94 L13 or L1 9 142.11 5 or L15a 4 33.84 3 4 -86.74 3 53.61 66)m + (67)r	108.43 also see 10.33 3a), also 140.14), also se 33.84 3 -86.74	Sep 108.43 Table 5 13.86 See Tal 145.11 ee Table 33.84 3	Oct 108.43 17.6 ole 5 155.68 5 33.84 3 -86.74	Nov 108.43 20.54 169.03 33.84 3	Dec 108.43 21.9 181.58 33.84 3 -86.74	leating	(67) (68) (69) (70) (71)

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

Orientation: Access Fa	actor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x 0.77	X	1.78	x	36.79	x	0.63	x	0.7	=	20.02	(77)
Southeast 0.9x 0.77	X	1.78	x	62.67	x	0.63	х	0.7	=	34.09	(77)
Southeast 0.9x 0.77	X	1.78	x	85.75	x	0.63	х	0.7] =	46.65	(77)
Southeast 0.9x 0.77	x	1.78	x	106.25	x	0.63	x	0.7] =	57.8	(77)
Southeast 0.9x 0.77	X	1.78	x	119.01	x	0.63	х	0.7] =	64.74	(77)
Southeast 0.9x 0.77	X	1.78	x	118.15	x	0.63	х	0.7] =	64.27	(77)
Southeast 0.9x 0.77	X	1.78	x	113.91	x	0.63	х	0.7	=	61.97	(77)
Southeast 0.9x 0.77	X	1.78	x	104.39	x	0.63	x	0.7] =	56.79	(77)
Southeast 0.9x 0.77	X	1.78	x	92.85	x	0.63	х	0.7] =	50.51	(77)
Southeast 0.9x 0.77	X	1.78	x	69.27	x	0.63	x	0.7] =	37.68	(77)
Southeast 0.9x 0.77	X	1.78	x	44.07	x	0.63	x	0.7] =	23.97	(77)
Southeast 0.9x 0.77	X	1.78	x	31.49	x	0.63	x	0.7] =	17.13	(77)
Southwest _{0.9x} 0.77	X	1.75	x	36.79]	0.63	X	0.7] =	39.36	(79)
Southwest _{0.9x} 0.77	X	1.75	x	62.67]	0.63	x	0.7	=	67.04	(79)
Southwest _{0.9x} 0.77	X	1.75	x	85.75]	0.63	x	0.7	=	91.72	(79)
Southwest _{0.9x} 0.77	X	1.75	x	106.25]	0.63	x	0.7] =	113.65	(79)
Southwest _{0.9x} 0.77	X	1.75	x	119.01]	0.63	x	0.7] =	127.3	(79)
Southwest _{0.9x} 0.77	X	1.75	x	118.15]	0.63	x	0.7] =	126.38	(79)
Southwest _{0.9x} 0.77	X	1.75	x	113.91]	0.63	x	0.7] =	121.84	(79)
Southwest _{0.9x} 0.77	X	1.75	x	104.39]	0.63	x	0.7] =	111.66	(79)
Southwest _{0.9x} 0.77	X	1.75	x	92.85]	0.63	x	0.7] =	99.32	(79)
Southwest _{0.9x} 0.77	X	1.75	x	69.27]	0.63	X	0.7	=	74.09	(79)
Southwest _{0.9x} 0.77	X	1.75	X	44.07]	0.63	X	0.7	=	47.14	(79)
Southwest _{0.9x} 0.77	X	1.75	x	31.49]	0.63	X	0.7	=	33.68	(79)
Northwest 0.9x 0.77	X	1.55	x	11.28	X	0.63	X	0.7	=	5.34	(81)
Northwest 0.9x 0.77	X	1.55	x	22.97	x	0.63	x	0.7	=	10.88	(81)
Northwest 0.9x 0.77	X	1.55	X	41.38	x	0.63	x	0.7] =	19.6	(81)
Northwest 0.9x 0.77	X	1.55	X	67.96	x	0.63	X	0.7	=	32.19	(81)
Northwest 0.9x 0.77	X	1.55	X	91.35	X	0.63	X	0.7	=	43.27	(81)
Northwest 0.9x 0.77	X	1.55	X	97.38	x	0.63	X	0.7	=	46.13	(81)
Northwest 0.9x 0.77	X	1.55	X	91.1	x	0.63	X	0.7	=	43.15	(81)
Northwest 0.9x 0.77	X	1.55	x	72.63	x	0.63	x	0.7	=	34.4	(81)
Northwest 0.9x 0.77	X	1.55	x	50.42	x	0.63	X	0.7	=	23.88	(81)
Northwest 0.9x 0.77	X	1.55	X	28.07	X	0.63	X	0.7	=	13.3	(81)
Northwest 0.9x 0.77	X	1.55	x	14.2	x	0.63	x	0.7	=	6.73	(81)
Northwest 0.9x 0.77	X	1.55	x	9.21	x	0.63	x	0.7	=	4.36	(81)
Rooflights _{0.9x} 1	X	0.82	x	40.5	x	0.63	x	0.8	=	45.19	(82)
Rooflights _{0.9x} 1	X	0.82	x	15.92	x	0.63	x	0.8] =	11.84	(82)
Rooflights 0.9x 1	X	0.36	x	26	X	0.63	X	0.8	=	8.49	(82)

Rooflights 0.9x 1	×	0.82	1 x	72.74) x	0.63	7 x [0.8		92.20	(82)
D (1) 1	=	0.82] 1	73.74] ^] _x	0.63	╡╞	0.8		82.29	(82)
D fi l-t-	X] X] v	32.51	J 1	0.63	_		-	24.18	(82)
Deeflightee	→ × → ×	0.36] X] v	54] x] x	0.63	_ ×	0.8		17.64	(82)
D - di ulta da	→ × → ×	0.82] X] ,	111.06	J 1	0.63	_	0.8		123.92	=
D fi l-t-	X	0.82] X] v	59.5] X] ,	0.63	_	0.8		44.26	(82)
D (1) 1 1	×	0.36] X] .,	96] X] ,	0.63	_	0.8	_	31.35	(82)
D filinists	X	0.82] X]	150.59	X	0.63	_	0.8	=	168.04	(82)
	×	0.82	X	100.03	X 1	0.63	_	0.8	=	74.42	(82)
Rooflights 0.9x 1	×	0.36	X	150	X 1	0.63	_	0.8	=	48.99	(82)
Rooflights 0.9x 1	×	0.82	X	177.61	X 1	0.63	_	8.0	=	198.18	(82)
Rooflights 0.9x 1	X	0.82	X	136.88	X	0.63	_ ×	0.8	=	101.82	(82)
Rooflights 0.9x	X	0.36	X	192	X	0.63	_ ×	0.8	_ =	62.71	(82)
Rooflights 0.9x 1	X	0.82	X	179.47	X	0.63	_ ×	0.8	=	200.26	(82)
Rooflights 0.9x 1	X	0.82	X	147.03	X	0.63	_ x [0.8	=	109.38	(82)
Rooflights 0.9x 1	X	0.36	X	200	X	0.63	_ x	0.8	=	65.32	(82)
Rooflights 0.9x 1	X	0.82	X	171.77	X	0.63	x	0.8	=	191.68	(82)
Rooflights 0.9x	X	0.82	X	137.1	X	0.63	x	0.8	=	101.99	(82)
Rooflights 0.9x	X	0.36	X	189	X	0.63	_ x _	0.8	=	61.73	(82)
Rooflights 0.9x 1	X	0.82	X	151.65	X	0.63	x	0.8	=	169.23	(82)
Rooflights 0.9x 1	X	0.82	X	107.76	X	0.63	x	8.0	=	80.17	(82)
Rooflights 0.9x 1	X	0.36	X	157	X	0.63	x [0.8	=	51.27	(82)
Rooflights 0.9x 1	X	0.82	X	125.02	X	0.63	x [0.8	=	139.51	(82)
Rooflights _{0.9x} 1	X	0.82	X	73.17	X	0.63	x [0.8	=	54.43	(82)
Rooflights _{0.9x} 1	X	0.36	x	115	x	0.63	_ x [0.8	=	37.56	(82)
Rooflights 0.9x 1	X	0.82	x	84.48	X	0.63	x [0.8	=	94.27	(82)
Rooflights 0.9x 1	X	0.82	x	39.91	X	0.63	x [0.8	=	29.69	(82)
Rooflights _{0.9x} 1	X	0.36	x	66	x	0.63	x [0.8	=	21.56	(82)
Rooflights 0.9x 1	X	0.82	x	49.44	x	0.63	_ x [0.8	=	55.17	(82)
Rooflights 0.9x 1	x	0.82	x	20.03	x	0.63	_ x [0.8	=	14.9	(82)
Rooflights 0.9x 1	x	0.36	x	33	х	0.63	- x [0.8	=	10.78	(82)
Rooflights 0.9x 1	x	0.82	x	34.03	х	0.63	x	0.8	=	37.97	(82)
Rooflights 0.9x 1	x	0.82	x	13.01	x	0.63	x	0.8	=	9.67	(82)
Rooflights 0.9x 1	X	0.36	x	21	x	0.63		0.8	=	6.86	(82)
			•								
Solar gains in watts, cald	ulated	for each mon	th		(83)m	= Sum(74)m	.(82)m				
(83)m= 130.24 236.12 3	357.51	495.08 598.0	2 6	11.74 582.35	503	.52 405.21	270.58	158.68	109.68		(83)
Total gains – internal and	d solar	(84)m = (73) n	n + (33)m , watts							
(84)m= 482.79 585.55	693.5	810.26 892.4	7 8	86.29 844.54	772	.59 685.49	571.88	483.76	452.37		(84)
7. Mean internal temper	ature (heating seaso	on)								
Temperature during hea	ating p	eriods in the li	ving	area from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation factor for gain	ns for li	ving area, h1,	m (s	ee Table 9a)							_
Jan Feb	Mar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		

(86)m= 1	0.99	0.98	0.94	0.85	0.7	0.55	0.61	0.84	0.96	0.99	1		(86)
Mean inter	nal temper	ature in	living are	ea T1 (fc	ollow ste	ps 3 to 7	' in Tabl	e 9c)					
(87)m= 19.0	9 19.31	19.69	20.19	20.61	20.87	20.96	20.94	20.73	20.18	19.56	19.08		(87)
Temperatu	re durina h	neating p	eriods ir	rest of	dwellina	from Ta	ble 9. T	h2 (°C)					
(88)m= 19.4		19.49	19.52	19.53	19.55	19.55	19.56	19.54	19.53	19.51	19.5		(88)
Utilisation	factor for a	ains for I	rest of du	velling l	n2 m (se	a Tabla	02)		<u> </u>			l	
(89)m= 0.99		0.97	0.91	0.79	0.58	0.39	0.44	0.75	0.95	0.99	1		(89)
							<u> </u>		<u> </u>				, ,
Mean inter (90)m= 17.7		18.39	tne rest	ot awelli 19.28	ng 12 (fo	19.54	19.54	/ IN Tabl	e 9c) 18.91	18.29	17.8		(90)
(90)m= 17.7	9 10.02	10.39	10.9	19.20	19.5	19.54	19.54		l	g area ÷ (4		0.38	(91)
									L/C LIVIII	g aroa · (-	•)	0.30	(31)
Mean inter		· `				ı —	- `	- 	Ι	ı	ı	1	(22)
(92)m= 18.2		18.88	19.39	19.78	20.02	20.08	20.07	19.91	19.39	18.77	18.28		(92)
Apply adju	1	1							 		10.00		(02)
(93)m= 18.2		18.88	19.39	19.78	20.02	20.08	20.07	19.91	19.39	18.77	18.28		(93)
8. Space h					4	44	T. I.I. 0		1 T: (70)	.1		
Set Ti to th the utilisati			•		ed at ste	ep 11 of	Table 9	o, so tha	it II,m=(/6)m an	d re-calc	culate	
Jai	T	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation 1	-			Way	Odii	- Gai	, rug	СОР		1101	200		
(94)m= 0.99	<u>_</u>	0.96	0.91	0.8	0.62	0.45	0.51	0.77	0.94	0.99	0.99		(94)
Useful gair	ns, hmGm	, W = (94	L——— 4)m x (8₄	L 4)m				l		!	l .		
(95)m= 478.8	1	668.35	738.4	716.46	553.8	379.83	392.95	529.91	539.35	476.59	449.41		(95)
Monthly av	erage exte	ernal tem	perature	from Ta	able 8		<u> </u>		<u>I</u>				
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss r	ate for me	an intern	al tempe	erature, l		=[(39)m :	x [(93)m	– (96)m]	!		l	
(97)m= 1675.	79 1622.53	1468.52	1213.28	930.29	610.31	391.95	411.96	659.67	1011.85	1356.59	1653.2		(97)
Space hea	ting require	ement fo	r each m	nonth, k\	Vh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 890.5	703.34	595.33	341.92	159.09	0	0	0	0	351.54	633.6	895.61		
							Tota	l per year	(kWh/year	·) = Sum(9	8)15,912 =	4570.97	(98)
Space hea	ting require	ement in	kWh/m²	/year								68.33	(99)
9a. Energy	requiremen	nts – Indi	vidual h	eating sy	/stems i	ncludina	micro-C	:HP)					
Space hea		no ma	vidual II	caming of	y otorrio i	nordanig	TITIOTO C)					
Fraction of	•	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction of	space hea	at from m	nain svst	em(s)		-	(202) = 1	- (201) =				1	(202)
Fraction of	•		-	. ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
		•	-				(=0.) (=	o=, [.	(200)]				╡
Efficiency	•					0/						90.3	(206)
Efficiency	of seconda	ry/suppl	ementar	y neating	g system	า, %	r		r			0	(208)
Jai	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space hea	ting require	ement (c	alculate	d above)			1		1		1		
890.	703.34	595.33	341.92	159.09	0	0	0	0	351.54	633.6	895.61		
(211)m = {[(98)m x (20	(4)] } x 1	00 ÷ (20	6)								1	(211)
986.2	22 778.89	659.28	378.64	176.18	0	0	0	0	389.3	701.66	991.82		_
							Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	5061.98	(211)

Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)					ı	ı			
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		_
			Tota	I (kWh/yea	ar) =Sum(2	215) _{15,101}	2	0	(215)
Water heating									
Output from water heater (calculated above) 197.73 172.73 179.71 159.39 154.32 1	135.92	130.22	145.16	146.77	167.12	178.4	193.09		
Efficiency of water heater					<u> </u>	ļ		81	(216)
(217)m= 88.45 88.3 87.96 87.12 85.47	81	81	81	81	87.08	88.08	88.5		(217)
Fuel for water heating, kWh/month									
$(219)m = (64)m \times 100 \div (217)m$	407.0	100.70	470.04	101.10	104.00	000.55	T 040 40 T		
(219)m= 223.54 195.61 204.31 182.96 180.56	167.8	160.76	179.21	181.19 I = Sum(2	191.92	202.55	218.19	0000.04	7(240)
Annual totals			Tota	i – Guili(2		Wh/yea	. l	2288.61	(219)
Space heating fuel used, main system 1					K.	vvii/yeai	· [kWh/yea 5061.98	<u>'</u>
Water heating fuel used								2288.61	Ī
Electricity for pumps, fans and electric keep-hot							•		
central heating pump:									
contrai neating pamp.							30		(230c)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =		30	30	(230c)
			sum	of (230a).	(230g) =		30	30 376.23	_ `
Total electricity for the above, kWh/year	ns inclu	ding mi			(230g) =		30		(231)
Total electricity for the above, kWh/year Electricity for lighting	Ene	ding mid e rgy h/year				ion fac			(231) (232)
Total electricity for the above, kWh/year Electricity for lighting	Ene	e rgy h/year			Emiss	ion fac 2/kWh		376.23 Emission :	(231) (232)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	Ene kW	e rgy h/year) ×			Emiss kg CO	ion fac 2/kWh	tor	376.23 Emissions kg CO2/ye	(231) (232) Sear
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	Ene kW(ergy h/year) ×			Emiss kg CO	ion fac 2/kWh 16	tor = [376.23 Emissions kg CO2/yes 1093.39	(231) (232) Sear (261)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Ene kWl (211) (215) (219)	ergy h/year) ×) ×			Emiss kg CO2	ion fac 2/kWh 16	tor = [376.23 Emissions kg CO2/yes 1093.39	(231) (232) Sear (261) (263)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Ene kWl (211) (215) (219)	ergy h/year) x) x) x	cro-CHP		Emiss kg CO2	ion fac 2/kWh 16 19	tor = [376.23 Emissions kg CO2/ye 1093.39 0 494.34	(231) (232) Sear (261) (263) (264)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Ene kWl (211) (215) (219) (261)	ergy h/year) x) x) x) + (262) -	cro-CHP		Emiss kg CO2 0.2 0.5 0.2	ion fac 2/kWh 16 19	tor = [= [= [376.23 Emissions kg CO2/ye 1093.39 0 494.34 1587.73	(231) (232) (232) (232) (261) (263) (264) (265)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) (215) (219) (261) (231)	ergy h/year) x) x) x) + (262) -	cro-CHP	264) =	Emiss kg CO2 0.2 0.5 0.5	ion fac 2/kWh 16 19 16	tor = [= [= [376.23 Emissions kg CO2/ye 1093.39 0 494.34 1587.73	(231) (232) (232) (232) (261) (263) (264) (265) (267)

El rating (section 14)

(274)

78

Appendix B Energy Assessment 6 Lindfield Gardens



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Be Lean Residential - DER from the Be Lean scenario DER SAP worksheet

		User Details:			
Assessor Name:	Chris Hocknell	Stroma Num	nber: STF	RO016363	
Software Name:	Stroma FSAP 2012	Software Ve	rsion: Ver	sion: 1.0.4.26	
	Pro	pperty Address: Flat 1-	Lean		
Address :	Flat 1, 6, Lindfield Gardens, L	ONDON, NW3 6PU			
1. Overall dwelling dime	ensions:				
		Area(m²)	Av. Height(m)	Volume(m³)	7
Ground floor		92.28 (1a) x	4.18 (2a)	= 385.73	(3a)
First floor		40.18 (1b) x	2.5 (2b)	= 100.45	(3b)
Second floor		106.16 (1c) x	2.63 (2c)	= 279.2	(3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	238.62 (4)			
Dwelling volume		(3a)+(3l	o)+(3c)+(3d)+(3e)+(3n) =	765.38	(5)
2. Ventilation rate:					_
	main secondary heating heating	other	total	m³ per hour	
Number of chimneys		+ 0 =	0 x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0 x 20 =	0	(6b)
Number of intermittent fa	ins		5 x 10 =	50	(7a)
Number of passive vents	;		0 x 10 =	0	(7b)
Number of flueless gas fi	ires		0 x 40 =	0	(7c)
		<u> </u>	A:		
		<u>-</u>	Air	changes per hou	ur -
	ys, flues and fans = (6a)+(6b)+(7a)	L	\div (5) =	0.07	(8)
Number of storeys in the	neen carried out or is intended, proceed t he dwelling (ns)	to (17), otherwise continue i	10111 (9) 10 (10)	0	(9)
Additional infiltration	ine aweiling (113)		[(9)-1]x0.1		(10)
	.25 for steel or timber frame or 0).35 for masonry const		0	(11)
if both types of wall are p	resent, use the value corresponding to t	•		Ŭ	۱٬۰۰/
deducting areas of openii		(l . l) . l			٦
·	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter 0		0	(12)
If no draught lobby, en				0	(13)
<u> </u>	s and doors draught stripped	0.05 (0.0 (4.4)	4001	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷	-	0	(15)
Infiltration rate		(8) + (10) + (11) + (0	(16)
•	q50, expressed in cubic metres		netre of envelope area	10	(17)
•	lity value, then $(18) = [(17) \div 20] + (8)$			0.57	(18)
	es if a pressurisation test has been done	or a degree air permeability	is being used		٦
Number of sides sheltere Shelter factor	ed	(20) = 1 - [0.075 x (19)] =	2	(19)
	ting abolton footon			0.85	(20)
Infiltration rate incorporat	-	(21) = (18) x (20) =		0.48	(21)
Infiltration rate modified f	- 		1	\neg	
Jan Feb	Mar Apr May Jun	Jul Aug Sep	Oct Nov De	С	
Monthly average wind sp	peed from Table 7			_	

4.4

4.3

3.8

3.8

3.7

4.3

4

4.5

4.7

4.9

5.1

(22)m=

5

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
A 11 (1 C1)		·		.,			(0.4.)	(00.)					
Adjusted infiltr	ation rat	e (allowi 0.59	ng for sr 0.53	0.52	a wina s	0.46	(21a) X 0.44	(22a)m 0.48	0.52	0.54	0.56		
Calculate effe	1	I					0.44	0.46	0.52	0.54	0.56		
If mechanic		_										0	(23a)
If exhaust air h	eat pump i	using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance	ed mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2	2b)m + (23b) × [1	I – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat rec	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)		ı	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				•	•								
<u> </u>	n < 0.5 ×	<u> </u>	· `	<u> </u>	<u> </u>	· ` ·	ŕ	ŕ	· ` ·	ŕ		l	(0.4.)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural	ventilation n = 1, the								0.51				
(24d)m = 0.69	0.68	0.67	0.64	0.63	0.6	0.6	0.5 . [(2	0.62	0.63	0.65	0.66		(24d)
Effective air													, ,
(25)m= 0.69	0.68	0.67	0.64	0.63	0.6	0.6	0.6	0.62	0.63	0.65	0.66		(25)
	<u> </u>									ı			
0 1141	a a al la a	4											
3. Heat losse		·			Not Ar	00	Hayalı	110	A V I I		k voluc		Λ Υ <i>k</i>
3. Heat losse ELEMENT	s and he Gros area	SS	oaramete Openin m	gs	Net Ar		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·ł		A X k kJ/K
	Gros	SS	Openin	gs						K)			
ELEMENT	Gros area	SS	Openin	gs	A ,n	m² x	W/m2	2K =	(W/I	K)			kJ/K
ELEMENT Doors	Gros area	SS	Openin	gs	A ,n	m² x x1.	W/m2	eK = 0.04] =	(W/I 5.538	K)			kJ/K (26)
ELEMENT Doors Windows Type	Gros area e 1 e 2	SS	Openin	gs	A ,n 4.26	m² x x1.	W/m2 1.3 /[1/(1.6)+	0.04] = 0.04] =	5.538 5.17	K)			kJ/K (26) (27)
ELEMENT Doors Windows Type Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,r 4.26 3.44 1.56	x1 x1 x1 x1	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+	0.04] = 0.04] = 0.04] =	5.538 5.17 2.35	K)			kJ/K (26) (27) (27)
Doors Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67	x1. x1. x1.	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	0.04] = 0.04] = 0.04] = 0.04] =	5.538 5.17 2.35 1.01	K)			kJ/K (26) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4 e 5	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67	x1. x1. x1. x1. x1.	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	(W/I 5.538 5.17 2.35 1.01 1.05	K)			kJ/K (26) (27) (27) (27) (27) (27)
Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52	x1. x1. x1. x1. x1. x1.	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	0.04] = 0.04]	(W/I 5.538 5.17 2.35 1.01 1.05 1.08	K)			kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72	x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	0.04] = 0.04]	(W/I 5.538 5.17 2.35 1.01 1.05 1.08 0.78 1.08	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1 2 2 3 4 4 5 5 6 6 7 8 8	SS	Openin	gs	A ,r 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3	x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 5.538 5.17 2.35 1.01 1.05 1.08 0.78 1.08	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3)+	K	(W/I 5.538 5.17 2.35 1.01 1.05 1.08 0.78 1.08 1.95	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area 1	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3 1 8.58	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3)+ /[1/(1.3)+	K	(W/I 5.538 5.17 2.35 1.01 1.05 1.08 0.78 1.95 1.24 10.6	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 oe 1	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3 1 8.58 0.47	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.6)+	K	(W/I 5.538 5.17 2.35 1.01 1.05 1.08 0.78 1.95 1.24 10.6 0.752	K)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Type Rooflights Type	Gros area 1 1 2 2 3 4 4 5 5 6 6 7 6 8 8 9 9 6 10 9 6 1	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3 1 8.58 0.47 0.63	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.8)+	K	(W/I 5.538 5.17 2.35 1.01 1.05 1.08 0.78 1.08 1.95 1.24 10.6 0.752 1.008	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ	Gros area 1	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 1.3 1 8.58 0.47 0.63 0.84	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 5.538 5.17 2.35 1.01 1.05 1.08 0.78 1.08 1.95 1.24 10.6 0.752 1.008 1.344	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ Rooflights Typ	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 o e 1 o e 2 o e 3 o e 4	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 0.72 1.3 1 8.58 0.47 0.63 0.84 0.62	x1	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 5.538 5.17 2.35 1.01 1.05 1.08 0.78 1.95 1.24 10.6 0.752 1.008 1.344 0.992	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEMENT Doors Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Rooflights Typ Rooflights Typ	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9 e 10 e 1 e 2 e 3 e 4 e 5	SS	Openin	gs	A ,n 4.26 3.44 1.56 0.67 0.72 0.52 1.3 1 8.58 0.47 0.63 0.84	x1	W/m2 1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3)+ /[1/(1.3)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+	K	(W/I 5.538 5.17 2.35 1.01 1.05 1.08 0.78 1.08 1.95 1.24 10.6 0.752 1.008 1.344	<)			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

Rooflights Type 7		3.27	x1/	/[1/(1.6) + (0.04] =	5.232				(27b)
Rooflights Type 8		0.89	x1/	/[1/(1.6) + (0.04] =	1.424				(27b)
Rooflights Type 9		1.29	x1/	/[1/(1.6) + (0.04] =	2.064				(27b)
Rooflights Type 10		2.37	x1/	/[1/(1.6) + 0	0.04] =	3.792				(27b)
Floor Type 1		191.44	4 ×	0.55	= [105.292				(28)
Floor Type 2		10.26	X	0.55	= [5.643				(28)
Walls Type1 145.59	0	145.59	9 x	0.55	= [80.07				(29)
Walls Type2 147.31	12.75	134.56	6 X	0.55	<u> </u>	74.01	= ┌		7 -	(29)
Walls Type3 42.7	14.84	27.86	x	0.14	<u> </u>	3.9			7 =	(29)
Roof Type1 88.47	17.67	70.8	x	0.18	<u> </u>	12.74			7 =	(30)
Roof Type2 28.75	0	28.75	x	0.14	= i	4.03	Ŧ Ē		ī	(30)
Total area of elements, m ²		654.52	2							(31)
Party wall	53.98	x	0	_ = [0				(32)	
Party ceiling		84.47	<u> </u>						7 <u> </u>	(32b)
* for windows and roof windows, use effect	ive window U-va	alue calcula	ated using	formula 1/	/[(1/U-valu	e)+0.04] a	s given in	paragraph	3.2	_
** include the areas on both sides of interna	al walls and part	titions		(00) (00)	. (00)			r		_
Fabric heat loss, W/K = S (A x U)				(26)(30)		(00)		(22.)	350.04	(33)
Heat capacity Cm = S(A x k)	O TEA) !:	1. 1/ 217				.(30) + (32		(32e) = [35022.54	(34)
Thermal mass parameter (TMP =)	,			acisaly tha		tive Value:		hle 1f	250	(35)
For design assessments where the details can be used instead of a detailed calculation		on are not	Kriowri pr	ecisely trie	muicative	values of	IIVIP III Ta	ible II		
Thermal bridges : S (L x Y) calcula	ited using Ap	pendix k	<						98.18	(36)
if details of thermal bridging are not known	$(36) = 0.05 \times (3$	1)								_
Total fabric heat loss						(36) =			448.22	(37)
Ventilation heat loss calculated mo	<u> </u>		(38)m = 0.33 × (25)m x (5)							
	Apr May 1.57 159.99	Jun 152.61	Jul 152.61	Aug 151.24	Sep 155.45	Oct 159.99	Nov 163.19	Dec 166.55		(38)
` '	1.57	132.01	132.01	131.24		l l		100.55		(30)
Heat transfer coefficient, W/K (39)m= 621.91 620.07 618.27 609	9.79 608.21	600.02	600.83	599.46	(39)m 603.67	= (37) + (3	611.42	614.77	1	
(39)m= 621.91 620.07 618.27 609	9.79 608.21	600.83	000.03	599.40		Average =			609.79	(39)
Heat loss parameter (HLP), W/m²k	<					= (39)m ÷	` '	12712	000.70	
(40)m= 2.61 2.6 2.59 2.	.56 2.55	2.52	2.52	2.51	2.53	2.55	2.56	2.58		
New town of the circumstate (Table 4	- \				,	Average =	Sum(40) _{1.}	12 /12=	2.56	(40)
Number of days in month (Table 1	′	lum l	11	Aug		-		·	2.56	(40)
Jan Feb Mar A	Apr May	Jun 30	Jul 31	Aug	Sep	Oct	Nov	Dec	2.56	
Jan Feb Mar A	′	Jun 30	Jul 31	Aug 31		-		·	2.56	(41)
Jan Feb Mar A	Apr May 30 31				Sep	Oct	Nov	Dec 31		
Jan Feb Mar A	Apr May 30 31				Sep	Oct	Nov	Dec		
Jan Feb Mar A (41)m= 31 28 31 3 4. Water heating energy requirem Assumed occupancy, N	Apr May 30 31	30	31	31	Sep 30	Oct 31	Nov 30	Dec 31		
Jan Feb Mar A (41)m= 31 28 31 3 4. Water heating energy requirem	Apr May 30 31	30	31	31	Sep 30	Oct 31	Nov 30	Dec 31 kWh/ye		(41)
Jan Feb Mar A (41)m= 31 28 31 3 4. Water heating energy requirem Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - if TFA £ 13.9, N = 1 Annual average hot water usage in	Apr May 30 31 nent: - exp(-0.0003	30 349 x (TF ay Vd,ave	31 FA -13.9 erage =	31)2)] + 0.0 (25 x N)	Sep 30 0013 x (⁻ + 36	Oct 31	Nov 30 3. 9)	Dec 31 kWh/ye		(41)
Jan Feb Mar A (41)m= 31 28 31 3 4. Water heating energy requirem Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - if TFA £ 13.9, N = 1 Annual average hot water usage in Reduce the annual average hot water usage	Apr May 30 31 nent: - exp(-0.0003 n litres per dage by 5% if the day	30 349 x (TF ay Vd,ave welling is d	31 FA -13.9 erage = designed t	31)2)] + 0.0 (25 x N)	Sep 30 0013 x (⁻ + 36	Oct 31	Nov 30 3. 9)	Dec 31 kWh/ye		(41)
Jan Feb Mar A (41)m= 31 28 31 3 4. Water heating energy requirem Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - if TFA £ 13.9, N = 1 Annual average hot water usage in Reduce the annual average hot water usage not more that 125 litres per person per day	Apr May 30 31 nent: exp(-0.0003 n litres per day by 5% if the day (all water use, if	30 349 x (TF ay Vd,ave welling is onet and col	31 FA -13.9 erage = designed to to to to to to to to to to to to to	31 (25 x N) o achieve a	Sep 30 0013 x (⁻ + 36 a water us	Oct 31 TFA -13.5 se target of	Nov 30 3. 9)	Dec 31 kWh/ye		(41)
Jan Feb Mar A (41)m= 31 28 31 3 4. Water heating energy requirem Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - if TFA £ 13.9, N = 1 Annual average hot water usage in Reduce the annual average hot water usage not more that 125 litres per person per day	Apr May 30 31 nent: - exp(-0.0003 n litres per da ye by 5% if the d (all water use, t) Apr May	30 349 x (TF ay Vd,ave lwelling is a not and col	31 FA -13.9 erage = designed to	31 (25 x N) o achieve a	Sep 30 0013 x (⁻ + 36	Oct 31	Nov 30 3. 9)	Dec 31 kWh/ye		(41)
Jan Feb Mar A (41)m= 31 28 31 3 4. Water heating energy requirem Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - if TFA £ 13.9, N = 1 Annual average hot water usage in Reduce the annual average hot water usage not more that 125 litres per person per day Jan Feb Mar A	Apr May 30 31 nent: exp(-0.0003 n litres per dage by 5% if the dage litres per dage by 5% if the dage litres per dage by 5% if the dage litres per dage lit	30 349 x (TF ay Vd,ave lwelling is a not and col	31 FA -13.9 erage = designed to do Jul Fable 1c x	31 (25 x N) o achieve a	Sep 30 0013 x (⁻ + 36 a water us	Oct 31 TFA -13.5 se target of	Nov 30 3. 9)	Dec 31 kWh/ye	ear:	(41)

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) 174.04 152.21 157.07 136.94 131.4 113.38 105.07 120.57 122.01 142.19 155.21 168.55 (45)m =Total = $Sum(45)_{1...12}$ = 1678.62 (45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 22.83 23.56 20.54 (46)26.11 19.71 17.01 15.76 21.33 23.28 25.28 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): (48)Temperature factor from Table 2b 0 (49)Energy lost from water storage, kWh/year $(48) \times (49) =$ (50)0 b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)If community heating see section 4.3 Volume factor from Table 2a 0 (52)Temperature factor from Table 2b 0 (53)Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ (54)0 Enter (50) or (54) in (55) (55)0 Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m =0 0 (56)If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H (57)(57)m =(58)Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) \div 365 \times (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (59)(59)m =O Combi loss calculated for each month (61)m = (60) \div 365 × (41)m 50.96 46.03 50.96 50.96 47.35 48.93 50.96 49.32 50.96 49.32 50.96 (61)(61)m=Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m 198.24 208.03 186.25 171.53 171.32 (62)225 182.35 160.74 154 193.15 204.52 219.5 (62)m=Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)(63)m=0 0 0 0 0 0 0 0 Output from water heater (64)m =198.24 208.03 182.35 186.25 160.74 154 171.53 171.32 193.15 204.52 219.5 2274.63 (64)Output from water heater (annual)_{1...12} Heat gains from water heating, kWh/month 0.25 \(^{1}\) [0.85 \times (45)m + (61)m] + 0.8 \(^{1}\) [(46)m + (57)m + (59)m] 47.17 (65)(65)m =70.61 62.12 64.97 57.86 56.43 49.54 52.83 52.9 60.02 include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Aug Jan Feb Mar Apr May Jun Jul Sep Oct Nov Dec

ı													1	
(66)m=	152.61	152.61	152.61	152.61	152.61	152.61	152.61	152.61	152.61	152.61	152.61	152.61		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5					
(67)m=	36.49	32.41	26.36	19.96	14.92	12.59	13.61	17.69	23.74	30.14	35.18	37.51		(67)
Appliar	nces gai	ns (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Tal	ole 5				
(68)m=	406.41	410.63	400	377.38	348.82	321.98	304.05	299.83	310.46	333.08	361.64	388.48		(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	38.26	38.26	38.26	38.26	38.26	38.26	38.26	38.26	38.26	38.26	38.26	38.26		(69)
Pumps	and far	ns gains	(Table 5	āa)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)							•	
(71)m=	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09	-122.09		(71)
Water	heating	gains (T	able 5)		-					-			•	
(72)m=	94.9	92.44	87.32	80.36	75.85	68.8	63.4	71.01	73.47	80.67	88.8	92.45		(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	- (69)m + (70)m + (7	1)m + (72)	m	-	
(73)m=	609.59	607.26	585.47	549.48	511.36	475.16	452.83	460.3	479.45	515.67	557.4	590.22		(73)
0.0.1														

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

Orientation: A T	ccess Facto able 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x}	0.77	x	0.72	x	11.28	x	0.63	x	0.7	=	2.48	(75)
Northeast _{0.9x}	0.77	x	1	X	11.28	X	0.5	X	0.7	=	5.47	(75)
Northeast _{0.9x}	0.77	x	8.58	x	11.28	x	0.5	x	0.7	=	23.48	(75)
Northeast _{0.9x}	0.77	x	0.72	x	22.97	x	0.63	x	0.7	=	5.05	(75)
Northeast _{0.9x}	0.77	x	1	X	22.97	X	0.5	X	0.7	=	11.14	(75)
Northeast _{0.9x}	0.77	x	8.58	X	22.97	X	0.5	X	0.7	=	47.8	(75)
Northeast _{0.9x}	0.77	x	0.72	X	41.38	X	0.63	x	0.7	=	9.11	(75)
Northeast _{0.9x}	0.77	x	1	X	41.38	X	0.5	X	0.7	=	20.07	(75)
Northeast _{0.9x}	0.77	x	8.58	X	41.38	X	0.5	X	0.7	=	86.11	(75)
Northeast _{0.9x}	0.77	x	0.72	X	67.96	X	0.63	X	0.7	=	14.95	(75)
Northeast _{0.9x}	0.77	x	1	X	67.96	X	0.5	X	0.7	=	32.97	(75)
Northeast _{0.9x}	0.77	x	8.58	X	67.96	X	0.5	X	0.7	=	141.42	(75)
Northeast _{0.9x}	0.77	x	0.72	X	91.35	X	0.63	X	0.7	=	20.1	(75)
Northeast _{0.9x}	0.77	x	1	X	91.35	X	0.5	X	0.7	=	44.31	(75)
Northeast _{0.9x}	0.77	x	8.58	X	91.35	X	0.5	X	0.7	=	190.1	(75)
Northeast _{0.9x}	0.77	x	0.72	X	97.38	X	0.63	x	0.7	=	21.43	(75)
Northeast _{0.9x}	0.77	x	1	x	97.38	X	0.5	x	0.7	=	47.24	(75)
Northeast _{0.9x}	0.77	x	8.58	x	97.38	x	0.5	x	0.7	=	202.66	(75)
Northeast _{0.9x}	0.77	x	0.72	X	91.1	X	0.63	X	0.7	=	20.05	(75)
Northeast _{0.9x}	0.77	x	1	x	91.1	X	0.5	x	0.7	=	44.19	(75)
Northeast _{0.9x}	0.77	X	8.58	X	91.1	X	0.5	X	0.7	=	189.59	(75)

Northeast _{0.9x}	0.77	٦ ,,	0.70	1 .,	70.00	1 .,	0.00	l	0.7	1 _	45.00	7(75)
Northeast 0.9x	0.77	X	0.72	X	72.63] X	0.63	X	0.7] = 1	15.98	(75)
Northeast 0.9x	0.77	X	1	X	72.63] X]	0.5	X	0.7] = 1	35.23	(75)
<u> </u>	0.77	X	8.58	X	72.63] X]	0.5	X	0.7] = 1	151.14	(75)
Northeast 0.9x	0.77	X	0.72	X	50.42] X]	0.63	X	0.7] =	11.09	(75)
Northeast _{0.9x}	0.77	X	1	X	50.42	X	0.5	X	0.7] =	24.46	(75)
Northeast _{0.9x}	0.77	X	8.58	X	50.42	X	0.5	X	0.7] =	104.93	(75)
Northeast 0.9x	0.77	X	0.72	X	28.07	X	0.63	X	0.7] =	6.18	(75)
Northeast _{0.9x}	0.77	X	1	X	28.07	X	0.5	X	0.7] =	13.62	(75)
Northeast _{0.9x}	0.77	X	8.58	X	28.07	X	0.5	X	0.7] =	58.41	(75)
Northeast _{0.9x}	0.77	X	0.72	X	14.2	X	0.63	X	0.7] =	3.12	(75)
Northeast _{0.9x}	0.77	X	1	X	14.2	X	0.5	X	0.7	=	6.89	(75)
Northeast _{0.9x}	0.77	X	8.58	X	14.2	X	0.5	X	0.7	=	29.54	(75)
Northeast _{0.9x}	0.77	X	0.72	X	9.21	X	0.63	X	0.7	=	2.03	(75)
Northeast _{0.9x}	0.77	X	1	x	9.21	X	0.5	X	0.7	=	4.47	(75)
Northeast _{0.9x}	0.77	X	8.58	X	9.21	X	0.5	X	0.7	=	19.18	(75)
Southeast _{0.9x}	0.77	X	0.7	x	36.79	X	0.63	X	0.7	=	7.87	(77)
Southeast _{0.9x}	0.77	X	0.52	x	36.79	X	0.63	X	0.7	=	11.69	(77)
Southeast _{0.9x}	0.77	X	1.3	x	36.79	X	0.63	x	0.7	=	43.85	(77)
Southeast _{0.9x}	0.77	X	0.7	x	62.67	x	0.63	x	0.7] =	13.41	(77)
Southeast _{0.9x}	0.77	X	0.52	x	62.67	X	0.63	X	0.7	=	19.92	(77)
Southeast _{0.9x}	0.77	X	1.3	x	62.67	X	0.63	X	0.7	=	74.7	(77)
Southeast 0.9x	0.77	х	0.7	x	85.75	x	0.63	x	0.7	=	18.34	(77)
Southeast 0.9x	0.77	х	0.52	x	85.75	х	0.63	x	0.7	=	27.26	(77)
Southeast _{0.9x}	0.77	X	1.3	x	85.75	x	0.63	x	0.7	=	102.21	(77)
Southeast 0.9x	0.77	X	0.7	x	106.25	x	0.63	x	0.7] =	22.73	(77)
Southeast 0.9x	0.77	x	0.52	×	106.25	x	0.63	x	0.7] =	33.77	(77)
Southeast 0.9x	0.77	X	1.3	x	106.25	x	0.63	x	0.7	j =	126.64	(77)
Southeast 0.9x	0.77	X	0.7	x	119.01	x	0.63	x	0.7	j =	25.46	(77)
Southeast 0.9x	0.77	X	0.52	x	119.01	x	0.63	x	0.7	j =	37.83	(77)
Southeast 0.9x	0.77	X	1.3	x	119.01	x	0.63	x	0.7	j =	141.85	(77)
Southeast 0.9x	0.77	X	0.7	x	118.15	х	0.63	х	0.7	j =	25.28	(77)
Southeast 0.9x	0.77	X	0.52	x	118.15	х	0.63	х	0.7] =	37.55	(77)
Southeast 0.9x	0.77	X	1.3	x	118.15	x	0.63	х	0.7	j =	140.82	(77)
Southeast 0.9x	0.77	X	0.7	x	113.91	x	0.63	х	0.7] =	24.37	(77)
Southeast 0.9x	0.77	X	0.52	x	113.91	x	0.63	х	0.7] =	36.2	(77)
Southeast _{0.9x}	0.77	X	1.3	×	113.91	x	0.63	x	0.7] =	135.77	(77)
Southeast _{0.9x}	0.77	X	0.7	x	104.39	x	0.63	x	0.7] =	22.33	(77)
Southeast _{0.9x}	0.77	X	0.52	×	104.39	x	0.63	X	0.7] =	33.18	(77)
Southeast _{0.9x}	0.77	X	1.3	X	104.39	X	0.63	X	0.7] =	124.42	(77)
Southeast _{0.9x}	0.77	X	0.7	x	92.85	X	0.63	X	0.7] =	19.86	(77)
Southeast _{0.9x}	0.77	X	0.52	X	92.85) x	0.63	X	0.7] =	29.51	(77)
<u>L</u>		_		1		1		1	<u> </u>	ı		_ ' '

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Southeast 0.9x	0.77	X	1.3	X	92.85	X	0.63	X	0.7	=	110.67	(77)
Southeast 0.9x	0.77	X	0.7	X	69.27	X	0.63	X	0.7	=	14.82	(77)
Southeast _{0.9x}	0.77	X	0.52	X	69.27	X	0.63	X	0.7	=	22.02	(77)
Southeast _{0.9x}	0.77	X	1.3	X	69.27	X	0.63	X	0.7	=	82.56	(77)
Southeast _{0.9x}	0.77	X	0.7	X	44.07	X	0.63	X	0.7	=	9.43	(77)
Southeast _{0.9x}	0.77	X	0.52	X	44.07	X	0.63	X	0.7	=	14.01	(77)
Southeast 0.9x	0.77	X	1.3	X	44.07	X	0.63	X	0.7	=	52.53	(77)
Southeast _{0.9x}	0.77	X	0.7	X	31.49	X	0.63	X	0.7	=	6.74	(77)
Southeast _{0.9x}	0.77	X	0.52	X	31.49	X	0.63	X	0.7	=	10.01	(77)
Southeast 0.9x	0.77	X	1.3	x	31.49	X	0.63	X	0.7	=	37.53	(77)
Southwest _{0.9x}	0.77	X	3.44	x	36.79]	0.63	X	0.7	=	38.68	(79)
Southwest _{0.9x}	0.77	X	1.56	x	36.79]	0.63	X	0.7	=	17.54	(79)
Southwest _{0.9x}	0.77	X	0.67	x	36.79]	0.63	x	0.7	=	7.53	(79)
Southwest _{0.9x}	0.77	X	0.72	x	36.79]	0.63	x	0.7	=	8.1	(79)
Southwest _{0.9x}	0.77	X	3.44	x	62.67]	0.63	x	0.7	=	65.89	(79)
Southwest _{0.9x}	0.77	X	1.56	x	62.67]	0.63	X	0.7	=	29.88	(79)
Southwest _{0.9x}	0.77	X	0.67	x	62.67]	0.63	X	0.7	=	12.83	(79)
Southwest _{0.9x}	0.77	X	0.72	x	62.67]	0.63	x	0.7	=	13.79	(79)
Southwest _{0.9x}	0.77	X	3.44	x	85.75	Ī	0.63	x	0.7] =	90.15	(79)
Southwest _{0.9x}	0.77	X	1.56	x	85.75	Ī	0.63	x	0.7] =	40.88	(79)
Southwest _{0.9x}	0.77	X	0.67	x	85.75		0.63	x	0.7	=	17.56	(79)
Southwest _{0.9x}	0.77	X	0.72	x	85.75	ĺ	0.63	x	0.7	j =	18.87	(79)
Southwest _{0.9x}	0.77	X	3.44	x	106.25	Ī	0.63	x	0.7] =	111.7	(79)
Southwest _{0.9x}	0.77	X	1.56	x	106.25	ĺ	0.63	x	0.7	j =	50.66	(79)
Southwest _{0.9x}	0.77	X	0.67	x	106.25	ĺ	0.63	x	0.7	j =	21.76	(79)
Southwest _{0.9x}	0.77	x	0.72	x	106.25	ĺ	0.63	x	0.7	j =	23.38	(79)
Southwest _{0.9x}	0.77	X	3.44	x	119.01	ĺ	0.63	x	0.7	j =	125.12	(79)
Southwest _{0.9x}	0.77	X	1.56	x	119.01	Ī	0.63	x	0.7] =	56.74	(79)
Southwest _{0.9x}	0.77	X	0.67	x	119.01	Ī	0.63	x	0.7] =	24.37	(79)
Southwest _{0.9x}	0.77	X	0.72	x	119.01]	0.63	x	0.7	=	26.19	(79)
Southwest _{0.9x}	0.77	x	3.44	x	118.15]	0.63	x	0.7] =	124.21	(79)
Southwest _{0.9x}	0.77	X	1.56	x	118.15	ĺ	0.63	X	0.7	j =	56.33	(79)
Southwest _{0.9x}	0.77	X	0.67	x	118.15	ĺ	0.63	x	0.7	j =	24.19	(79)
Southwest _{0.9x}	0.77	X	0.72	x	118.15	ĺ	0.63	x	0.7	j =	26	(79)
Southwest _{0.9x}	0.77	X	3.44	x	113.91	ĺ	0.63	x	0.7	j =	119.75	(79)
Southwest _{0.9x}	0.77	X	1.56	x	113.91	Ī	0.63	x	0.7	j =	54.31	(79)
Southwest _{0.9x}	0.77	X	0.67	x	113.91	Ī	0.63	x	0.7	j =	23.32	(79)
Southwest _{0.9x}	0.77	X	0.72	x	113.91	ĺ	0.63	x	0.7	j =	25.06	(79)
Southwest _{0.9x}	0.77	X	3.44	x	104.39	j	0.63	x	0.7	j =	109.75	(79)
Southwest _{0.9x}	0.77	X	1.56	x	104.39	ĺ	0.63	x	0.7	j =	49.77	(79)
Southwest _{0.9x}	0.77	X	0.67	x	104.39	ĺ	0.63	x	0.7	j =	21.38	(79)
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Southwest _{0.9x}	0.77	X	0.72	X	104.39	<u> </u>	0.63	Х	0.7] =	22.97	(79)
Southwest _{0.9x}	0.77	X	3.44	X	92.85	ļ	0.63	X	0.7] =	97.62	(79)
Southwest _{0.9x}	0.77	X	1.56	X	92.85		0.63	X	0.7	=	44.27	(79)
Southwest _{0.9x}	0.77	X	0.67	X	92.85	ļ	0.63	X	0.7	=	19.01	(79)
Southwest _{0.9x}	0.77	X	0.72	X	92.85	[0.63	Х	0.7	=	20.43	(79)
Southwest _{0.9x}	0.77	X	3.44	X	69.27	<u> </u>	0.63	X	0.7	=	72.82	(79)
Southwest _{0.9x}	0.77	X	1.56	X	69.27	<u> </u>	0.63	X	0.7	=	33.02	(79)
Southwest _{0.9x}	0.77	X	0.67	X	69.27]	0.63	X	0.7	=	14.18	(79)
Southwest _{0.9x}	0.77	X	0.72	X	69.27		0.63	X	0.7	=	15.24	(79)
Southwest _{0.9x}	0.77	X	3.44	X	44.07]	0.63	X	0.7	=	46.33	(79)
Southwest _{0.9x}	0.77	X	1.56	X	44.07		0.63	X	0.7	=	21.01	(79)
Southwest _{0.9x}	0.77	X	0.67	X	44.07]	0.63	X	0.7	=	9.02	(79)
Southwest _{0.9x}	0.77	X	0.72	X	44.07		0.63	X	0.7	=	9.7	(79)
Southwest _{0.9x}	0.77	X	3.44	X	31.49]	0.63	X	0.7	=	33.1	(79)
Southwest _{0.9x}	0.77	X	1.56	X	31.49]	0.63	X	0.7	=	15.01	(79)
Southwest _{0.9x}	0.77	X	0.67	x	31.49]	0.63	X	0.7	=	6.45	(79)
Southwest _{0.9x}	0.77	X	0.72	X	31.49]	0.63	X	0.7	=	6.93	(79)
Rooflights _{0.9x}	1	X	0.47	X	26	x	0.63	x	0.8	=	11.09	(82)
Rooflights _{0.9x}	1	X	0.63	x	26	x	0.63	x	0.8] =	14.86	(82)
Rooflights _{0.9x}	1	X	0.84	x	26	x	0.63	x	0.8] =	29.72	(82)
Rooflights _{0.9x}	1	X	0.62	x	26	x	0.63	x	0.8	=	7.31	(82)
Rooflights 0.9x	1	X	2.36	x	26	x	0.63	х	0.8	=	27.83	(82)
Rooflights 0.9x	1	X	2.15	x	26	x	0.63	х	0.8] =	25.36	(82)
Rooflights _{0.9x}	1	X	3.27	x	26	x	0.63	х	0.8] =	38.57	(82)
Rooflights 0.9x	1	x	0.89	x	26	x	0.63	х	0.8] =	10.5	(82)
Rooflights 0.9x	1	x	1.29	x	26	x	0.63	х	0.8] =	15.21	(82)
Rooflights _{0.9x}	1	X	2.37	x	26	x	0.63	х	0.8] =	27.95	(82)
Rooflights _{0.9x}	1	X	0.47	X	54	x	0.63	х	0.8	=	23.02	(82)
Rooflights 0.9x	1	x	0.63	x	54	x	0.63	х	0.8] =	30.86	(82)
Rooflights 0.9x	1	X	0.84	x	54	x	0.63	х	0.8] =	61.73	(82)
Rooflights 0.9x	1	x	0.62	x	54	x	0.63	х	0.8] =	15.19	(82)
Rooflights 0.9x	1	X	2.36	x	54	x	0.63	х	0.8] =	57.81	(82)
Rooflights 0.9x	1	X	2.15	x	54	х	0.63	х	0.8] =	52.66	(82)
Rooflights 0.9x	1	x	3.27	x	54	x	0.63	х	0.8] =	80.1	(82)
Rooflights 0.9x	1	X	0.89	x	54	x	0.63	х	0.8] =	21.8	(82)
Rooflights 0.9x	1	x	1.29	x	54	x	0.63	x	0.8	j =	31.6	(82)
Rooflights _{0.9x}	1	x	2.37	x	54	x	0.63	x	0.8] =	58.05	(82)
Rooflights 0.9x	1	X	0.47	x	96	x	0.63	x	0.8	j =	40.93	(82)
Rooflights 0.9x	1	x	0.63	x	96	x	0.63	x	0.8	j =	54.87	(82)
Rooflights 0.9x	1	x	0.84	x	96	x	0.63	x	0.8	j =	109.73	(82)
Rooflights 0.9x	1	X	0.62	x	96	x	0.63	х	0.8	j =	27	(82)
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Rooflights 0.9x		٦ ,	0.00	1	00	1	0.00	l "	0.0	1 =	400.77	7(02)
Rooflights 0.9x	1] X]	2.36	X 1	96	X 1	0.63	X	0.8]	102.77	(82)
Rooflights 0.9x	1] X]	2.15	X	96	X	0.63	X	0.8] = 1 _	93.62	(82)
Rooflights 0.9x	1	X	3.27	X	96	X	0.63	X	0.8] = 1	142.39	(82)
	1	X	0.89	X	96	X	0.63	X	0.8] = 1	38.76	(82)
Rooflights 0.9x	1	X	1.29	X	96	X	0.63	X	0.8] = 1	56.17	(82)
Rooflights 0.9x	1	X	2.37	X	96] X	0.63	X	0.8] = 1	103.2	(82)
Rooflights 0.9x	1	X	0.47	X	150] X]	0.63	X	0.8] = 1	63.96	(82)
Rooflights 0.9x	1	X	0.63	X	150	X	0.63	X	0.8] = 1	85.73	(82)
Rooflights 0.9x	1	X	0.84	X	150	X	0.63	X	0.8] =	171.46	(82)
Rooflights 0.9x	1	X	0.62	X	150	X	0.63	X	0.8] =	42.18	(82)
Rooflights 0.9x	1	X	2.36	X	150	X	0.63	X	0.8] =	160.57	(82)
Rooflights _{0.9x}	1	X	2.15	X	150	X	0.63	X	0.8] =	146.29	(82)
Rooflights _{0.9x}	1	X	3.27	X	150	X	0.63	X	0.8	=	222.49	(82)
Rooflights _{0.9x}	1	X	0.89	X	150	X	0.63	X	0.8	_ =	60.56	(82)
Rooflights _{0.9x}	1	X	1.29	X	150	X	0.63	X	0.8	=	87.77	(82)
Rooflights _{0.9x}	1	X	2.37	X	150	X	0.63	X	0.8	=	161.25	(82)
Rooflights _{0.9x}	1	X	0.47	X	192	X	0.63	X	0.8] =	81.87	(82)
Rooflights 0.9x	1	X	0.63	X	192	X	0.63	X	0.8	=	109.73	(82)
Rooflights 0.9x	1	X	0.84	X	192	X	0.63	X	0.8	=	219.47	(82)
Rooflights _{0.9x}	1	X	0.62	X	192	X	0.63	X	0.8	=	54	(82)
Rooflights _{0.9x}	1	X	2.36	X	192	X	0.63	X	0.8	=	205.54	(82)
Rooflights _{0.9x}	1	x	2.15	x	192	x	0.63	x	0.8] =	187.25	(82)
Rooflights 0.9x	1	X	3.27	X	192	X	0.63	x	0.8] =	284.79	(82)
Rooflights _{0.9x}	1	X	0.89	x	192	x	0.63	X	0.8	=	77.51	(82)
Rooflights _{0.9x}	1	X	1.29	x	192	x	0.63	X	0.8] =	112.35	(82)
Rooflights _{0.9x}	1	X	2.37	X	192	x	0.63	X	0.8	=	206.41	(82)
Rooflights _{0.9x}	1	X	0.47	x	200	x	0.63	x	0.8	=	85.28	(82)
Rooflights _{0.9x}	1	x	0.63	x	200	x	0.63	x	0.8	=	114.31	(82)
Rooflights _{0.9x}	1	х	0.84	x	200	x	0.63	x	0.8	=	228.61	(82)
Rooflights 0.9x	1	X	0.62	x	200	x	0.63	x	0.8	=	56.25	(82)
Rooflights _{0.9x}	1	X	2.36	x	200	x	0.63	x	0.8] =	214.1	(82)
Rooflights _{0.9x}	1	X	2.15	x	200	x	0.63	x	0.8] =	195.05	(82)
Rooflights 0.9x	1	X	3.27	x	200	x	0.63	x	0.8] =	296.65	(82)
Rooflights 0.9x	1	x	0.89	x	200	х	0.63	х	0.8	j =	80.74	(82)
Rooflights 0.9x	1	x	1.29	x	200	х	0.63	х	0.8	j =	117.03	(82)
Rooflights _{0.9x}	1	j x	2.37	x	200	x	0.63	x	0.8	j =	215.01	(82)
Rooflights _{0.9x}	1	X	0.47	x	189	x	0.63	x	0.8] =	80.59	(82)
Rooflights _{0.9x}	1	i x	0.63	X	189	X	0.63	x	0.8] =	108.02	(82)
Rooflights _{0.9x}	1	i x	0.84	X	189	X	0.63	x	0.8] =	216.04	(82)
Rooflights _{0.9x}	1	i x	0.62	x	189	x	0.63	x	0.8	j =	53.15	(82)
Rooflights _{0.9x}	1] x	2.36	X	189	X	0.63	X	0.8] =	202.32	(82)
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Rooflights 0.9x	1	7 x	2.15	1 x	189	1 x	0.63	x	0.8	1 =	184.32	(82)
Rooflights 0.9x	1	」 ^ 기 x] ^] x] ^] x		X]		(82)
Rooflights 0.9x		」^ ⅂ ӿ	3.27	J 1	189] ^] x	0.63	X	0.8]	280.34	(82)
Rooflights 0.9x	1	」^] x	0.89] X] v]]	0.63		0.8]	76.3	(82)
Rooflights 0.9x	1	╡	1.29] X] v	189] X] ,	0.63	X	0.8]	110.59	=
Rooflights 0.9x	1	」 × ¬ ,	2.37] X] v	189] X] ,	0.63	X	0.8]	203.18	(82)
Rooflights 0.9x	1	」 × ¬ ↓	0.47] X] v	157] X] v	0.63	X	0.8]	66.94	(82)
Rooflights 0.9x	1	」× ¬ 、	0.63	X] v	157] X] v	0.63	X	0.8]	89.73	=
Rooflights 0.9x	1	」 × ¬ ,	0.84	X	157	X	0.63	X	0.8]	179.46	(82)
Rooflights 0.9x	1	」 × ¬ ,	0.62] X] ,	157] X] ,	0.63	X	0.8	1	44.15	(82)
Rooflights 0.9x	1] х П	2.36] X]	157] X]	0.63	X	0.8] = 1 _	168.07	(82)
Rooflights 0.9x	1	X 	2.15] X]	157] X]	0.63	X	0.8] = 1 _	153.11	(82)
	1	X	3.27] X]	157	X	0.63	X	0.8] =	232.87	(82)
Rooflights 0.9x	1	X	0.89	X	157	X	0.63	X	0.8] = 1	63.38	(82)
Rooflights 0.9x	1	X	1.29	X	157	X	0.63	X	0.8] =	91.87	(82)
Rooflights 0.9x	1	X	2.37	X	157	X	0.63	X	0.8] =	168.78	(82)
Rooflights 0.9x	1	X	0.47	X	115	X	0.63	X	0.8] =	49.03	(82)
Rooflights 0.9x	1	X	0.63	X	115	X	0.63	X	0.8] =	65.73	(82)
Rooflights 0.9x	1	X	0.84	X	115	X	0.63	X	0.8] =	131.45	(82)
Rooflights _{0.9x}	1	X	0.62	X	115	X	0.63	X	0.8] =	32.34	(82)
Rooflights _{0.9x}	1	X	2.36	X	115	X	0.63	X	0.8	=	123.11	(82)
Rooflights _{0.9x}	1	X	2.15	X	115	X	0.63	X	0.8	=	112.15	(82)
Rooflights _{0.9x}	1	X	3.27	X	115	X	0.63	X	0.8	=	170.58	(82)
Rooflights _{0.9x}	1	X	0.89	X	115	X	0.63	X	0.8	=	46.43	(82)
Rooflights _{0.9x}	1	X	1.29	X	115	X	0.63	X	0.8	=	67.29	(82)
Rooflights _{0.9x}	1	X	2.37	X	115	X	0.63	X	0.8	=	123.63	(82)
Rooflights _{0.9x}	1	X	0.47	X	66	X	0.63	X	0.8	=	28.14	(82)
Rooflights _{0.9x}	1	X	0.63	X	66	X	0.63	x	0.8	=	37.72	(82)
Rooflights _{0.9x}	1	X	0.84	X	66	X	0.63	X	0.8	=	75.44	(82)
Rooflights _{0.9x}	1	X	0.62	X	66	X	0.63	X	0.8	=	18.56	(82)
Rooflights 0.9x	1	X	2.36	X	66	X	0.63	X	0.8	=	70.65	(82)
Rooflights _{0.9x}	1	X	2.15	X	66	x	0.63	x	0.8	=	64.37	(82)
Rooflights _{0.9x}	1	X	3.27	x	66	x	0.63	X	0.8	=	97.9	(82)
Rooflights 0.9x	1	X	0.89	x	66	x	0.63	x	0.8] =	26.64	(82)
Rooflights _{0.9x}	1	X	1.29	x	66	x	0.63	X	0.8	=	38.62	(82)
Rooflights 0.9x	1	X	2.37	x	66	x	0.63	x	0.8	=	70.95	(82)
Rooflights 0.9x	1	x	0.47	x	33	x	0.63	х	0.8	j =	14.07	(82)
Rooflights 0.9x	1	X	0.63	x	33	x	0.63	x	0.8] =	18.86	(82)
Rooflights 0.9x	1	×	0.84	x	33	x	0.63	x	0.8] =	37.72	(82)
Rooflights 0.9x	1	X	0.62	×	33	x	0.63	x	0.8] =	9.28	(82)
Rooflights 0.9x	1	X	2.36	x	33	x	0.63	x	0.8] =	35.33	(82)
Rooflights _{0.9x}	1	X	2.15	X	33	x	0.63	x	0.8] =	32.18	(82)
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Roofligh	nts _{0.9x}	1	Х	3.2	27	x	33	x [0.63	x	0.8	=	48.95	(82)
Roofligh	nts _{0.9x}	1	х	0.0	39	x	33	x [0.63	x	0.8	=	13.32	(82)
Roofligh	nts _{0.9x}	1	X	1.2	29	x	33	x	0.63	x	0.8	=	19.31	(82)
Roofligh	nts _{0.9x}	1	X	2.3	37	x	33	x	0.63	x	0.8	=	35.48	(82)
Roofligh	nts _{0.9x}	1	х	0.4	1 7	x	21	x	0.63	x	0.8	=	8.95	(82)
Roofligh	nts _{0.9x}	1	X	0.6	63	x	21	x	0.63	x	0.8	=	12	(82)
Roofligh	nts _{0.9x}	1	х	0.8	34	x	21	x [0.63	x	0.8	=	24	(82)
Roofligh	nts _{0.9x}	1	X	0.6	62	x	21	x	0.63	x	0.8	=	5.91	(82)
Roofligh	nts _{0.9x}	1	Х	2.3	36	x	21	x	0.63	x	0.8	=	22.48	(82)
Roofligh	nts _{0.9x}	1	X	2.1	15	x	21	x	0.63	x	0.8	=	20.48	(82)
Roofligh	nts _{0.9x}	1	х	3.2	27	x	21	x	0.63	x	0.8		31.15	(82)
Roofligh	nts _{0.9x}	1	х	0.8	39	x	21	x	0.63	x	0.8	=	8.48	(82)
Roofligh	nts _{0.9x}	1	X	1.2	29	x	21	x	0.63	x	0.8	=	12.29	(82)
Roofligh	nts _{0.9x}	1	X	2.3	37	x	21	x	0.63	x	0.8	=	22.58	(82)
Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m =	Sum(74)m .	(82)m				
(83)m=	375.1	727.23	1200.01			2308.		1844.5	2 1403.59	861.86	466.08	309.76		(83)
Total g	ains – ir			<u> </u>	· · ·	+ (83)	m , watts	1					1	
(84)m=	984.69	1334.49	1785.48	2331.72	2742.32	2783	.9 2640.31	2304.8	3 1883.04	1377.5	4 1023.49	899.97		(84)
7. Me	an interi	nal temp	erature	(heating	season)								
Temp	erature	during h	eating p	eriods i	n the livi	ng are	a from Tab	ole 9 T	Th1 (°C)				21	(85)
						•		J.O O, .	()				l -:	(/
Utilisa	ition fac	tor for g	ains for	living are	ea, h1,m	•	Table 9a)	, ,	(0)					(\)
Utilisa	ition fac Jan	tor for ga	ains for Mar	living are	ea, h1,m May	•	Table 9a)	Aug	·	Oct	Nov	Dec		
Utilisa (86)m=		Ť		<u> </u>		(see	Table 9a)		·	Oct	Nov 1	Dec 1		(86)
(86)m=	Jan 1	Feb 1	Mar 0.99	Apr 0.97	May 0.93	(see Jur 0.84	Table 9a) n Jul 0.74	Aug 0.8	Sep 0.94		+]	
(86)m=	Jan 1	Feb 1	Mar 0.99	Apr 0.97	May 0.93	(see Jur 0.84	Table 9a) 1 Jul 1 0.74 1 steps 3 to 7	Aug 0.8	Sep 0.94 ble 9c)		+]	
(86)m= Mean (87)m=	Jan 1 internal 18.08	Feb 1 I temper 18.31	Mar 0.99 ature in 18.76	Apr 0.97 living ar 19.4	0.93 ea T1 (fo	(see Jui 0.84 ollow s	Table 9a) 1 Jul 1 0.74 1 steps 3 to 7 2 20.78	Aug 0.8 ' in Ta 20.71	Sep 0.94 ble 9c) 20.25	0.99	1	1		(86)
(86)m= Mean (87)m=	Jan 1 internal 18.08	Feb 1 I temper 18.31	Mar 0.99 ature in 18.76	Apr 0.97 living ar 19.4	0.93 ea T1 (fo	(see Jui 0.84 ollow s	Table 9a) 1 Jul 1 0.74 steps 3 to 7 3 20.78 ng from Ta	Aug 0.8 ' in Ta 20.71	Sep 0.94 ble 9c) 20.25 Th2 (°C)	0.99	1	1		(86)
(86)m= Mean (87)m= Temp (88)m=	Jan 1 internal 18.08 erature 18.96	Feb 1 I temper 18.31 during h 18.96	Mar 0.99 ature in 18.76 eating p	Apr 0.97 living ar 19.4 periods it	May 0.93 ea T1 (for 20.02 n rest of 18.99	Jui 0.84 ollow s 20.55 dwelli 19.0	Table 9a) 1 Jul 1 0.74 steps 3 to 7 3 20.78 ng from Ta 1 19.01	0.8 7 in Ta 20.71 able 9,	Sep 0.94 ble 9c) 20.25 Th2 (°C)	0.99	18.66	18.05		(86)
(86)m= Mean (87)m= Temp (88)m= Utilisa	Jan 1 internal 18.08 erature 18.96	Feb 1 I temper 18.31 during h 18.96	Mar 0.99 ature in 18.76 eating p 18.97 ains for	Apr 0.97 living ar 19.4 periods it 18.99 rest of d	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling,	(see Jui 0.84 bllow s 20.5 dwelli 19.0 h2,m	Table 9a) 1 Jul 1 0.74 steps 3 to 7 3 20.78 ng from Ta 1 19.01 (see Table	Aug 0.8 7 in Ta 20.71 able 9, 19.01	Sep 0.94 ble 9c) 20.25 Th2 (°C)	0.99 19.44 18.99	18.66	18.05		(86) (87) (88)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	Jan 1 internal 18.08 erature 18.96 ation fac	Feb 1 I temper 18.31 during h 18.96 tor for ga	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99	Apr 0.97 living ar 19.4 periods it 18.99 rest of d 0.96	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88	(see Jui 0.84 ollow s 20.55 dwelli 19.0 h2,m 0.72	Table 9a) 1 Jul 1 0.74 Steps 3 to 7 3 20.78 1 19.01 (see Table 9 0.5	Aug 0.8 7 in Ta 20.71 able 9, 19.01 9a)	Sep 0.94 ble 9c) 20.25 Th2 (°C) 19	0.99 19.44 18.99 0.98	18.66	18.05		(86)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal	Feb 1 I temper 18.31 during h 18.96 tor for gall I temper	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in	Apr 0.97 living ar 19.4 periods it 18.99 rest of d 0.96 the rest	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelli	(see Jun 0.84 b) Jun 0.84 b) Jun 0.84 b) Jun 0.84 b) Jun 19.0 b) J	Table 9a) 1 Jul 1 0.74 steps 3 to 7 3 20.78 ng from Ta 1 19.01 (see Table 2 0.5	Aug 0.8 7 in Ta 20.71 able 9, 19.01 9a) 0.59	Sep 0.94 ble 9c) 20.25 Th2 (°C) 19 0.88	0.99 19.44 18.99 0.98 e 9c)	18.66	1 18.05 18.98		(86) (87) (88) (89)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	Jan 1 internal 18.08 erature 18.96 ation fac	Feb 1 I temper 18.31 during h 18.96 tor for ga	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99	Apr 0.97 living ar 19.4 periods it 18.99 rest of d 0.96	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88	(see Jui 0.84 ollow s 20.55 dwelli 19.0 h2,m 0.72	Table 9a) 1 Jul 1 0.74 steps 3 to 7 3 20.78 ng from Ta 1 19.01 (see Table 2 0.5	Aug 0.8 7 in Ta 20.71 able 9, 19.01 9a)	Sep 0.94 ble 9c) 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59	0.99 19.44 18.99 0.98 e 9c) 17.82	1 18.66 18.98 1 1 17.03	1 18.05 18.98 1		(86) (87) (88) (89)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal	Feb 1 I temper 18.31 during h 18.96 tor for gall I temper	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in	Apr 0.97 living ar 19.4 periods it 18.99 rest of d 0.96 the rest	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelli	(see Jun 0.84 b) Jun 0.84 b) Jun 0.84 b) Jun 0.84 b) Jun 19.0 b) J	Table 9a) 1 Jul 1 0.74 steps 3 to 7 3 20.78 ng from Ta 1 19.01 (see Table 2 0.5	Aug 0.8 7 in Ta 20.71 able 9, 19.01 9a) 0.59	Sep 0.94 ble 9c) 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59	0.99 19.44 18.99 0.98 e 9c) 17.82	18.66	1 18.05 18.98 1	0.15	(86) (87) (88) (89)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal 16.43	Feb 1 I temper 18.31 during h 18.96 tor for ga 1 I temper 16.66	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in 17.11	Apr 0.97 living ar 19.4 periods it 18.99 rest of d 0.96 the rest 17.76	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelling 18.36	(see Jui 0.84	Table 9a) 1 Jul 1 0.74 steps 3 to 7 3 20.78 ng from Ta 1 19.01 (see Table 2 0.5	Aug 0.8 7 in Tal 20.71 able 9, 19.01 9a) 0.59 eps 3 to	Sep 0.94 ble 9c) 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59	0.99 19.44 18.99 0.98 e 9c) 17.82	1 18.66 18.98 1 1 17.03	1 18.05 18.98 1		(86) (87) (88) (89)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal 16.43 internal 16.67	Feb 1 I temper 18.31 during h 18.96 tor for ga 1 I temper 16.66	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in 17.11 ature (fo	Apr 0.97 living ar 19.4 periods it 18.99 rest of d 0.96 the rest 17.76 or the wh	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelling 18.36	(see Jur 0.84	Table 9a) 1 Jul 1 0.74 Steps 3 to 7 3 20.78 Ing from Ta 1 19.01 (see Table 9 2 0.5 I (follow step 1 18.97) = fLA × T1 6 19.23	Aug 0.8 7 in Tal 20.71 able 9, 19.01 9a) 0.59 eps 3 to 18.95 + (1 –	Sep 0.94 ble 9c) 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59 f fLA) × T2 18.83	0.99 19.44 18.99 0.98 e 9c) 17.82 LA = Liv	1 18.66 18.98 1 1 17.03	1 18.05 18.98 1		(86) (87) (88) (89)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal 16.43 internal 16.67 adjustn	Feb 1 I temper 18.31 during h 18.96 tor for ga 1 temper 16.66 I temper 16.9 hent to th	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in 17.11 ature (for 17.35 ne mear	Apr 0.97 living an 19.4 periods ii 18.99 rest of d 0.96 the rest 17.76 or the wh 18 n interna	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelling 18.36 lole dwe 18.6 I temper	(see Jun 0.84	Table 9a) 1 Jul 1 0.74 1 steps 3 to 7 3 20.78 1 19.01 (see Table 9 1 18.97 1 18.97 1 19.23 1 19.23 1 19.23	Aug 0.8 7 in Tal 20.71 able 9, 19.01 9a) 0.59 eps 3 to 18.95 + (1 – 19.2 4e, w	Sep 0.94 ble 9c) 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59 f fLA) × T2 18.83 here appro	0.99 19.44 18.99 0.98 e 9c) 17.82 LA = Liv	1 18.66 18.98 1 1 17.03 ing area ÷ (4	1 18.05 18.98 1 16.42 1) =		(86) (87) (88) (89) (90) (91)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m=	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal 16.43 internal 16.67 adjustn 16.67	Feb 1 I temper 18.31 during h 18.96 tor for ga 1 I temper 16.66 I temper 16.9 ment to tl 16.9	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in 17.11 ature (for 17.35 ne mean 17.35	Apr 0.97 living ar 19.4 periods in 18.99 rest of d 0.96 the rest 17.76 or the wh 18 n interna	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelling 18.36	(see Jur 0.84	Table 9a) 1 Jul 1 0.74 1 steps 3 to 7 3 20.78 1 19.01 (see Table 9 1 18.97 1 18.97 1 19.23 1 19.23 1 19.23	Aug 0.8 7 in Tal 20.71 able 9, 19.01 9a) 0.59 eps 3 to 18.95 + (1 –	Sep 0.94 ble 9c) 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59 f fLA) × T2 18.83	0.99 19.44 18.99 0.98 e 9c) 17.82 LA = Liv	1 18.66 18.98 1 1 17.03 ing area ÷ (4	1 18.05 18.98 1 1 16.42		(86) (87) (88) (89) (90) (91)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal 16.43 internal 16.67 adjustm 16.67	Feb 1 I temper 18.31 during h 18.96 tor for ga 1 temper 16.66 I temper 16.9 hent to th 16.9 ting requ	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in 17.11 ature (for 17.35 ne mean 17.35 uirement	Apr 0.97 living an 19.4 periods ii 18.99 rest of d 0.96 the rest 17.76 or the wh 18 n interna 18	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelling 18.36 lole dwe 18.6 I temper 18.6	(see Jun 0.84	Table 9a) 1 Jul 1 0.74 1 19.01 (see Table 9 0.5) 2 (follow stee 1 18.97 FLA × T1 1 19.23 From Table 19.23	Aug 0.8 7 in Ta 20.71 able 9, 19.01 9a) 0.59 eps 3 to 18.95 + (1 – 19.2 4e, w 19.2	Sep 0.94 ble 9c) 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59 ffLA) × T2 18.83 here appro-	0.99 19.44 18.99 0.98 e 9c) 17.82 LA = Liv 18.05 priate 18.05	1 18.66 18.98 1 1 17.03 ing area ÷ (4 17.27	1 18.05 18.98 1 16.42 16.66	0.15	(86) (87) (88) (89) (90) (91)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal 16.43 internal 16.67 adjustm 16.67 acce head to the r	Feb 1 I temper 18.31 during h 18.96 tor for ga 1 I temper 16.66 I temper 16.9 nent to th 16.9 ting required	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in 17.11 ature (for 17.35 ne mear 17.35 uirement ernal tei	Apr 0.97 living ar 19.4 periods if 18.99 rest of d 0.96 the rest 17.76 or the wh 18 n interna	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelling 18.36 nole dwe 18.6 I temper 18.6 re obtain	(see Jun 0.84	Table 9a) 1 Jul 1 0.74 1 steps 3 to 7 3 20.78 1 19.01 (see Table 9 1 18.97 1 18.97 1 19.23 1 19.23 1 19.23	Aug 0.8 7 in Ta 20.71 able 9, 19.01 9a) 0.59 eps 3 to 18.95 + (1 – 19.2 4e, w 19.2	Sep 0.94 ble 9c) 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59 ffLA) × T2 18.83 here appro-	0.99 19.44 18.99 0.98 e 9c) 17.82 LA = Liv 18.05 priate 18.05	1 18.66 18.98 1 1 17.03 ing area ÷ (4 17.27	1 18.05 18.98 1 16.42 16.66	0.15	(86) (87) (88) (89) (90) (91)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal 16.43 internal 16.67 adjustm 16.67 acce head to the rillisation	Feb 1 I temper 18.31 during h 18.96 tor for ga 1 I temper 16.66 I temper 16.9 ting required interpretation for the second of the second	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in 17.11 ature (for 17.35 ne mean 17.35 uirement ernal telepr gains	Apr 0.97 living ar 19.4 periods it 18.99 rest of d 0.96 the rest 17.76 or the wh 18 miniterna 18 mperatu using Ta	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelling 18.36 tole dwelling 18.6 I temper 18.6 re obtain able 9a	(see Jun 0.84	Table 9a) 1 Jul 1 0.74 steps 3 to 7 3 20.78 In 19.01 (see Table 9 2 0.5 It (follow steps 1 1 19.23 from Table 19.23 step 11 of	Aug 0.8 7 in Ta 20.71 able 9, 19.01 9a) 0.59 eps 3 to 18.95 + (1 – 19.2 4e, w 19.2	Sep 0.94 ble 9c 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59 fLA) × T2 18.83 here approximates 18.83 9b, so that	0.99 19.44 18.99 0.98 e 9c) 17.82 LA = Liv 18.05 ppriate 18.05	1 18.66 18.98 1 1 17.03 ing area ÷ (4 17.27 17.27 17.27	1 18.05 18.98 1 16.42 16.66 16.66 dre-cald	0.15	(86) (87) (88) (89) (90) (91)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti the ut	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal 16.43 internal 16.67 adjustn 16.67 ace hear to the rillisation Jan	Feb 1 I temper 18.31 during h 18.96 tor for ga 1 I temper 16.66 I temper 16.9 nent to th 16.9 ting required	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in 17.11 ature (for 17.35 ne mean 17.35 direment ernal teleor gains Mar	Apr 0.97 living an 19.4 periods ii 18.99 rest of d 0.96 the rest 17.76 or the wh 18 n interna 18 mperatu using Ta Apr	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelling 18.36 nole dwe 18.6 I temper 18.6 re obtain	(see Jun 0.84	Table 9a) 1 Jul 1 0.74 steps 3 to 7 3 20.78 In 19.01 (see Table 9.5 I (follow steps 1 1 19.23 from Table 9.6 1 19.23 step 11 of	Aug 0.8 7 in Ta 20.71 able 9, 19.01 9a) 0.59 eps 3 to 18.95 + (1 – 19.2 4e, w 19.2	Sep 0.94 ble 9c 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59 fLA) × T2 18.83 here approximates 18.83 9b, so that	0.99 19.44 18.99 0.98 e 9c) 17.82 LA = Liv 18.05 priate 18.05	1 18.66 18.98 1 1 17.03 ing area ÷ (4 17.27	1 18.05 18.98 1 16.42 16.66	0.15	(86) (87) (88) (89) (90) (91)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti the ut	Jan 1 internal 18.08 erature 18.96 ation fac 1 internal 16.43 internal 16.67 adjustn 16.67 ace hear to the rillisation Jan	Feb 1 I temper 18.31 during h 18.96 tor for ga 1 temper 16.66 I temper 16.9 ment to th 16.9 ting required interpretation for for for for for gas and the factor for for for for for for for for for f	Mar 0.99 ature in 18.76 eating p 18.97 ains for 0.99 ature in 17.11 ature (for 17.35 ne mean 17.35 direment ernal teleor gains Mar	Apr 0.97 living an 19.4 periods ii 18.99 rest of d 0.96 the rest 17.76 or the wh 18 n interna 18 mperatu using Ta Apr	May 0.93 ea T1 (for 20.02 n rest of 18.99 welling, 0.88 of dwelling 18.36 tole dwelling 18.6 I temper 18.6 re obtain able 9a	(see Jun 0.84	Table 9a) Jul 0.74 steps 3 to 7 3	Aug 0.8 7 in Ta 20.71 able 9, 19.01 9a) 0.59 eps 3 to 18.95 + (1 – 19.2 4e, w 19.2	Sep 0.94 ble 9c 20.25 Th2 (°C) 19 0.88 0.7 in Table 18.59 fLA) × T2 18.83 here approximates 18.83 9b, so that	0.99 19.44 18.99 0.98 e 9c) 17.82 LA = Liv 18.05 ppriate 18.05	1 18.66 18.98 1 1 17.03 ing area ÷ (4 17.27 17.27 17.27	1 18.05 18.98 1 16.42 16.66 16.66 dre-cald	0.15	(86) (87) (88) (89) (90) (91)

Useful gains, hmG	m \// = (C	1/1)m v (8.	1)m									
	29 1752.53		 	2018 83	1410.06	1416 87	1635.72	1343.69	1018 07	897.98	1	(95)
Monthly average		<u> </u>		<u> </u>				10.000	10.000	001.00	I	,
(96)m= 4.3 4.9	_	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for		nal tempe	L erature.	Lm . W :	I =[(39)m :	x [(93)m	L _ (96)m	1			I	
(97)m= 7693.04 7442		5549.41			1582.49		<u> </u>		6216.55	7659.02		(97)
Space heating req	<u> </u>	or each n	nonth. k\	Mh/mon	th = 0.02	24 x [(97	ı <u> </u>)ml x (4	L 1)m	l .	ı	
(98)m= 4993.13 4110	-	2404.99	1349.14	0	0	0	0	2373.05	<u> </u>	5030.21		
			<u> </u>			Tota	l per year	ı (kWh/year	·) = Sum(9	8) _{15,912} =	27693.11	(98)
Space heating req	uirement ir	n kWh/m²	²/vear								116.06	<u> </u> (99)
8c. Space cooling			.,								7.2.2	`
Calculated for Jun			See Tal	hle 10h								
Jan Fe		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss rate Lm		<u> </u>									i 	
(100)m= 0 0	0	T 0	0	5647.77			0	0	0	0		(100)
Utilisation factor fo	r loss hm	1	1	1	1			1	l	ı	1	
(101)m= 0 0	0	0	0	0.5	0.58	0.52	0	0	0	0		(101)
Useful loss, hmLm	(Watts) =	(100)m x	(101)m	<u> </u>					Į.		ı	
(102)m= 0 0	0	0	0	2835.75	2571.46	2360.27	0	0	0	0		(102)
Gains (solar gains	calculated	for appli	cable w	eather re	egion, se	e Table	10)				•	
(103)m= 0 0	0	0	0	3126.14	2969.66	2623.62	0	0	0	0		(103)
Space cooling req				dwelling,	continuo	ous (kW	(h) = 0.0	24 x [(10	03)m – (102)m] :	x (41)m	
set (104)m to zero	if (104)m	< 3 × (98)m	,					1	1	•	
(104)m= 0 0	0	0	0	0	0	0	0	0	0	0		_
								l = Sum(,	=	0	(104)
Cooled fraction	/T-bl- 401	- \					† C =	cooled	area ÷ (4	1) =	0.29	(105)
Intermittency factor (106)m= 0 0	(Table 100)	0	0	0.25	0.25	0.25	0	0	0	0		
(100)111-		1 0		0.23	0.23	0.23		 = Sum(l	 =		(106)
Space cooling requ	rement for	month =	: (104)m	× (105)	× (106)r	n	TOtal	ı – Sum	1 001)	_	0	_(100)
(107)m = 0 0	0	0	0	0	0	0	0	0	0	0		
` /		1	l		l		L Total	l = Sum(1.0.7)	=	0	(107)
Space cooling requ	rement in	kWh/m²/v	/ear) ÷ (4) =	55 /		0	(108)
9a. Energy requirer			<i>′</i>	vetome i	neludina	micro C	` ') - ()			0	
Space heating:	ients – mo	iiviuuai II	eaung s	ysterns i	riciuality	IIIICIO-C	,nr)					
Fraction of space	neat from s	secondar	y/supple	mentary	system						0	(201)
Fraction of space				-	-	(202) = 1 -	- (201) =				1	(202)
Fraction of total he		-	` ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main	•	-									90.3	(206)
Efficiency of secon	•			a svstem	ղ. %						0	(208)
Cooling System E			•	3 - 7 ·	-,						4.32	(209)
Jan Fe		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	
Space heating req		<u> </u>			I Gai	, .ug	_ oop	1 500	1 1101	1 500		∽ 1
4993.13 4110	<u>`</u>	2404.99		í	0	0	0	2373.05	3742.9	5030.21		
		1	<u> </u>	I	<u> </u>			<u> </u>	<u> </u>	<u>I</u>	1	

5529.5 4552.14 4085.	x 100 ÷ (206 38 2663.34 1		0	0	0	0	2627.96	4144.96	5570.55		
					Tota	l ıl (kWh/yea	ar) =Sum(2	L 211) _{15,1012}	=	30667.9	(2
pace heating fuel (second	lary), kWh/m	nonth							L		_
[(98)m x (201)] } x 100 ÷		-		Î	i	i	i	i			
5)m= 0 0 0	0	0	0	0	O Tota	0	0	0	0		٦,,
-4 b					Tota	ii (Kvvn/yea	ar) =Sum(2	215) _{15,1012}		0	(2
ater heating utput from water heater (ca	alculated abo	ove)									
225 198.24 208.0		182.35	160.74	154	171.53	171.32	193.15	204.52	219.5		
iciency of water heater	•	,			•		•			81	(2
7)m= 89.86 89.83 89.7	5 89.56	89.08	81	81	81	81	89.53	89.77	89.87		(2
el for water heating, kWh											
$19)m = (64)m \times 100 \div (2^{\circ})$ $9)m = 250.4 220.7 231.7$		204.7	198.44	190.12	211.76	211.51	215.74	227.84	244.25		
				ļ	Tota	l = Sum(2	19a) ₁₁₂ =			2615.21	(2
inual totals							k\	Wh/year		kWh/yea	<u></u>
ace heating fuel used, ma	ain system 1									30667.9	
stor booting first used											_
ater neating fuel used										2615.21	
-	nd electric ke	eep-hot	t							2615.21	
ectricity for pumps, fans a	nd electric ke	eep-hot	t						30	2615.21	(2
ectricity for pumps, fans a entral heating pump:		-	t		sum	of (230a).	(230g) =		30	2615.21	
ectricity for pumps, fans a entral heating pump: tal electricity for the above		-	i		sum	of (230a).	(230g) =		30		(2
ater heating fuel used ectricity for pumps, fans a central heating pump: otal electricity for the above ectricity for lighting 2a. CO2 emissions – Indi	e, kWh/year			uding mi			(230g) =		30	30	(2](2](2
ectricity for pumps, fans a entral heating pump: tal electricity for the above ectricity for lighting	e, kWh/year		ems inclu						[[30 644.47	(2
ectricity for pumps, fans a entral heating pump: tal electricity for the above ectricity for lighting	e, kWh/year		ms inclu	uding mi ergy /h/year				ion fac	[[30	(2)(2
ectricity for pumps, fans a entral heating pump: tal electricity for the above ectricity for lighting 2a. CO2 emissions – Indi	e, kWh/year /idual heatin		ems inclu En kW	ergy			Emiss	ion fac 2/kWh	[[30 644.47 Emissions	(2)(2)(2)(3
ectricity for pumps, fans a entral heating pump: tal electricity for the above ectricity for lighting 2a. CO2 emissions – Individue heating (main system)	e, kWh/year /idual heatin		ems inclu En kW (211	ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	30 644.47 Emissions kg CO2/ye	(2)(2)(2)(3
ectricity for pumps, fans a entral heating pump: tal electricity for the above ectricity for lighting 2a. CO2 emissions – Individue heating (main system ace heating (secondary)	e, kWh/year /idual heatin		ems inclu En kW (211	ergy /h/year			Emiss kg CO	ion fac 2/kWh 16	tor = [30 644.47 Emissions kg CO2/ye	(2 ss.ear (2 (2
ectricity for pumps, fans a entral heating pump: tal electricity for the above ectricity for lighting 2a. CO2 emissions – Individual entral heating (main system ace heating (secondary) ater heating	e, kWh/year /idual heatin		ems inclu En kW (21 (218	ergy /h/year 1) x 5) x			Emiss kg CO	ion fac 2/kWh 16	tor = [30 644.47 Emissions kg CO2/ye 6624.27	(2 (2 (2 (2 (2
ectricity for pumps, fans a entral heating pump: tal electricity for the above ectricity for lighting 2a. CO2 emissions – Individual entral material electricity for lighting ace heating (main system ace heating (secondary) ater heating ace and water heating	e, kWh/year vidual heatin	ng syste	ems inclu En kW (211 (215 (219 (262	ergy /h/year 1) x 5) x	cro-CHF		Emiss kg CO	ion fac 2/kWh 16 19 16	tor = [30 644.47 Emissions kg CO2/ye 6624.27 0 564.89	(2 (2 (2 (2 (2 (2 (2
ectricity for pumps, fans a entral heating pump: tal electricity for the above ectricity for lighting 2a. CO2 emissions – Individual entral material electricity for lighting ace heating (main system ace heating (secondary) ater heating ace and water heating ectricity for pumps, fans a	e, kWh/year vidual heatin	ng syste	ems inclu En kW (21* (218 (26*	ergy /h/year 1) x 5) x 9) x	cro-CHF		Emiss kg CO2 0.2 0.5 0.2	ion fac 2/kWh 16 19 16	tor = [= [= [30 644.47 Emissions kg CO2/ye 6624.27 0 564.89 7189.15	(2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (
ectricity for pumps, fans a entral heating pump: tal electricity for the above ectricity for lighting 2a. CO2 emissions – Individual entral material electricity for lighting ace heating (secondary) ater heating ace and water heating ectricity for pumps, fans a ectricity for lighting	e, kWh/year vidual heatin	ng syste	ems inclu En kW (21* (218 (26*	ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x	cro-CHF	(264) =	Emiss kg CO2 0.2 0.5 0.5	ion fac 2/kWh 16 19 16	tor = [= [= [30 644.47 Emissions kg CO2/ye 6624.27 0 564.89 7189.15 15.57 334.48	(2) (2) (2) (2) (2) (2) (2) (2) (2) (2)
ectricity for pumps, fans a entral heating pump: tal electricity for the above ectricity for lighting	e, kWh/year vidual heatin n 1)	ng syste	ems inclu En kW (21* (218 (26*	ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x	cro-CHF	(264) = sum c	Emiss kg CO: 0.2 0.5 0.5 0.5	ion fac 2/kWh 16 19 16	tor = [= [= [30 644.47 Emissions kg CO2/ye 6624.27 0 564.89 7189.15	(2)(2)(3

			User D)etaile:						
Access an Names	Chris Haal	e all	USCIL		- N	.		CTDO	046262	
Assessor Name:	Chris Hock Stroma FS			Strom					016363 on: 1.0.4.26	
Software Name:	Stroma FS		Daniel	Softwa				versio	M: 1.U.4.26	
			Property			_ean				
Address :		ndfield Garden	s, LONDO	JN, NVV3	8 6PU					
1. Overall dwelling dime	ensions:		•	4 2)),
Craumal flags				a(m²)	1,, ,		eight(m)	_	Volume(m ³	<u>-</u>
Ground floor				98.7	(1a) x		2.5	(2a) =	246.75	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+((1d)+(1e)+(1n)	98.7	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	246.75	(5)
2. Ventilation rate:										
	main heating	second heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	, + [0] = [0	Х	40 =	0	(6a)
Number of open flues	0	- + C	-	0		0	x	20 =	0	(6b)
Number of intermittent fa	ans					3	x	10 =	30	 _(7a)
Number of passive vents	2				L	0	x	10 =	0	(7b)
·					Ļ			40 =		= '
Number of flueless gas f	ires					0		40 -	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs flues and fa	ans = (6a) + (6b) + (-(7a)+(7b)+((7c) =	Г	30		÷ (5) =	0.12	(8)
If a pressurisation test has l					continue fr			. (3) –	0.12	(0)
Number of storeys in t						(0)	(- 5)		0	(9)
Additional infiltration	3 (,					[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0).25 for steel or	timber frame	or 0.35 fo	r masoni	ry constr	uction	LX-	1	0	(11)
if both types of wall are p	resent, use the va	lue corresponding			•					 ` ′
deducting areas of openi	• ,		0.4 (1\1	1 0					_
If suspended wooden		•	U.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2		_			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic met	res per ho	our per s	quare m	etre of e	envelope	area	10	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	+(8), otherw	rise (18) =	(16)				0.62	(18)
Air permeability value applie	es if a pressurisatio	on test has been d	one or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18) x (20) =				0.53	(21)
Infiltration rate modified	for monthly win	d speed								
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Tabl	e 7							_	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (00-) (0	10) 1									
Wind Factor (22a)m = $(22a)$ m =	•	1.00 0.05	0.05	1 0 00			_		1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

) × [1 – (230 0 0 0 0 0 0 68 0.69 k-valukJ/m²	(24) (24) (24) (24) (25)
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 (23 (24 (24 (25 (25 (25 (25 (25 (25 (25 (25 (25 (25
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 (23 (24 (24 (25 (25 (25 (25 (25 (25 (25 (25 (25 (25
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24) (24) (24) (24) (24) (25)
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24) (24) (24) (24) (25)
0 0 0 0 68 0.69 k-valu	(24) (24) (24) (25)
0 0 0 0 68 0.69 68 0.69	(24) (24) (25) ue A X k
0 0 68 0.69 68 0.69 k-valu	(24) (24) (25) ue A X k
68 0.69 68 0.69 k-vali	(24) (25) ue A X k
68 0.69 68 0.69 k-vali	(24) (25) ue A X k
68 0.69 68 0.69 k-vali	(24) (25) ue A X k
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68 0.69 k-vali	ue AXk
k-valı	ue AXk
k-valı	ue AXk
	(26
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	(29
	(29
	(30
	(31
	(32
	(32
en in paragra _l	ph 3.2
	108.62 (33
32a)(32e) =	
,(-=-)	.00.2.00
lium	250
	ven in paragra (32a)(32e) : dium P in Table 1f

	eat loss								(36) =			138.41	(37
entilation he	at loss ca	alculated	l monthly	У		Т	Т	·	= 0.33 × (25)m x (5)) •	I	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 59.19	58.47	57.77	54.47	53.85	50.97	50.97	50.44	52.08	53.85	55.1	56.4		(3
eat transfer	coefficier	nt, W/K						(39)m	= (37) + (38)m			
9)m= 197.6	196.88	196.18	192.87	192.26	189.38	189.38	188.85	190.49	192.26	193.51	194.81		
				=	=	=	=		Average =		12 /12=	192.87	(3
eat loss para	- `								= (39)m ÷	·		I	
0)m= 2	1.99	1.99	1.95	1.95	1.92	1.92	1.91	1.93	1.95	1.96	1.97		— ,,
umber of da	vs in mor	nth (Tabl	le 1a)						Average =	Sum(40) ₁	12 /12=	1.95	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
,	1												Ì
. Water hea	ting ener	av regui	rement:								kWh/ye	aar:	
r. Water nee	iting ener	gy requi	rement.								KVVII/ y	zai.	
ssumed occ											.73		(4
if TFA > 13.	,	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (TFA -13.	.9)		•	
if TFA £ 13. nual averag	,	ater usac	ne in litre	se per da	y Vd av	erage =	(25 v NI)	± 36				1	
ınuar averaç duce the annu	•		•	•	•	_	` ,		se target o		3.97		(4
more that 125	_				-	-							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
								l OCP		1 1101			
ot water usage	in litres per	day for ea	ch month	Vd,m = fa		Table 1c x		ОСР	1 000	1404		l	
	in litres per	day for ea	96.99	Vd,m = fac 93.03		Fable 1c x		96.99	100.95	104.91	108.87		
t water usage 4)m= 108.87					ctor from 7		(43)	96.99		104.91	108.87	1187.64	\(\frac{1}{2}\)
4)m= 108.87	104.91	100.95	96.99	93.03	89.07	89.07	93.03	96.99	100.95 Total = Su	104.91 m(44) ₁₁₂ =	108.87	1187.64	(4
ergy content o	104.91	100.95	96.99	93.03	89.07	89.07	93.03	96.99	100.95 Total = Su	104.91 m(44) ₁₁₂ =	108.87	1187.64	(4
108.87 ergy content o	104.91	100.95 used - cal	96.99	93.03 onthly = 4.	89.07 89.07	89.07 m x nm x D	(43) 93.03 97m / 3600	96.99 0 kWh/mor 113.18	100.95 Total = Su	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98	108.87 = c, 1d)	1187.64 1557.18	
ergy content o	104.91 f hot water	100.95 used - calc 145.71	96.99 culated mo	93.03 onthly = 4.	89.07 89.07 190 x Vd,n	89.07 n x nm x E 97.47	(43) 93.03 97m / 3600 111.84	96.99) kWh/mor	100.95 Total = Su th (see Ta	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98	108.87 = c, 1d)		(4 (4
ergy content o	104.91 f hot water	100.95 used - calc 145.71	96.99 culated mo	93.03 onthly = 4.	89.07 89.07 190 x Vd,n	89.07 n x nm x E 97.47	(43) 93.03 97m / 3600 111.84	96.99) kWh/mor	100.95 Total = Su th (see Ta	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98	108.87 = c, 1d)		(4
ergy content of 161.45 nstantaneous v 5)m= 24.22	104.91 f hot water 141.2 vater heatin 21.18	100.95 used - calc 145.71 ng at point	96.99 culated model 127.03 of use (no	93.03 onthly = 4. 121.89 hot water	ctor from 7 89.07 190 x Vd,n 105.18	89.07 n x nm x E 97.47 enter 0 in	(43) 93.03 97m / 3600 111.84 boxes (46)	96.99) kWh/mor 113.18) to (61)	100.95 Total = Su nth (see Ta 131.9 Total = Su	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ =	108.87 = c, 1d) 156.35		(4
ergy content of instantaneous which is the storage after storage.	104.91 f hot water 141.2 water heatin 21.18 closs:	100.95 used - cald 145.71 ng at point 21.86	96.99 culated model 127.03 of use (note 19.05)	93.03 onthly = 4. 121.89 o hot water 18.28	ctor from 7 89.07 190 x Vd,n 105.18 - storage),	89.07 n x nm x E 97.47 enter 0 in 14.62	(43) 93.03 97m / 3600 111.84 boxes (46) 16.78	96.99 6 kWh/mor 113.18 1 to (61) 16.98	100.95 Total = Su tth (see Ta 131.9 Total = Su 19.79	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ =	108.87 = c, 1d) 156.35		(4
ergy content of 108.87 ergy content of 161.45 instantaneous volume 24.22 ater storage orage volume	104.91 f hot water 141.2 vater heatin 21.18 c loss: ne (litres)	100.95 used - calc 145.71 ng at point 21.86 includin	96.99 culated mo 127.03 of use (no 19.05	93.03 onthly = 4. 121.89 o hot water 18.28 olar or W	ctor from 7 89.07 190 x Vd,n 105.18 r storage), 15.78	89.07 n x nm x E 97.47 enter 0 in 14.62 storage	(43) 93.03 97m / 3600 111.84 boxes (46) 16.78 within sa	96.99 6 kWh/mor 113.18 1 to (61) 16.98	100.95 Total = Su tth (see Ta 131.9 Total = Su 19.79	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ =	108.87 = c, 1d) 156.35 =		(4
ergy content of instantaneous value storage volunce community in therwise if n	104.91 f hot water 141.2 vater heatin 21.18 c loss: ne (litres) neating a o stored	100.95 used - calc 145.71 ng at point 21.86 includin nd no ta	96.99 culated model 127.03 of use (not 19.05) ng any south in dw.	93.03 onthly = 4. 121.89 o hot water 18.28 clar or W velling, e	ctor from 7 89.07 190 x Vd,n 105.18 storage), 15.78 /WHRS	89.07 n x nm x E 97.47 enter 0 in 14.62 storage	(43) 93.03 97m / 3600 111.84 boxes (46) 16.78 within sa (47)	96.99 0 kWh/mor 113.18 0 to (61) 16.98 ame ves	100.95 Total = Su nth (see Ta 131.9 Total = Su 19.79 sel	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ =	108.87 = c, 1d) 156.35 =		(4
ergy content of 108.87 ergy content of 161.45 nstantaneous volume 24.22 ater storage volume community in the wise if no ater storage.	104.91 f hot water 141.2 vater heatin 21.18 e loss: ne (litres) neating a o stored e loss:	100.95 used - calc 145.71 ng at point 21.86 includin nd no ta hot wate	96.99 culated mo 127.03 of use (no 19.05 ag any so nk in dw er (this in	93.03 onthly = 4. 121.89 o hot water 18.28 olar or W velling, e	tor from 7 89.07 190 x Vd,n 105.18 storage), 15.78 /WHRS nter 110	89.07 n x nm x E 97.47 enter 0 in 14.62 storage litres in neous co	(43) 93.03 97m / 3600 111.84 boxes (46) 16.78 within sa (47)	96.99 0 kWh/mor 113.18 0 to (61) 16.98 ame ves	100.95 Total = Su nth (see Ta 131.9 Total = Su 19.79 sel	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ =	108.87 = c, 1d) 156.35 =		(4)
ergy content of instantaneous values orage volunceommunity inherwise if nater storage of the sto	104.91 f hot water 141.2 vater heatin 21.18 c loss: ne (litres) neating a o stored c loss: turer's de	100.95 used - calc 145.71 ng at point 21.86 including and no tale hot water	96.99 culated model 127.03 of use (not 19.05) ag any sounk in dwor (this in the coss factors)	93.03 onthly = 4. 121.89 o hot water 18.28 olar or W velling, e	tor from 7 89.07 190 x Vd,n 105.18 storage), 15.78 /WHRS nter 110	89.07 n x nm x E 97.47 enter 0 in 14.62 storage litres in neous co	(43) 93.03 97m / 3600 111.84 boxes (46) 16.78 within sa (47)	96.99 0 kWh/mor 113.18 0 to (61) 16.98 ame ves	100.95 Total = Su nth (see Ta 131.9 Total = Su 19.79 sel	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ = 21.6	108.87 = c, 1d) 156.35 =		(4)
ergy content of the stantaneous with the storage volume atter storage orage volume atter storage of the storage	104.91 f hot water 141.2 vater heatin 21.18 c loss: ne (litres) neating a o stored e loss: turer's defactor fro	100.95 used - calc 145.71 145.71 21.86 includin nd no ta hot wate eclared lo	96.99 culated model 127.03 of use (not 19.05) ag any so the in dward (this in the coss factor 2b	93.03 onthly = 4. 121.89 o hot water 18.28 colar or Water velling, eacludes in the column of t	tor from 7 89.07 190 x Vd,n 105.18 storage), 15.78 /WHRS nter 110	89.07 n x nm x E 97.47 enter 0 in 14.62 storage litres in neous co	(43) 93.03 97m / 3600 111.84 boxes (46) 16.78 within sa (47)	96.99 0 kWh/mor 113.18 0 to (61) 16.98 ame ves	100.95 Total = Su nth (see Ta 131.9 Total = Su 19.79 sel	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ = 21.6	108.87 = c, 1d) 156.35 = 23.45		(4)
ergy content of some 161.45 mstantaneous vices atter storage orage volunt community litherwise if nater storage of the storag	104.91 f hot water 141.2 vater heatin 21.18 c loss: ne (litres) neating a o stored c loss: turer's defactor from water	100.95 used - calc 145.71 145.71 21.86 includin nd no ta hot water eclared le m Table	96.99 culated model 127.03 of use (not 19.05) ag any so the in dwer (this in oss factor 2b, kWh/ye	93.03 onthly = 4. 121.89 o hot water 18.28 clar or Water velling, encludes in the control of the control	ttor from T 89.07 190 x Vd,n 105.18 15.78 15.78 WHRS nter 110 nstantar	89.07 n x nm x D 97.47 enter 0 in 14.62 storage litres in neous con/day):	(43) 93.03 97m / 3600 111.84 boxes (46) 16.78 within sa (47)	96.99 2 kWh/mor 113.18 2 to (61) 16.98 ame ves ers) ente	100.95 Total = Su nth (see Ta 131.9 Total = Su 19.79 sel	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ = 21.6	108.87 = c, 1d) 156.35 = 23.45		(4)
ergy content of the stantaneous was attended to some some some some some some some som	104.91 f hot water 141.2 water heatin 21.18 c loss: ne (litres) neating a o stored e loss: turer's defactor from water turer's defactor from water	100.95 used - calc 145.71 ng at point 21.86 includin nd no ta hot wate eclared lo	96.99 culated model 127.03 of use (not 19.05) ag any sounk in dwer (this in oss factor 2b, kWh/ye cylinder l	93.03 onthly = 4. 121.89 o hot water 18.28 olar or W velling, e ncludes i or is known	tor from 7 89.07 190 x Vd,n 105.18 15.78 /WHRS nter 110 nstantar wn (kWh	89.07 n x nm x E 97.47 enter 0 in 14.62 storage litres in neous con/day):	93.03 97m / 3600 111.84 boxes (46) 16.78 within sa (47) embi boil	96.99 2 kWh/mor 113.18 2 to (61) 16.98 ame ves ers) ente	100.95 Total = Su nth (see Ta 131.9 Total = Su 19.79 sel	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ = 21.6	108.87 c, 1d) 156.35 23.45 0		(4)
ergy content of the property of the restorage orage volunt community is therwise if neater storage orage volunt community is therwise if neater storage or the restorage of the	104.91 f hot water 141.2 vater heatin 21.18 c loss: ne (litres) neating a costored c loss: turer's defactor from water turer's defage loss	100.95 used - calc 145.71 ng at point 21.86 includin nd no ta hot wate eclared le m Table storage eclared c factor fr	96.99 culated mo 127.03 of use (no 19.05 ag any so nk in dw er (this in coss facto 2b , kWh/ye cylinder I com Tabl	93.03 onthly = 4. 121.89 o hot water 18.28 olar or W velling, e ncludes i or is known	tor from 7 89.07 190 x Vd,n 105.18 15.78 /WHRS nter 110 nstantar wn (kWh	89.07 n x nm x E 97.47 enter 0 in 14.62 storage litres in neous con/day):	93.03 97m / 3600 111.84 boxes (46) 16.78 within sa (47) embi boil	96.99 2 kWh/mor 113.18 2 to (61) 16.98 ame ves ers) ente	100.95 Total = Su nth (see Ta 131.9 Total = Su 19.79 sel	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ = 21.6	108.87 = c, 1d) 156.35 = 23.45		(4)
ergy content of instantaneous with a storage volunt community in the wise if nater storage in the manufacture in the water storage in t	104.91 f hot water 141.2 vater heatin 21.18 c loss: ne (litres) neating a o stored e loss: turer's defactor fro om water turer's derage loss neating s	100.95 used - calc 145.71 145.71 21.86 including the including the twater of the including the i	96.99 culated mo 127.03 of use (no 19.05 ag any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl	93.03 onthly = 4. 121.89 o hot water 18.28 olar or W velling, e ncludes i or is known	tor from 7 89.07 190 x Vd,n 105.18 15.78 /WHRS nter 110 nstantar wn (kWh	89.07 n x nm x E 97.47 enter 0 in 14.62 storage litres in neous con/day):	93.03 97m / 3600 111.84 boxes (46) 16.78 within sa (47) embi boil	96.99 2 kWh/mor 113.18 2 to (61) 16.98 ame ves ers) ente	100.95 Total = Su nth (see Ta 131.9 Total = Su 19.79 sel	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ = 21.6	108.87 = c, 1d) 156.35 = 23.45 0		(4)
ergy content of the property o	104.91 f hot water 141.2 vater heatin 21.18 c loss: ne (litres) neating a o stored c loss: turer's defactor fro om water turer's derage loss neating s from Tal	100.95 used - calc 145.71 ng at point 21.86 includin nd no ta hot wate eclared le m Table storage eclared of factor fr ee section ble 2a	96.99 culated model 127.03 of use (not 19.05) ag any so the in dweer (this in oss factor 2b) kWh/ye cylinder I com Tablon 4.3	93.03 onthly = 4. 121.89 o hot water 18.28 olar or W velling, e ncludes i or is known	tor from 7 89.07 190 x Vd,n 105.18 15.78 /WHRS nter 110 nstantar wn (kWh	89.07 n x nm x E 97.47 enter 0 in 14.62 storage litres in neous con/day):	93.03 97m / 3600 111.84 boxes (46) 16.78 within sa (47) embi boil	96.99 2 kWh/mor 113.18 2 to (61) 16.98 ame ves ers) ente	100.95 Total = Su nth (see Ta 131.9 Total = Su 19.79 sel	104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ = 21.6	108.87 c, 1d) 156.35 23.45 0 0 0		(4) (4) (4) (5) (5) (5) (5) (5) (5)
4)m= 108.87 nergy content o 5)m= 161.45 instantaneous v	104.91 f hot water 141.2 vater heatin 21.18 c loss: ne (litres) neating a constored construction from water from water factor from Tal factor from Tal factor from Tal	100.95 used - calc 145.71 145.71 21.86 including and no talc hot water eclared least storage eclared of factor from the security of the se	96.99 culated model 127.03 of use (not 19.05) ag any so the index (this ind	93.03 onthly = 4. 121.89 o hot water 18.28 clar or W velling, e ncludes i or is known ear oss facte le 2 (kW)	tor from 7 89.07 190 x Vd,n 105.18 15.78 /WHRS nter 110 nstantar wn (kWh	89.07 n x nm x E 97.47 enter 0 in 14.62 storage litres in neous con/day): known:	93.03 97m / 3600 111.84 boxes (46) 16.78 within sa (47) embi boil	96.99 0 kWh/mor 113.18 0 to (61) 16.98 ame ves ers) ente	100.95 Total = Su tth (see Ta 131.9 Total = Su 19.79 sel er '0' in (104.91 m(44) ₁₁₂ = ables 1b, 1 143.98 m(45) ₁₁₂ = 21.6	108.87 = c, 1d) 156.35 = 23.45 0		

Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylind	er contains	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primai	ry circuit	loss (an	nual) fro	om Table	e 3							0		(58)
Prima	ry circuit	loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				•	
(mo	dified by	factor fr	om Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Comb	i loss cal	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	50.96	46.03	50.96	47.83	47.41	43.93	45.39	47.41	47.83	50.96	49.32	50.96		(61)
Total h	neat requ	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	212.41	187.23	196.67	174.86	169.3	149.11	142.86	159.25	161.01	182.86	193.29	207.31		(62)
Solar D	HW input of	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from wa	ater hea	ter									•	•	
(64)m=	212.41	187.23	196.67	174.86	169.3	149.11	142.86	159.25	161.01	182.86	193.29	207.31		
						!		Outp	out from wa	ater heate	r (annual) ₁	12	2136.16	(64)
Heat g	gains froi	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	κ [(46)m	+ (57)m	+ (59)m]	_
(65)m=	66.42	58.46	61.19	54.2	52.38	45.95	43.76	49.04	49.59	56.6	60.2	64.73	_	(65)
inclu	ude (57)	m in calc	rulation (of (CE)		<u> </u>		!				ļ.		
			Julation	ווו(כס) וכ	only if c	:vlinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	, ,				•	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
	ternal ga	ains (see	Table 5	and 5a	•	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
	ternal ga	ains (see s (Table	Table 5	and 5a):		ı			ı	ı		eating	
	ternal ga	ains (see	Table 5	and 5a	•	Jun 136.36	Jul 136.36	Aug 136.36	Sep	Oct	Nov	Dec	eating	(66)
Metab	ternal gain Jan 136.36	s (Table Feb 136.36	Table 5 5), Wat Mar 136.36	and 5a ts Apr 136.36	May	Jun 136.36	Jul 136.36	Aug 136.36	Sep 136.36	Oct	Nov	Dec	eating	(66)
Metab (66)m= Lightin	ternal ga olic gain Jan	s (Table Feb 136.36	Table 5 5), Wat Mar 136.36	and 5a ts Apr 136.36	May	Jun 136.36	Jul 136.36	Aug 136.36	Sep 136.36	Oct	Nov	Dec	eating	(66) (67)
Metab (66)m= Lightir (67)m=	ternal gain olic gain Jan 136.36 ng gains	s (Table Feb 136.36 (calculat	Table 5 5), Wat Mar 136.36 ted in Ap	ts Apr 136.36 Appendix 12.39	May 136.36 L, equat	Jun 136.36 ion L9 o	Jul 136.36 r L9a), a 8.45	Aug 136.36 Iso see	Sep 136.36 Table 5	Oct 136.36	Nov 136.36	Dec 136.36	eating	, ,
Metab (66)m= Lightir (67)m= Applia	olic gain Jan 136.36 ng gains 22.66 nces gai	s (Table Feb 136.36 (calculat 20.13	Table 5 : 5), Wat Mar 136.36 ted in Ap 16.37 ulated in	ts Apr 136.36 ppendix 12.39 Appendix	May 136.36 L, equat 9.26	Jun 136.36 ion L9 o 7.82 uation L	Jul 136.36 r L9a), a 8.45 13 or L1	Aug 136.36 Iso see 10.98 3a), also	Sep 136.36 Table 5 14.74 see Ta	Oct 136.36 18.72 ble 5	Nov 136.36 21.85	Dec 136.36	neating	(67)
Metab (66)m= Lightir (67)m= Applia (68)m=	olic gain Jan 136.36 ng gains 22.66 nces gai	s (Table Feb 136.36 (calculat 20.13 ins (calculated)	Table 5 5), Wat Mar 136.36 ted in Ap 16.37 ulated in 250.2	ts	May 136.36 L, equat 9.26 dix L, eq	Jun 136.36 ion L9 o 7.82 uation L 201.39	Jul 136.36 r L9a), a 8.45 13 or L1	Aug 136.36 Iso see 10.98 3a), also	Sep 136.36 Table 5 14.74 see Ta 194.19	Oct 136.36 18.72 ble 5 208.34	Nov 136.36	Dec 136.36	neating	` '
Metab (66)m= Lightin (67)m= Applia (68)m= Cookin	ternal gain Jan 136.36 ng gains 22.66 nces gain 254.21	s (Table Feb 136.36 (calculat 20.13 ins (calculat 256.85 (calculat	Table 5 5), Wat Mar 136.36 ted in Ap 16.37 ulated in 250.2 ted in Ap	Apr 136.36 ppendix 12.39 Append 236.05 ppendix	May 136.36 L, equat 9.26 dix L, eq 218.18 L, equat	Jun 136.36 ion L9 of 7.82 uation L 201.39	Jul 136.36 r L9a), a 8.45 13 or L1 190.18 or L15a	Aug 136.36 Iso see 10.98 3a), also 187.54), also se	Sep 136.36 Table 5 14.74 o see Ta 194.19 ee Table	Oct 136.36 18.72 ble 5 208.34	Nov 136.36 21.85	Dec 136.36 23.29 242.99	eating	(67) (68)
Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m=	olic gain Jan 136.36 ng gains 22.66 nces gai 254.21 ng gains 36.64	s (Table Feb 136.36 (calculat 20.13 ins (calculat 256.85 (calculat 36.64	Mar 136.36 ted in Ap 16.37 ulated in 250.2 ted in Ap 36.64	ts	May 136.36 L, equat 9.26 dix L, eq	Jun 136.36 ion L9 o 7.82 uation L 201.39	Jul 136.36 r L9a), a 8.45 13 or L1	Aug 136.36 Iso see 10.98 3a), also	Sep 136.36 Table 5 14.74 see Ta 194.19	Oct 136.36 18.72 ble 5 208.34	Nov 136.36 21.85	Dec 136.36	eating	(67)
Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps	olic gain Jan 136.36 ng gains 22.66 nces gai 254.21 ng gains 36.64 s and far	s (Table Feb 136.36 (calculat 20.13 ins (calculat 256.85 (calcula 36.64 ns gains	Table 5 S), Wat Mar 136.36 ted in Ap 16.37 ulated in 250.2 ted in A 36.64 (Table 5	ts Apr 136.36 ppendix 12.39 Appendix 236.05 ppendix 36.64 5a)	May 136.36 L, equat 9.26 dix L, eq 218.18 L, equat 36.64	Jun 136.36 ion L9 of 7.82 uation L 201.39 tion L15 36.64	Jul 136.36 r L9a), a 8.45 13 or L1 190.18 or L15a 36.64	Aug 136.36 Iso see 10.98 3a), also 187.54), also se 36.64	Sep 136.36 Table 5 14.74 o see Ta 194.19 ee Table 36.64	Oct 136.36 18.72 ble 5 208.34 5 36.64	Nov 136.36 21.85 226.2	Dec 136.36 23.29 242.99	eating	(67) (68) (69)
Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m=	olic gain Jan 136.36 ng gains 22.66 nces gain 254.21 ng gains 36.64 s and far	s (Table Feb 136.36 (calculat 20.13 ins (calculat 256.85 (calculat 36.64 ns gains	136.36 ted in Ap 16.37 ulated in 250.2 ted in A 36.64 (Table 5	136.36 ppendix 12.39 Appendix 236.05 ppendix 36.64 5a)	May 136.36 L, equat 9.26 dix L, eq 218.18 L, equat 36.64	Jun 136.36 ion L9 of 7.82 uation L 201.39 tion L15 36.64	Jul 136.36 r L9a), a 8.45 13 or L1 190.18 or L15a	Aug 136.36 Iso see 10.98 3a), also 187.54), also se	Sep 136.36 Table 5 14.74 o see Ta 194.19 ee Table	Oct 136.36 18.72 ble 5 208.34	Nov 136.36 21.85	Dec 136.36 23.29 242.99	eating	(67) (68)
Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses	olic gain Jan 136.36 ng gains 22.66 nces gain 254.21 ng gains 36.64 s and far 3 s e.g. ev	s (Table Feb 136.36 (calculate 20.13 ins (calculate 256.85 (calculate 36.64 ns gains 3	Table 5 S), Wat Mar 136.36 ted in Ap 16.37 ulated in 250.2 ted in Ap 36.64 (Table 5	ts	May 136.36 L, equat 9.26 dix L, eq 218.18 L, equat 36.64 3 es) (Tab	Jun 136.36 ion L9 of 7.82 uation L 201.39 tion L15 36.64	Jul 136.36 r L9a), a 8.45 13 or L1 190.18 or L15a 36.64	Aug 136.36 Iso see 10.98 3a), also 187.54), also se 36.64	Sep 136.36 Table 5 14.74 See Ta 194.19 ee Table 36.64	Oct 136.36 18.72 ble 5 208.34 5 36.64	Nov 136.36 21.85 226.2 36.64	Dec 136.36 23.29 242.99 36.64	neating	(67) (68) (69) (70)
Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	olic gain Jan 136.36 ng gains 22.66 nces gain 254.21 ng gains 36.64 s and far 3 s e.g. ev	s (Table Feb 136.36 (calculate 20.13 ins (calculate 256.85 (calculate 36.64 ns gains 3 raporatio -109.09	136.36 ted in Ap 16.37 ulated in 250.2 ted in Ap 36.64 (Table 5 3 on (negative)	136.36 ppendix 12.39 Appendix 236.05 ppendix 36.64 5a)	May 136.36 L, equat 9.26 dix L, eq 218.18 L, equat 36.64	Jun 136.36 ion L9 of 7.82 uation L 201.39 tion L15 36.64	Jul 136.36 r L9a), a 8.45 13 or L1 190.18 or L15a 36.64	Aug 136.36 Iso see 10.98 3a), also 187.54), also se 36.64	Sep 136.36 Table 5 14.74 o see Ta 194.19 ee Table 36.64	Oct 136.36 18.72 ble 5 208.34 5 36.64	Nov 136.36 21.85 226.2	Dec 136.36 23.29 242.99	neating	(67) (68) (69)
Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	olic gain Jan 136.36 ng gains 22.66 nces gai 254.21 ng gains 36.64 s and far 3 s e.g. ev -109.09 heating	s (Table Feb 136.36 (calculat 20.13 ins (calculat 36.64 ins gains 3 raporatio -109.09 gains (T	136.36 ted in Ap 16.37 ulated in 250.2 ted in A 36.64 (Table 5 3 on (negation) -109.09	ts Apr 136.36 ppendix 12.39 Appendix 236.05 ppendix 36.64 5a) 3 tive valu -109.09	May 136.36 L, equat 9.26 dix L, eq 218.18 L, equat 36.64 3 es) (Tab	Jun 136.36 ion L9 oi 7.82 uation L 201.39 tion L15 36.64 3 ole 5) -109.09	Jul 136.36 r L9a), a 8.45 13 or L1 190.18 or L15a 36.64	Aug 136.36 Iso see 10.98 3a), also 187.54), also se 36.64	Sep 136.36 Table 5 14.74 See Ta 194.19 ee Table 36.64	Oct 136.36 18.72 ble 5 208.34 5 36.64	Nov 136.36 21.85 226.2 36.64 3	Dec 136.36 23.29 242.99 36.64 3	eating	(67) (68) (69) (70) (71)
Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	olic gain Jan 136.36 ng gains 22.66 nces gai 254.21 ng gains 36.64 s and far 3 s e.g. ev -109.09 heating 89.28	s (Table Feb 136.36 (calculate 20.13 ins (calculate 36.64 ins gains 3 raporatio -109.09 gains (Table 86.99	136.36 ted in Ap 16.37 ulated in 250.2 ted in Ap 36.64 (Table 5 3 in (negation) 109.09 Table 5) 82.24	ts	May 136.36 L, equat 9.26 dix L, eq 218.18 L, equat 36.64 3 es) (Tab	Jun 136.36 ion L9 of 7.82 uation L 201.39 tion L15 36.64 3 ble 5) -109.09	Jul 136.36 r L9a), a 8.45 13 or L1 190.18 or L15a 36.64 3	Aug 136.36 Iso see 10.98 3a), also 187.54), also se 36.64 3	Sep 136.36 Table 5 14.74 See Ta 194.19 ee Table 36.64 3	Oct 136.36 18.72 ble 5 208.34 5 36.64 3 -109.09	Nov 136.36 21.85 226.2 36.64 3	Dec 136.36 23.29 242.99 36.64 3 -109.09	eating	(67) (68) (69) (70)
Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total	olic gain Jan 136.36 ng gains 22.66 nces gain 254.21 ng gains 36.64 s and far 3 s e.g. ev -109.09 heating 89.28 internal	s (Table Feb 136.36 (calculat 20.13 ins (calculat 256.85 (calcula 36.64 ns gains 3 raporatio -109.09 gains (T 86.99 gains =	Table 5 5), Wat Mar 136.36 ted in Ap 16.37 ulated in 250.2 ted in A 36.64 (Table 5 3 on (negation) -109.09 Table 5) 82.24	and 5a ts Apr 136.36 ppendix 12.39 Appendix 236.05 ppendix 36.64 5a) 3 tive valu -109.09	May 136.36 L, equat 9.26 dix L, eq 218.18 L, equat 36.64 3 es) (Tab -109.09	Jun 136.36 ion L9 of 7.82 uation L 201.39 tion L15 36.64 3 ole 5) -109.09	Jul 136.36 r L9a), a 8.45 13 or L1 190.18 or L15a 36.64 3 -109.09	Aug 136.36 Iso see 10.98 3a), also 187.54), also se 36.64 3 -109.09	Sep 136.36 Table 5 14.74 See Ta 194.19 See Table 36.64 3 -109.09	Oct 136.36 18.72 ble 5 208.34 5 36.64 3 -109.09 76.07 (70)m + (7	Nov 136.36 21.85 226.2 36.64 3 -109.09 83.61 1)m + (72	Dec 136.36 23.29 242.99 36.64 3 -109.09 87	neating	(67) (68) (69) (70) (71) (72)
Metab (66)m= Lightin (67)m= Applia (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total (73)m=	olic gain Jan 136.36 ng gains 22.66 nces gain 254.21 ng gains 36.64 s and far 3 s e.g. ev -109.09 heating 89.28 internal	s (Table Feb 136.36 (calcular 20.13 ins (calcular 36.64 ins gains 3 aporatio -109.09 gains (T 86.99 gains = 430.87	136.36 ted in Ap 16.37 ulated in 250.2 ted in Ap 36.64 (Table 5 3 in (negation) 109.09 Table 5) 82.24	ts Apr 136.36 ppendix 12.39 Appendix 236.05 ppendix 36.64 5a) 3 tive valu -109.09	May 136.36 L, equat 9.26 dix L, eq 218.18 L, equat 36.64 3 es) (Tab	Jun 136.36 ion L9 of 7.82 uation L 201.39 tion L15 36.64 3 ble 5) -109.09	Jul 136.36 r L9a), a 8.45 13 or L1 190.18 or L15a 36.64	Aug 136.36 Iso see 10.98 3a), also 187.54), also se 36.64 3	Sep 136.36 Table 5 14.74 See Ta 194.19 ee Table 36.64 3	Oct 136.36 18.72 ble 5 208.34 5 36.64 3 -109.09	Nov 136.36 21.85 226.2 36.64 3	Dec 136.36 23.29 242.99 36.64 3 -109.09	neating	(67) (68) (69) (70) (71)

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

Orientation: Access Fact Table 6d	or	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x} 0.77	x	6.4	x	11.28	x	0.5	x	0.7] =	17.51	(75)
Northeast 0.9x 0.77	X	1.2	x	11.28	x	0.5	x	0.7] =	6.57	(75)
Northeast 0.9x 0.77	X	8.58	x	11.28	x	0.5	x	0.7] =	23.48	(75)
Northeast 0.9x 0.77	X	6.4	x	22.97	x	0.5	x	0.7] =	35.65	(75)
Northeast 0.9x 0.77	X	1.2	x	22.97	x	0.5	x	0.7] =	13.37	(75)
Northeast 0.9x 0.77	X	8.58	x	22.97	x	0.5	x	0.7] =	47.8	(75)
Northeast _{0.9x} 0.77	X	6.4	x	41.38	x	0.5	x	0.7	=	64.23	(75)
Northeast 0.9x 0.77	X	1.2	X	41.38	X	0.5	X	0.7] =	24.09	(75)
Northeast _{0.9x} 0.77	X	8.58	x	41.38	x	0.5	X	0.7] =	86.11	(75)
Northeast _{0.9x} 0.77	X	6.4	X	67.96	X	0.5	X	0.7	=	105.49	(75)
Northeast 0.9x 0.77	X	1.2	x	67.96	x	0.5	X	0.7	=	39.56	(75)
Northeast 0.9x 0.77	X	8.58	x	67.96	x	0.5	X	0.7] =	141.42	(75)
Northeast _{0.9x} 0.77	X	6.4	X	91.35	X	0.5	X	0.7	=	141.8	(75)
Northeast _{0.9x} 0.77	X	1.2	x	91.35	X	0.5	X	0.7] =	53.17	(75)
Northeast 0.9x 0.77	X	8.58	x	91.35	x	0.5	x	0.7] =	190.1	(75)
Northeast _{0.9x} 0.77	X	6.4	x	97.38	x	0.5	x	0.7	=	151.17	(75)
Northeast _{0.9x} 0.77	X	1.2	x	97.38	X	0.5	X	0.7] =	56.69	(75)
Northeast 0.9x 0.77	X	8.58	x	97.38	x	0.5	x	0.7] =	202.66	(75)
Northeast _{0.9x} 0.77	X	6.4	x	91.1	x	0.5	x	0.7	=	141.42	(75)
Northeast 0.9x 0.77	X	1.2	x	91.1	x	0.5	x	0.7] =	53.03	(75)
Northeast 0.9x 0.77	×	8.58	x	91.1	x	0.5	x	0.7] =	189.59	(75)
Northeast 0.9x 0.77	X	6.4	x	72.63	x	0.5	x	0.7] =	112.74	(75)
Northeast _{0.9x} 0.77	X	1.2	x	72.63	x	0.5	x	0.7] =	42.28	(75)
Northeast 0.9x 0.77	X	8.58	x	72.63	x	0.5	x	0.7] =	151.14	(75)
Northeast _{0.9x} 0.77	X	6.4	X	50.42	X	0.5	X	0.7] =	78.27	(75)
Northeast 0.9x 0.77	X	1.2	x	50.42	x	0.5	X	0.7] =	29.35	(75)
Northeast 0.9x 0.77	X	8.58	x	50.42	X	0.5	X	0.7] =	104.93	(75)
Northeast 0.9x 0.77	X	6.4	X	28.07	X	0.5	X	0.7] =	43.57	(75)
Northeast 0.9x 0.77	X	1.2	x	28.07	x	0.5	X	0.7] =	16.34	(75)
Northeast _{0.9x} 0.77	X	8.58	X	28.07	X	0.5	X	0.7	=	58.41	(75)
Northeast _{0.9x} 0.77	X	6.4	X	14.2	X	0.5	X	0.7] =	22.04	(75)
Northeast 0.9x 0.77	X	1.2	x	14.2	x	0.5	x	0.7] =	8.26	(75)
Northeast _{0.9x} 0.77	X	8.58	X	14.2	X	0.5	X	0.7	=	29.54	(75)
Northeast _{0.9x} 0.77	X	6.4	X	9.21	X	0.5	X	0.7] =	14.3	(75)
Northeast _{0.9x} 0.77	X	1.2	×	9.21	x	0.5	x	0.7] =	5.36	(75)
Northeast _{0.9x} 0.77	X	8.58	x	9.21	x	0.5	x	0.7] =	19.18	(75)
Northwest _{0.9x} 0.77	X	1.39	x	11.28	x	0.63	x	0.7] =	19.17	(81)
Northwest _{0.9x} 0.77	X	1.39	x	22.97	x	0.63	x	0.7] =	39.03	(81)
Northwest _{0.9x} 0.77	X	1.39	×	41.38	×	0.63	X	0.7	=	70.31	(81)

Northwest _{0.9x}	0.77	×	1.3	39	x	6	7.96	X		0.63	x	0.7	=	115.47	(81)
Northwest _{0.9x}	0.77	x	1.3	39	x	9	1.35	X		0.63	x	0.7	=	155.22	(81)
Northwest _{0.9x}	0.77	X	1.3	39	x	9	7.38	X		0.63	х	0.7		165.48	(81)
Northwest _{0.9x}	0.77	X	1.3	39	x	9	91.1	x		0.63	х	0.7	-	154.8	(81)
Northwest _{0.9x}	0.77	Х	1.3	39	x	7:	2.63	x		0.63	x	0.7	_ =	123.41	(81)
Northwest _{0.9x}	0.77	x	1.3	39	x	5	0.42	X		0.63	x	0.7		85.68	(81)
Northwest 0.9x	0.77	x	1.3	39	х	2	8.07	x		0.63	_ x [0.7		47.69	(81)
Northwest _{0.9x}	0.77	x	1.3	39	x	1	4.2	x		0.63	_ x [0.7		24.12	(81)
Northwest _{0.9x}	0.77	x	1.3	39	x	g	9.21	X		0.63	- x -	0.7	╡ :	15.66	(81)
_															
Solar gains in	watts. ca	alculated	l for eac	h month				(83)m	า = Sเ	um(74)m .	(82)m				
(83)m= 66.74	135.84	244.74	401.94	540.29		76	538.84	429		298.22	166.01	83.97	54.5	\neg	(83)
Total gains – i	nternal a	and solar	(84)m =	= (73)m ·	+ (8		watts					<u> </u>			
(84)m= 499.79	566.71	660.46	792.56	905.05	91	5.95	863.19	760	.92	642.94	536.05	482.54	474.69)	(84)
7 Magninter	nol tomr	oratura	/hooting			!		<u> </u>					<u> </u>		
7. Mean inter	•		,		<i>'</i>			-I- O	The	4 (%C)					(OE)
Temperature	Ū	٠.			•			ріе 9,	, in	1 (10)				21	(85)
Utilisation fac	T Š			1	È	. 1		г.				T	ι	\neg	
Jan	Feb	Mar	Apr	May	_	Jun	Jul	_	ug	Sep	Oct	Nov	Dec		(0.0)
(86)m= 1	1	0.99	0.98	0.95	0	.87	0.76	0.8	32	0.95	0.99	1	1		(86)
Mean interna	l temper	ature in	living ar	ea T1 (fo	ollo	w step	os 3 to 7	in T	able	e 9c)					
(87)m= 18.69	18.85	19.19	19.71	20.23	20	0.65	20.85	20.	.8	20.42	19.78	19.17	18.68		(87)
Temperature	durina h	neating p	eriods ir	n rest of	dwe	ellina	from Ta	able 9	9. Tł	n2 (°C)					
(88)m= 19.33	19.34	19.34	19.36	19.37	_	9.39	19.39	19.	_	19.38	19.37	19.36	19.35	7	(88)
1.1600				112				O - /				ı			
Utilisation fac			0.97			Ť		<u> </u>	·- T	0.01	0.00	1 4	1 1	¬	(89)
(89)m= 1	1	0.99	0.97	0.92	L	.77	0.56	0.6	00	0.91	0.99	1	1		(69)
Mean interna	l temper	ature in	the rest	of dwell	ing	T2 (fc	ollow ste	ps 3	to 7	in Tabl	e 9c)			_	
(90)m= 17.3	17.46	17.8	18.33	18.83	19	9.22	19.35	19.	33	19.03	18.41	17.79	17.3		(90)
										f	LA = Livir	ng area ÷ (4) =	0.32	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	llinc	a) = fL	_A × T1	+ (1	– fL	A) × T2					
(92)m= 17.75	17.91	18.25	18.77	19.28	T	9.68	19.84	19		19.48	18.85	18.24	17.75	7	(92)
Apply adjustr	nent to t	he mean	interna		atur	re fro	m Table	4e.	—— whe	re appro	opriate	ı	<u> </u>	_	
(93)m= 17.75	17.91	18.25	18.77	19.28	_	9.68	19.84	19.		19.48	18.85	18.24	17.75	7	(93)
8. Space hea	itina real	uirement		l											
Set Ti to the				re obtair	ned	at ste	en 11 of	Tabl	le 9h	so tha	t Ti m=	76)m an	d re-ca	lculate	
the utilisation			•			ar ore	γ ρ 1 1 0 1			, 00 a.a	,	, , o , a	4.00		
Jan	Feb	Mar	Apr	May	Γ,	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	;	
Utilisation fac	tor for g	ains, hm	:		•			•		-		•			
(94)m= 1	0.99	0.99	0.97	0.91	0	.79	0.63	0.1	7	0.91	0.98	0.99	1	7	(94)
Useful gains,	hmGm	, W = (94	1)m x (8	4)m	•									_	
(95)m= 498.19	563.76	653.09	767.89	826.68	72	25.49	541.91	536	.17	586.46	526.86	480.09	473.44	Į .	(95)
Monthly aver	age exte	rnal tem	perature	from T	able	 8 =						•		_	
(96)m= 4.3	4.9	6.5	8.9	11.7	_	4.6	16.6	16.	.4	14.1	10.6	7.1	4.2	7	(96)
Heat loss rate	e for me	an intern	al temp	erature,	Lm	, W =	[(39)m	x [(9	3)m-	– (96)m]	•		_	
(97)m= 2656.96	2560.95	2305.23	1904.46	1457.63	96	2.25	612.7	642	.82	1024.03	1586.01	2154.77	2639.0	8	(97)
	•	•				!									

Space heating requirem (98)m= 1606.13 1342.11 1	229.2	818.33	10nth, KV 469.42	/Vn/moni	h = 0.02	24 x [(97))m – (95 0)m] x (4 ⁻⁷		1611.24		
(90)111- 1000.13 1342.11 1	229.2	010.33	409.42	U	U	•	•	(kWh/year			9070.2	(98)
Space heating requirem	ent in	kWh/m²	/year				. ,		,		91.9	(99)
9a. Energy requirements	– Indi	vidual h	eating sv	/stems i	ncluding	micro-C	HP)			L		
Space heating:					<u>_</u>		<i>'</i>					
Fraction of space heat for	rom se	econdar	y/supple	mentary	system						0	(201)
Fraction of space heat for	rom m	ain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating	from r	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space	e heati	ng syste	em 1								90.3	(206)
Efficiency of secondary/	supple/	ementar	y heating	g system	ı, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirem	`							1				
1606.13 1342.11 1	229.2	818.33	469.42	0	0	0	0	788.01	1205.76	1611.24		
(211) m = {[(98)m x (204)]				_	_	_	_					(211)
1778.66 1486.28 13	361.24	906.24	519.85	0	0	0 Tota	0	872.65	1335.29	1784.32		7(044)
0 1 " 6 1/		\ 1.14 <i>1</i> 1.7				Tota	i (Kvvii/yea	ar) =Sum(2	2 I I) _{15,1012}	L	10044.51	(211)
Space heating fuel (sec $= \{[(98)m \times (201)]\} \times 100$	-	•	month									
$ \frac{(215)m}{(215)m} = $	0	0	0	0	0	0	0	0	0	0		
, ,	!					Tota	l (kWh/yea	L ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating										L		
Output from water heater	(calcu	ulated al	oove)									
	96.67	174.86	169.3	149.11	142.86	159.25	161.01	182.86	193.29	207.31		_
Efficiency of water heater											81	(216)
` '	38.89	88.51	87.63	81	81	81	81	88.39	88.89	89.13		(217)
Fuel for water heating, kV (219)m = (64) m x 100 ÷												
` '	21.24	197.56	193.19	184.08	176.37	196.61	198.78	206.88	217.45	232.59		
	•					Tota	I = Sum(2	19a) ₁₁₂ =			2473.38	(219)
Annual totals								k\	Wh/year	· -	kWh/yea	r_
Space heating fuel used,	main	system	1								10044.51	
Water heating fuel used											2473.38	
Electricity for pumps, fan	s and	electric	keep-hot	t						_		
central heating pump:										30		(230
Total electricity for the ab	ove, k	:Wh/yea	r			sum	of (230a).	(230g) =			30	(231)
Electricity for lighting										Ī	400.23	(232)
										_		_

Energy

kWh/year

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Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	2169.61	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	534.25	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2703.87	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting	(232) x	0.519	=	207.72	(268)
Total CO2, kg/year	sum	of (265)(271) =		2927.16	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =		29.66	(273)
El rating (section 14)				73	(274)

			llser [Details:						
Assessor Name:	Chris Hock	nell	O3CFL	Strom	a Nive	bor:		QTD()	016363	
Software Name:	Stroma FS			Softwa					on: 1.0.4.26	
Software Name:	Stionia FS/	AP 2012	Durana					versic	JII. 1.0. 4 .20	
A 1.1	FI-40 0 1 in	alfialal Oamalan	Property			_ean				
Address :		dfield Garder	is, LONDO	JN, NVV3	6PU					
1. Overall dwelling dime	ensions:		_							. .
0				a(m²)	L., ,		ight(m)	_	Volume(m ³	<u>.</u>
Ground floor			(39.67	(1a) x	,	3.1	(2a) =	122.98	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+((1n) (39.67	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	122.98	(5)
2. Ventilation rate:										
	main heating	second heatin		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+	0] = [0	Х	40 =	0	(6a)
Number of open flues	0	+ 0		0	Ī = [0	x	20 =	0	(6b)
Number of intermittent fa	ans					2	x	10 =	20	(7a)
Number of passive vents	5				F	0	x	10 =	0	(7b)
Number of flueless gas f	ires				F	0	x	40 =	0	(7c)
· ·					L				-	`
								Air ch	anges per ho	our
Infiltration due to chimne	eys, flues and fa	ans = $(6a)+(6b)$	+(7a)+(7b)+	(7c) =		20		÷ (5) =	0.16	(8)
If a pressurisation test has l			eed to (17),	otherwise (continue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns	5)							0	(9)
Additional infiltration							[(9])-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or	timber frame	or 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are p deducting areas of openi			g to the grea	ter wall are	a (after					
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dra	aught stripped	i						0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic me	tres per h	our per s	quare m	etre of e	envelope	area	10	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	+(8), otherw	rise (18) =	(16)				0.66	(18)
Air permeability value applie	es if a pressurisatio	n test has been o	done or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x ([*]	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18) x (20) =				0.56	(21)
Infiltration rate modified	for monthly win	d speed				,			•	
Jan Feb	Mar Apr	May Jur	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	/2\m ÷ 1									
(22a)m = 1 27 1 25		1.00 0.05	1 0.05	T 0.02			1	1	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltration rate (allowing for shelted) 0.72	.61 0.54	0.54	0.52	0.56	0.61	0.63	0.66		
Calculate effective air change rate for the a	l l	l					1		
If mechanical ventilation:								0	(2
If exhaust air heat pump using Appendix N, (23b)) = (23a)			0	(2
If balanced with heat recovery: efficiency in % allow	_							0	(2
a) If balanced mechanical ventilation with		- ` ` 	- ´ ` -	ŕ	 		1 ` ` `	÷ 100]	(0
, <u> </u>	0 0	0	0	0	0	0	0		(2
b) If balanced mechanical ventilation with		- 	 	``	 			1	(2
,	0 0	0	0	0	0	0	0		(2
c) If whole house extract ventilation or point if $(22b)m < 0.5 \times (23b)$, then $(24c) =$	•				5 × (23b	o)			
	0 0	0	0	0	0	0	0		(2
d) If natural ventilation or whole house p	ositive input	ventilatio	on from I	oft	Į.	!	ļ	l	
if (22b)m = 1, then (24d)m = (22b)m	otherwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			•	
24d)m= 0.76 0.75 0.74 0.69 0.	.68 0.64	0.64	0.64	0.66	0.68	0.7	0.72		(2
Effective air change rate - enter (24a) or	` 	c) or (24		`				ı	
25)m= 0.76 0.75 0.74 0.69 0.	.68 0.64	0.64	0.64	0.66	0.68	0.7	0.72		(2
3. Heat losses and heat loss parameter:									
LEMENT Gross Openings	Net Ar		U-val		AXU		k-value		Χk
area (m²) m²	A ,r		W/m2	—	(W/I	K)	kJ/m²·ł	ξ Κ.	J/K
oors	2.2	×	1.3	= [2.86	=			(2
Vindows Type 1	0.71	= ,	/[1/(1.6)+		1.07	=			(2
Vindows Type 2	6.68	=	/[1/(1.6)+		10.05	릨 ,			(2
loor	39.67	=	0.55		21.818	5[╡	(2
Valls Type1 46.29 7.39	38.9	x	0.55	_ =	21.4	ᆜ !		╡	(2
Valls Type2 23.82 2.2	21.62	2 X	0.55	=	11.89				(2
otal area of elements, m²	109.7	8							(3
arty wall	27.35	5 X	0	= [0			⊣	(;
arty ceiling	39.67								(3
for windows and roof windows, use effective windov include the areas on both sides of internal walls an		ated using	formula 1	/[(1/U-valu	e)+0.04] a	is given in	n paragraph	3.2	
abric heat loss, W/K = S (A x U)	•		(26)(30)	+ (32) =				69.08	(;
eat capacity Cm = S(A x k)				((28)	.(30) + (32	2) + (32a)	(32e) =	9422.38	— (
hermal mass parameter (TMP = Cm ÷ TF	·A) in kJ/m²K	,		Indica	tive Value	: Medium		250	<u> </u>
or design assessments where the details of the con-	struction are not	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
n be used instead of a detailed calculation. hermal bridges : S (L x Y) calculated usin	a Annendix I	K					ı	16.47	<u> </u>
details of thermal bridging are not known (36) = 0.0								10.47	(
otal fabric heat loss	()			(33) +	(36) =			85.54	(:
autilation boot loss salavlated monthly				(38)m	= 0.33 × (25)m x (5)		
entilation heat loss calculated monthly	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	viay Juli							1	
Jan Feb Mar Apr M	7.73 26.1	26.1	25.8	26.73	27.73	28.44	29.18		(
Jan Feb Mar Apr M		-	25.8	<u> </u>	27.73 = (37) + (3	<u> </u>	29.18		(;

Heat loss para	ımeter (I	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 2.93	2.92	2.91	2.86	2.86	2.81	2.81	2.81	2.83	2.86	2.87	2.89		
	ļ	!		<u> </u>	ļ.	ļ.	ļ.		L—————————————————————————————————————	Sum(40) ₁	12 /12=	2.86	(40)
Number of day	/s in mo	nth (Tab	le 1a)	·	-	·	·			1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13		.4		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the a	welling is	designed t			se target o		.39		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pe	r day for ea		<u>_</u>	ctor from	Table 1c x			ļ.	!			
(44)m= 74.13	71.44	68.74	66.04	63.35	60.65	60.65	63.35	66.04	68.74	71.44	74.13		
		•								m(44) ₁₁₂ =	L	808.71	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 109.94	96.15	99.22	86.5	83	71.62	66.37	76.16	77.07	89.82	98.04	106.47		_
If instantaneous w	vater heati	na at noint	of use (no	hot water	r storage)	enter () in	hoxes (46		Total = Su	m(45) ₁₁₂ =	· [1060.35	(45)
								1	10.47	1 44 74	45.07		(46)
(46)m= 16.49 Water storage	14.42 loss:	14.88	12.98	12.45	10.74	9.96	11.42	11.56	13.47	14.71	15.97		(46)
Storage volum) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage					4.344								
a) If manufact				or is kno	wn (kVVI	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro b) If manufact		•			or io not		(48) x (49)) =			0		(50)
Hot water stor			•								0		(51)
If community h	-			`		,							,
Volume factor											0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (. , .	•									0		(55)
Water storage	loss cal	culated f	or each	month	_	_	((56)m = (55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Cambi lasa sa	المعاديما	for ooolo	na a matha d	(64)	(CO)	DGE + /44	\						
Combi loss ca (61)m= 37.78	32.88	35.03	32.57	32.28	29.91	30.91)m 32.2	3 32.57	35.03	35.23	37.78	1	(61)
				<u> </u>					<u> </u>	ļ		(50)=- + (61)=-	(01)
(62)m= 147.71	129.03	134.25	119.07	115.28	101 ea		108.4		124.85	133.27	144.24	(59)m + (61)m 1	(62)
` '	1											J	(02)
Solar DHW input (add additional)									ir contribu	uon to wat	er neaung)		
(63)m= 0	0	0	0	0	0	0	0		0	T 0	0	1	(63)
Output from v	l					1 ,				1 -		J	()
(64)m= 147.71		134.25	119.07	115.28	101.53	97.28	108.4	4 109.64	124.85	133.27	144.24	1	
(0.)	1 .20.00	.020			101100	1 020	L	output from w		<u> </u>		1464.6	(64)
Heat gains fro	m water	heating	kWh/m	onth 0.2	5 ′ [0 8	5 × (45)m						1	J
(65)m= 46	40.19	41.75	36.9	35.67	31.29	29.79	33.3		38.62	41.41	44.84]	(65)
include (57					L		<u> </u>		<u> </u>		<u> </u>] neating	` ,
5. Internal g	•		` ,		yiiiidei		avveiiii	ig or not w	rator io i	10111 0011	initiality i	louting	
Metabolic gai	,			<i>)</i> ·									
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 69.88	69.88	69.88	69.88	69.88	69.88	69.88	69.8		69.88	69.88	69.88	1	(66)
Lighting gains	(calcula	ted in Ar	pendix	L. eguat	ion L9	 or L9a). a	ılso se	e Table 5		1		J	
(67)m= 10.93	9.71	7.9	5.98	4.47	3.77	4.08	5.3	7.11	9.03	10.54	11.24]	(67)
Appliances ga	ins (calc	ulated in	Append	L dix L. ea	uation	 L13 or L1	т <u> </u>	L Iso see Ta	ble 5			J	
(68)m= 120.7	121.96	118.8	112.08	103.6	95.63	90.3	89.0		98.92	107.41	115.38]	(68)
Cooking gains	s (calcula	ıted in Aı	opendix	L. eguat	ion L1	 5 or L15a). also	see Table	5			ı	
(69)m= 29.99	29.99	29.99	29.99	29.99	29.99	29.99	29.9		29.99	29.99	29.99]	(69)
Pumps and fa	ıns gains	(Table 5	ia)	<u> </u>	<u> </u>	1			<u> </u>		Į.	ı	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g. e	vaporatio	n (negat	tive valu	es) (Tab	le 5)	-1			<u> </u>		Į	J	
(71)m= -55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9	-55.9]	(71)
Water heating	gains (T	able 5)		<u> </u>	<u> </u>	-	!		!		ļ	J	
(72)m= 61.83	59.81	56.11	51.26	47.94	43.46	40.05	44.8	3 46.9	51.91	57.51	60.27]	(72)
Total interna	l gains =	<u> </u>			(6	6)m + (67)m	า + (68)	m + (69)m +	(70)m + (7	71)m + (72)m	J	
(73)m= 240.43	, 	229.77	216.28	202.97	189.83	181.39	186.	2 193.18	206.83	222.42	233.85]	(73)
6. Solar gain	is:								ı		·		
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to the	ne applica	ble orienta	tion.		
Orientation:			Area			ux		_ g	_	FF		Gains	
	Table 6d		m²		Ta	able 6a		Table 6b	T	able 6c		(W)	
Southwest _{0.9x}	0.77	X	6.6	88	X	36.79		0.63	x	0.7	=	75.11	(79)
Southwest _{0.9x}	0.77	X	6.6	88	X	62.67		0.63	x	0.7	=	127.95	(79)
Southwest _{0.9x}	0.77	X	6.6	88	x	85.75		0.63	x	0.7	=	175.06	(79)
Southwest _{0.9x}	0.77	X	6.6	88	x	106.25		0.63	x	0.7	=	216.91	(79)
Southwest _{0.9x}	0.77	X	6.6	88	x	119.01] [0.63	x	0.7	=	242.96	(79)

_														
Southwest _{0.9x}	0.77	X	6.6	8	X	1	18.15		0.63	X	0.7	=	241.2	(79)
Southwest _{0.9x}	0.77	X	6.6	8	X	1	13.91		0.63	X	0.7	=	232.55	(79)
Southwest _{0.9x}	0.77	X	6.6	8	X	1	04.39		0.63	X	0.7	=	213.11	(79)
Southwest _{0.9x}	0.77	X	6.6	i8	X	9	2.85		0.63	X	0.7	=	189.56	(79)
Southwest _{0.9x}	0.77	X	6.6	8	X	6	9.27]	0.63	X	0.7	=	141.41	(79)
Southwest _{0.9x}	0.77	X	6.6	8	X	4	4.07		0.63	X	0.7	=	89.97	(79)
Southwest _{0.9x}	0.77	X	6.6	8	X	3	1.49		0.63	X	0.7	=	64.28	(79)
Northwest _{0.9x}	0.77	X	0.7	' 1	x	1	1.28	x	0.63	X	0.7	=	2.45	(81)
Northwest _{0.9x}	0.77	X	0.7	'1	x	2	2.97	x	0.63	X	0.7	=	4.98	(81)
Northwest 0.9x	0.77	X	0.7	'1	x	4	1.38	x	0.63	X	0.7	=	8.98	(81)
Northwest _{0.9x}	0.77	x	0.7	1	X	6	7.96	x	0.63	x	0.7	=	14.75	(81)
Northwest _{0.9x}	0.77	X	0.7	1	X	g	1.35	x	0.63	x	0.7	=	19.82	(81)
Northwest _{0.9x}	0.77	X	0.7	1	х	9	7.38	x	0.63	x	0.7	= =	21.13	(81)
Northwest _{0.9x}	0.77	X	0.7	<u>'1</u>	x	,	91.1	х	0.63	x	0.7	=	19.77	(81)
Northwest _{0.9x}	0.77	X	0.7	<u>'</u> 1	X	7	2.63	х	0.63	x	0.7	=	15.76	(81)
Northwest _{0.9x}	0.77	X	0.7	1	X	5	0.42	x	0.63	X	0.7	=	10.94	(81)
Northwest _{0.9x}	0.77	X	0.7	·1	X	2	8.07	x	0.63	X	0.7	=	6.09	(81)
Northwest _{0.9x}	0.77	X	0.7	<u>'</u> 1	X		14.2	х	0.63	x	0.7	=	3.08	(81)
Northwest _{0.9x}	0.77	X	0.7	·1	X	9	9.21	x	0.63	X	0.7	=	2	(81)
_					'									_
Solar gains in	watts, cal	lculated	for eacl	n month	1			(83)m	n = Sum(74)m	n(82)m	1			
(83)m= 77.56	132.93	184.04	231.66	262.78	26	52.33	252.31	228	.87 200.5	147.	93.05	66.28		(83)
Total gains – i	nternal ar	nd solar	(84)m =	(73)m	+ (8	33)m	, watts							
(84)m= 317.99	371.37	413.82	447.94	465.75	45	52.16	433.7	415	.07 393.68	354.3	315.47	300.14		(84)
7. Mean inter	nal tempe	erature	(heating	seasor	1)									
Temperature	during he	eating p	eriods ir	the livi	ing a	area 1	from Tal	ole 9	Th1 (°C)				21	(85)
Utilisation fac	tor for ga	ins for I	iving are	ea, h1,n	า (ร	ee Ta	ble 9a)							
Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug Sep	Ос	t Nov	Dec		
(86)m= 0.99	0.99	0.98	0.96	0.93	().87	0.77	0.8	8 0.91	0.97	0.99	0.99		(86)
Mean interna	l tempera	ture in l	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)					
(87)m= 18.09	18.32	18.72	19.3	19.88	_	0.41	20.71	20.		19.49	9 18.71	18.07		(87)
Temperature	during he	eating n	eriods ir	rest of	: dw	ellina	from Ta	hle (Th2 (°C)	_ .			•	
(88)m= 18.78	18.79	18.79	18.82	18.82	1	8.85	18.85	18.		1	2 18.81	18.81]	(88)
Litilization for	tor for go	ina far r	oot of d	volling	h2	m (00	L Tabla	.00/	!		!	Ţ	ı	
Utilisation fac	0.98	0.97	0.94	0.88	1).74	0.51	0.5	66 0.82	0.95	0.98	0.99	1	(89)
` '	<u> </u>						<u> </u>			_!	0.00	0.00		()
Mean interna					Ť		i	r i			- 140.07	40.00	1	(00)
(90)m= 16.34	16.56	16.97	17.55	18.11	1	8.59	18.79	18.	78 18.46	17.7	5 16.97 ving area ÷ (16.33	2.2-	(90)
										ILA - LI	villy alea ÷ (-) -	0.85	(91)
Mean interna		`			_			`		1			1	
(92)m= 17.83	18.05	18.46	19.03	19.61		0.14	20.42	20.		19.23		17.81		(92)
Apply adjustr	nent to th	e mean	internal	tempe	ratu	re fro	m Table	4e,	where app	ropriate	•			

_								1				1	ı	
` '	17.83	18.05	18.46	19.03	19.61	20.14	20.42	20.38	19.98	19.23	18.44	17.81		(93)
8. Spac														
			ernal ter or gains :	•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
<u> </u>			ains, hm		iviay	Odii	<u> </u>	l mag	СОР	000	1101	200		
	0.99	0.98	0.97	0.95	0.9	0.83	0.72	0.75	0.88	0.95	0.98	0.99		(94)
L Useful d	gains, h	nmGm ,	W = (94	1)m x (84	4)m		l	<u> </u>	l		l	<u>. </u>	l	
		364.02	400.87	424.01	421.39	374.12	312.22	311.18	345.6	338.12	309.44	296.8		(95)
Monthly	/ avera	ge exte	rnal tem	perature	from Ta	able 8	!				!		l	
(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 los	ss rate	for mea	an intern	al tempe	erature,	Lm , W =	-[(39)m	x [(93)m	– (96)m]		•	'	
(97)m= 15	573.21	1524.2	1381.32	1151.48	896.33	618.29	426.89	443.66	659.66	977.48	1293.04	1561.22		(97)
Space h	neating	require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 9	36.95	779.64	729.45	523.78	353.35	0	0	0	0	475.69	708.19	940.73		_
								Tota	l per year	(kWh/yeaı	·) = Sum(9	8)15,912 =	5447.77	(98)
Space h	neating	require	ement in	kWh/m²	/year								137.33	(99)
9a. Ener	av real	ıiremen	nts — Indi	vidual h	eating s	vstems i	ncludinc	ı micro-C	:HP)					
Space I			no mai	Madairi	caming o	yotomo i	nordanig	, moro c)					
-		-	t from se	econdar	y/supple	mentary	system						0	(201)
			it from m			•	•	(202) = 1 -	- (201) =				1	(202)
			ng from	-	. ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
			_	-				(=0.) (=	o=, [.	(200)]				╡`
	•		ace heat				0/						90.3	(206)
Eπicien	cy or se	econda	ry/supple	ementar	y neating	g systen	1, % 						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
	Ť		ement (c									T	1	
9	36.95	779.64	729.45	523.78	353.35	0	0	0	0	475.69	708.19	940.73		
(211)m =								,				,		(211)
10	037.59	863.39	807.81	580.05	391.31	0	0	0	0	526.78	784.26	1041.78		_
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	2=	6032.97	(211)
-	-	•	econdar		month									
= {[(98)m	<u> </u>	l)]} x 1	· ` `				1				ı		ı	
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water he	_													
Output fr		ter hea	ter (calc 134.25	ulated al	oove) 115.28	101.53	97.28	108.44	109.64	124.05	122.27	144.24		
				119.07	113.20	101.55	97.20	106.44	109.64	124.85	133.27	144.24	0.4	7(246)
Efficiency				00.40	07.00	04			0.4	00.40	00.00	00.04	81	(216)
· · ·	88.91	88.85	88.72	88.42	87.82	81	81	81	81	88.19	88.69	88.94		(217)
Fuel for v (219)m =		•												
(219)m = 1		145.22	151.32	134.67	131.27	125.35	120.1	133.88	135.36	141.56	150.27	162.18		
· / L							I		I = Sum(2:	19a) ₁₁₂ =	I		1697.3	(219)
Annual t	totals										Wh/year	r	kWh/year	」 `
Space he		uel use	ed, main	system	1						. ,		6032.97	7
													1	_

Water heating fuel used				1697.3]
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
Total electricity for the above, kWh/year	sum of (230	a)(230g) =		30	(231)
Electricity for lighting				193.09	(232)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	1303.12	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	366.62	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1669.74	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting	(232) x	0.519	=	100.21	(268)
Total CO2, kg/year	sur	n of (265)(271) =		1785.52	(272)
Dwelling CO2 Emission Rate	(27	2) ÷ (4) =		45.01	(273)

El rating (section 14)

(274)

			User_[Details:						
Assessor Name: Software Name:	Chris Hocknell Stroma FSAP 2	012		Strom Softwa	_				0016363 on: 1.0.4.26	
			·	Address		_ean				
Address :	Flat 4, 6, Lindfield	d Gardens,	LOND	ON, NW3	6PU					
1. Overall dwelling dim	ensions:		Δ	a/wa2\		Av. Ha	: a.la4/.aa\		Valuma/m³	,
Ground floor				a(m²) 61.01	(1a) x		ight(m) 2.5	(2a) =	Volume(m³ 152.52) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+((1e)+(1ı	1) <u> </u>	61.01	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	152.52	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	ry □ +	other 0	7 = [total 0	x	40 =	m³ per hou	r (6a)
Number of open flues		0	┪╻┝]	0	x	20 =		(6b)
·	0			0	J				0	╡`′
Number of intermittent fa					Ĺ	3		10 =	30	(7a)
Number of passive vent	S				L	0	X	10 =	0	(7b)
Number of flueless gas	fires					0	X 4	40 =	0	(7c)
								Air cl	nanges per ho	ur
Infiltration due to chimne	eve flues and fans =	(6a)+(6b)+(7	7a)+(7b)+	(7c) =	Г	20		÷ (5) =		(8)
If a pressurisation test has	-				continue fr	30 om (9) to (+ (5) -	0.2	(0)
Number of storeys in		,,,	,,			() ()	/		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (•	uction			0	(11)
if both types of wall are pure deducting areas of open	oresent, use the value cor	responding to	the grea	ter wall are	a (after					
If suspended wooden	- / .	ealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter	0	,	•					0	(13)
Percentage of window	s and doors draught	t stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value	·		•	•	•	etre of e	envelope	area	10	(17)
If based on air permeab	•								0.7	(18)
Air permeability value appli Number of sides shelter	•	has been dor	ne or a de	gree air pe	meability	is being u	sed			(19)
Shelter factor	eu			(20) = 1 -	[0.075 x (1	19)] =			0.85	- (20)
Infiltration rate incorpora	iting shelter factor			(21) = (18) x (20) =				0.59	(21)
Infiltration rate modified	for monthly wind spe	eed								 `
Jan Feb	Mar Apr Ma	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind s	peed from Table 7	•	•			-	-	-	-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
		•	•	•		•	-	-	-	
Wind Factor $(22a)m = (2a)m =$			T 0.0-	T			1 440	T 445	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	_	

Adjusted infiltration	on rate (allow	ing for sh	nelter an	nd wind s	peed) =	: (21a) x	(22a)m					
0.76	0.74 0.73	0.65	0.64	0.56	0.56	0.55	0.59	0.64	0.67	0.7]	
Calculate effectiv	-	rate for t	he appli	cable ca	se							
If mechanical v		a a sa alla a NI - (O	OL) (OO	- \ F (4: (1	N/5\\ -4	t (00k) (OO -)			0	(23a)
If exhaust air heat								o) = (23a)			0	(23b
If balanced with he		-	_								0	(23c
a) If balanced r		_		1	- 	1 	ŕ	 		' ' ') ÷ 100] 1	(0.4
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(24a
b) If balanced r		_		1	covery (I	MV) (24k	o)m = (2:	2b)m + (2	23b)		1	
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24b
c) If whole hous if (22b)m <	se extract ve : 0.5 × (23b),		•	•				.5 × (23b	o)			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(240
d) If natural ver if (22b)m =	ntilation or wi 1, then (24d							0.5]		•	•	
(24d)m= 0.79 (0.77 0.76	0.71	0.7	0.66	0.66	0.65	0.68	0.7	0.72	0.74]	(24d
Effective air ch	ange rate - e	nter (24a	or (24)	b) or (24	c) or (24	ld) in bo	x (25)		<u> </u>	!		
	0.77 0.76	0.71	0.7	0.66	0.66	0.65	0.68	0.7	0.72	0.74]	(25)
				ı	l	L	ı	ı		L	J	
3. Heat losses a				NI-4 A		Haral		A V I I		le control		A V I.
ELEMENT	Gross area (m²)	Openin m		Net Ar A ,r		U-val W/m2		A X U (W/I	<)	k-value kJ/m²·		A X k kJ/K
Doors				2.2	X	1.3	=	2.86				(26)
Windows Type 1				1.69	x1	/[1/(1.3)+	0.04] =	2.09				(27)
Windows Type 2				3.55	x1	/[1/(1.3)+	0.04] =	4.39				(27)
Windows Type 3				1.39	x1	/[1/(1.6)+	0.04] =	2.09				(27)
Walls Type1	20.15	5.56		14.59) x	0.55	=	8.02				(29)
Walls Type2	28.61	5.24		23.37	7 X	0.14	=	3.27	$\overline{}$		$\neg \vdash$	(29)
Walls Type3	15.55	2.2		13.35	5 X	0.55	=	7.34			= =	(29)
Roof [8.86	0		8.86	x	0.14	_	1.24	₹ i		7 F	(30)
Total area of elen	ments, m²			73.17								(31)
Party wall				21.72	=	0		0	– [\neg	(32)
Party floor				61.01	=						╡	(32a
Party ceiling				52.15	=				L T		= =	(32b
* for windows and roo	of windows use	effective wi	ndow I J-v:			g formula 1	/[(1/U-valı	ue)+0.041 a	L Is aiven in	paragrani		(021
** include the areas o						,		,	J	, <u></u>		
Fabric heat loss,	W/K = S (A)	κU)				(26)(30) + (32) =				37.58	(33)
Heat capacity Cm	$n = S(A \times k)$						((28).	(30) + (32	2) + (32a).	(32e) =	11071.	73 (34)
Thermal mass pa	arameter (TM	IP = Cm ÷	- TFA) ir	า kJ/m²K			Indica	ntive Value	Medium		250	(35)
For design assessme can be used instead of			construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridges			using Ap	pendix I	<						10.98	3 (36)
if details of thermal br	ridging are not k	nown (36) =	0.05 x (3	31)								

Total fabric heat loss				(33) +	(36) =		ı	40.55	(37)
Ventilation heat loss calculated monthly					` '	25)m x (5)		48.55	(37)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 39.51 38.96 38.41 35.85 35.37	33.13	33.13	32.72	33.99	35.37	36.34	37.35		(38)
Heat transfer coefficient, W/K			<u> </u>	(39)m	= (37) + (37)	 38)m			
(39)m= 88.06 87.51 86.96 84.4 83.92	81.68	81.68	81.27	82.54	83.92	84.89	85.9		
Lie et le composition (LILD) Miles 217	1					Sum(39) _{1.}	12 /12=	84.39	(39)
Heat loss parameter (HLP), W/m²K (40)m= 1.44 1.43 1.43 1.38 1.38	1.34	1.34	1.33	1.35	= (39)m ÷	1.39	1.41		
(40)11- 1.44 1.45 1.45 1.50 1.50	1.04	1.54	1.00			Sum(40) ₁ .		1.38	(40)
Number of days in month (Table 1a)					worago	- Cum (10)	12 / 12	1.00	
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31 28 31 30 31	30	31	31	30	31	30	31		(41)
4. Water heating energy requirement:							kWh/ye	ear:	
Assumed assurancy M							<u> </u>		(40)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.00034	49 x (TF.	A -13.9)2)] + 0.0	013 x (1	ΓFA -13.		01		(42)
if TFA £ 13.9, N = 1	•		, ,,	,					
Annual average hot water usage in litres per day Reduce the annual average hot water usage by 5% if the dy	•	_	,		o taraat a		.94		(43)
not more that 125 litres per person per day (all water use, he	_	-	o acmeve	a water us	e largel o	1			
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month $Vd,m = fac$				ОСР	001	1407	DCC		
(44)m= 90.13 86.85 83.58 80.3 77.02	73.74	73.74	77.02	80.3	83.58	86.85	90.13		
					Γotal = Su	l m(44) ₁₁₂ =		983.26	(44)
Energy content of hot water used - calculated monthly = 4.1	190 x Vd,m	x nm x D	77m / 3600	kWh/mon	th (see Ta	ables 1b, 1	c, 1d)		
(45)m= 133.66 116.9 120.63 105.17 100.91	87.08	80.69	92.6	93.7	109.2	119.2	129.45		
If instantaneous water heating at point of use (no hot water	storage) e	enter () in	hoves (46)		Γotal = Su	m(45) ₁₁₂ =	:	1289.21	(45)
				-	10.00	47.00	40.40		(46)
(46)m= 20.05 17.54 18.1 15.78 15.14 Water storage loss:	13.06	12.1	13.89	14.06	16.38	17.88	19.42		(46)
Storage volume (litres) including any solar or W	WHRS s	storage	within sa	me ves	sel		0		(47)
If community heating and no tank in dwelling, er	nter 110	litres in	(47)						
Otherwise if no stored hot water (this includes in	nstantan	eous co	mbi boile	ers) ente	er '0' in (47)			
Water storage loss:									
a) If manufacturer's declared loss factor is know	wn (kWh	/day):					0		(48)
Temperature factor from Table 2b							0		(49)
Energy lost from water storage, kWh/year			(48) x (49)	=			0		(50)
 b) If manufacturer's declared cylinder loss factor Hot water storage loss factor from Table 2 (kWh 									(51)
If community heating see section 4.3	i/iiti C/day	y <i>)</i>					0		(31)
Volume factor from Table 2a							0		(52)
Temperature factor from Table 2b							0		(53)
Energy lost from water storage, kWh/year			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (54) in (55)							0		(55)

	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	om Table	- 3							0		(58)
	-	•	•	for each		59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor fr	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	45.93	39.98	42.59	39.6	39.25	36.37	37.58	39.25	39.6	42.59	42.83	45.93		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	l for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	179.59	156.88	163.22	144.77	140.16	123.45	118.27	131.85	133.3	151.79	162.03	175.38		(62)
Solar DH	HW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WHRS	applies	, see Ap	pendix (€)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter			•	•	•			•	•		
(64)m=	179.59	156.88	163.22	144.77	140.16	123.45	118.27	131.85	133.3	151.79	162.03	175.38		
								Outp	out from w	ater heate	r (annual) ₁	12	1780.71	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	1	
(65)m=	55.93	48.86	50.76	44.87			<u> </u>	·			· ' ′		, -	
l.			30.70	44.07	43.37	38.05	36.23	40.6	41.06	46.96	50.34	54.52		(65)
inclu	ıde (57)ı	!	!	<u> </u>		<u> </u>	<u> </u>	ļ		ļ	<u> </u>		eating	(65)
		m in calc	culation o	of (65)m	only if c	<u> </u>	<u> </u>	ļ		ļ	<u> </u>	54.52 munity h	eating	(65)
5. Int	ernal ga	m in cald ains (see	culation of Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>	ļ		ļ	<u> </u>		eating	(65)
5. Int	ernal ga	m in calc ains (see as (Table	culation of Table 5	of (65)m and 5a	only if c	ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	(65)
5. Int	ernal ga olic gain Jan	m in cald ains (see	culation of Table 5	of (65)m and 5a	only if c	<u> </u>	<u> </u>	ļ		ļ	<u> </u>	munity h	eating	(65)
5. Int Metabo (66)m=	ernal gain Jan 100.5	m in cald ains (see as (Table Feb 100.5	ETable 5 5), Wat Mar	of (65)m 5 and 5a ts Apr 100.5	only if constant of the consta	Jun	Jul	Aug	Sep	ater is fr	om com	munity h	eating	
5. Int Metabo (66)m= Lightin	ernal ga olic gain Jan 100.5 g gains	m in calc ains (see s (Table Feb 100.5	Experience Table 5 Experience 5), Wate Mar 100.5 ted in Ap	of (65)m and 5a ts Apr 100.5	only if constant of the consta	Jun 100.5	Jul 100.5 r L9a), a	Aug 100.5	Sep 100.5	Oct	Nov	Dec 100.5	eating	(66)
5. Int Metabo (66)m= Lightin (67)m=	ernal gan Dlic gain Jan 100.5 g gains	m in calcular in c	Table 5 5), Wat Mar 100.5 ted in Ap	of (65)m 6 and 5a tts Apr 100.5 ppendix 8.76	May 100.5 L, equat	Jun 100.5 ion L9 o	Jul 100.5 r L9a), a	Aug 100.5 Iso see	Sep 100.5 Table 5	Oct 100.5	om com	munity h	eating	
5. Int Metabo (66)m= Lightin (67)m= Appliar	ernal gain Jan 100.5 g gains 16.02 nces ga	m in calc	Evaluation of Table 5 (a) Wat Mar 100.5 (b) ted in Apulated in ulated in the color of the color	of (65)m and 5a ts Apr 100.5 ppendix 8.76 Append	May 100.5 L, equat 6.55 dix L, eq	Jun 100.5 ion L9 of 5.53 uation L	Jul 100.5 r L9a), a 5.97	Aug 100.5 Iso see 7.77 3a), also	Sep 100.5 Table 5 10.42 see Ta	Oct 100.5	Nov 100.5	Dec 100.5	eating	(66) (67)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m=	ernal gain Jan 100.5 g gains 16.02 nces ga	m in calc ains (see s (Table Feb 100.5 (calcula 14.23 ins (calc	Table 5 2 5), Wat Mar 100.5 ted in Ap 11.57 ulated in	of (65)m and 5a ts Apr 100.5 ppendix 8.76 Appendix 162.95	only if construction only if c	Jun 100.5 ion L9 of 5.53 uation L	Jul 100.5 r L9a), a 5.97 13 or L1	Aug 100.5 Iso see 7.77 3a), also	Sep 100.5 Table 5 10.42 see Ta	Oct 100.5 13.24 ble 5 143.82	Nov	Dec 100.5	eating	(66)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin	ernal gan Jan 100.5 g gains 16.02 nces ga 175.49	m in calc ains (see s (Table Feb 100.5 (calcula 14.23 ins (calc 177.31 (calcula	Example 5 to 2 to 2 to 2 to 2 to 2 to 2 to 2 to	of (65)m of and 5a tts Apr 100.5 opendix 8.76 Append 162.95 opendix	only if constructions only if constructions on the construction of	Jun 100.5 ion L9 of 5.53 uation L 139.03	Jul 100.5 r L9a), a 5.97 13 or L1 131.28 or L15a	Aug 100.5 Iso see 7.77 3a), also 129.46), also se	Sep 100.5 Table 5 10.42 see Ta 134.05	Oct 100.5 13.24 ble 5 143.82 5	Nov 100.5 15.45	Dec 100.5	eating	(66) (67)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m=	ernal gar Jan 100.5 g gains 16.02 nces ga 175.49 ng gains 33.05	m in calcular ins (calcular 177.31 (calcular 33.05	ted in Apulated in	of (65)m 5 and 5a ts Apr 100.5 ppendix 8.76 Append 162.95 ppendix 33.05	only if construction only if c	Jun 100.5 ion L9 of 5.53 uation L	Jul 100.5 r L9a), a 5.97 13 or L1	Aug 100.5 Iso see 7.77 3a), also	Sep 100.5 Table 5 10.42 see Ta 134.05	Oct 100.5 13.24 ble 5 143.82	Nov 100.5	Dec 100.5	eating	(66) (67)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps	ernal gain Jan 100.5 g gains 16.02 nces ga 175.49 ng gains 33.05 and fai	m in calc ains (see s (Table Feb 100.5 (calcula 14.23 ins (calc 177.31 (calcula 33.05 ns gains	Table 5 2 5), Wat Mar 100.5 ted in Ap 11.57 ulated in 172.72 tted in A 33.05 (Table 5	of (65)m and 5a ts Apr 100.5 ppendix 8.76 Appendix 162.95 ppendix 33.05	only if construction only if c	Jun 100.5 ion L9 of 5.53 uation L 139.03 tion L15 33.05	Jul 100.5 r L9a), a 5.97 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 7.77 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 10.42 see Ta 134.05 ee Table 33.05	Oct 100.5 13.24 ble 5 143.82 5 33.05	Nov 100.5 15.45 156.15	Dec 100.5 16.47 167.74 33.05	eating	(66) (67) (68)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m=	ernal gar Jan 100.5 g gains 16.02 nces ga 175.49 ng gains 33.05 and fai	m in calc ains (see s (Table Feb 100.5 (calcula: 14.23 ins (calc 177.31 (calcula: 33.05 ns gains 3	ted in Apulated in	of (65)m 5 and 5a ts Apr 100.5 ppendix 8.76 Appendix 162.95 ppendix 33.05 5a) 3	only if construction only if c	Jun 100.5 ion L9 of 5.53 uation L 139.03 tion L15 33.05	Jul 100.5 r L9a), a 5.97 13 or L1 131.28 or L15a	Aug 100.5 Iso see 7.77 3a), also 129.46), also se	Sep 100.5 Table 5 10.42 see Ta 134.05	Oct 100.5 13.24 ble 5 143.82 5	Nov 100.5 15.45	Dec 100.5	eating	(66) (67)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses	ernal garanteernal	m in calc ains (see s (Table Feb 100.5 (calcula 14.23 ins (calc 177.31 (calcula 33.05 ns gains 3	ted in Apulated in 172.72 tted in Apulated in 172.72 tted in Apulated in 172.72 tted in Apulated in Ap	of (65)m 5 and 5a ts Apr 100.5 ppendix 8.76 Append 162.95 ppendix 33.05 5a) 3 tive valu	only if construction only if c	Jun 100.5 ion L9 of 5.53 uation L 139.03 tion L15 33.05	Jul 100.5 r L9a), a 5.97 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 7.77 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 10.42 see Ta 134.05 ee Table 33.05	Oct 100.5 13.24 ble 5 143.82 5 33.05	Nov 100.5 15.45 156.15	Dec 100.5 16.47 167.74 33.05	eating	(66) (67) (68) (69)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	ernal gar Jan 100.5 g gains 16.02 nces ga 175.49 ng gains 33.05 and fai 3 s e.g. ev	m in calc ains (see s (Table Feb 100.5 (calcula 14.23 ins (calc 177.31 (calcula 33.05 ns gains 3 raporatio -80.4	ted in Ap 172.72 ulated in Ap 172.72 tted in Ap 33.05 (Table 5	of (65)m 5 and 5a ts Apr 100.5 ppendix 8.76 Appendix 162.95 ppendix 33.05 5a) 3	only if construction only if c	Jun 100.5 ion L9 of 5.53 uation L 139.03 tion L15 33.05	Jul 100.5 r L9a), a 5.97 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 7.77 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 10.42 see Ta 134.05 ee Table 33.05	Oct 100.5 13.24 ble 5 143.82 5 33.05	Nov 100.5 15.45 156.15	Dec 100.5 16.47 167.74 33.05	eating	(66) (67) (68)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	ernal garanteernal	m in calc ains (see s (Table Feb 100.5 (calcula 14.23 ins (calc 177.31 (calcula 33.05 ns gains 3 raporatio -80.4 gains (T	ted in Ap 172.72 ted in Ap 33.05 (Table 5 3 on (negatine) and the fall of the	of (65)m of (65)m of and 5a tts Apr 100.5 opendix 8.76 Appendix 162.95 opendix 33.05 oa itive valu -80.4	only if construction only if construction only if construction on the construction of the construction on the construction of the construction of the construction on the construction of	Jun 100.5 ion L9 of 5.53 uation L 139.03 tion L15 33.05	Jul 100.5 r L9a), a 5.97 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 7.77 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 10.42 see Ta 134.05 ee Table 33.05	Oct 100.5 13.24 ble 5 143.82 5 33.05	Nov 100.5 15.45 156.15 33.05	Dec 100.5 16.47 167.74 33.05	eating	(66) (67) (68) (69) (70)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ernal gar Jan 100.5 g gains 16.02 nces ga 175.49 ng gains 33.05 and fair 3 s e.g. ev -80.4 heating	m in calc ains (see s (Table Feb 100.5 (calcula 14.23 ins (calcula 33.05 ns gains 3 raporatio -80.4 gains (T	culation of the Table 5 2 5), Wat Mar 100.5 ted in Ap 11.57 ulated in 172.72 ted in Ap 33.05 (Table 5 3 on (negation of the Solida of th	of (65)m 5 and 5a ts Apr 100.5 ppendix 8.76 Append 162.95 ppendix 33.05 5a) 3 tive valu	only if construction only if c	Jun 100.5 ion L9 of 5.53 uation L 139.03 tion L15 33.05 3 ble 5) -80.4	Jul 100.5 r L9a), a 5.97 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 7.77 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 10.42 see Ta 134.05 ee Table 33.05	Oct 100.5 13.24 ble 5 143.82 5 33.05	Nov 100.5 15.45 156.15 33.05	Dec 100.5 16.47 167.74 33.05 3	eating	(66) (67) (68) (69)
5. Int Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ernal gar Jan 100.5 g gains 16.02 nces ga 175.49 ng gains 33.05 and fair 3 s e.g. ev -80.4 heating	m in calc ains (see s (Table Feb 100.5 (calcula 14.23 ins (calc 177.31 (calcula 33.05 ns gains 3 raporatio -80.4 gains (T	culation of the Table 5 2 5), Wat Mar 100.5 ted in Ap 11.57 ulated in 172.72 ted in Ap 33.05 (Table 5 3 on (negation of the Solida of th	of (65)m of (65)m of and 5a tts Apr 100.5 opendix 8.76 Appendix 162.95 opendix 33.05 oa itive valu -80.4	only if construction only if construction only if construction on the construction of the construction on the construction of the construction of the construction on the construction of	Jun 100.5 ion L9 of 5.53 uation L 139.03 tion L15 33.05 3 ble 5) -80.4	Jul 100.5 r L9a), a 5.97 13 or L1 131.28 or L15a 33.05	Aug 100.5 Iso see 7.77 3a), also 129.46), also se 33.05	Sep 100.5 Table 5 10.42 see Ta 134.05 ee Table 33.05	Oct 100.5 13.24 ble 5 143.82 5 33.05	Nov 100.5 15.45 156.15 33.05	Dec 100.5 16.47 167.74 33.05 3	eating	(66) (67) (68) (69) (70)

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

Orientation: Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b	-	FF Table 6c		Gains (W)	
Northeast _{0.9x} 0.77	X	1.69	x	11.28	x	0.5	×	0.7	=	4.62	(75)
Northeast _{0.9x} 0.77	X	3.55	x	11.28	x	0.5	×	0.7		9.72	(75)
Northeast 0.9x 0.77	X	1.69	×	22.97	x	0.5	x	0.7	=	9.41	(75)
Northeast 0.9x 0.77	X	3.55	x	22.97	x	0.5	_ x [0.7	=	19.78	(75)
Northeast _{0.9x} 0.77	X	1.69	x	41.38	x	0.5	x	0.7	=	16.96	(75)
Northeast 0.9x 0.77	X	3.55	x	41.38	x	0.5	x	0.7	=	35.63	(75)
Northeast _{0.9x} 0.77	X	1.69	x	67.96	X	0.5	x [0.7	=	27.86	(75)
Northeast _{0.9x} 0.77	X	3.55	x	67.96	X	0.5	x	0.7	=	58.51	(75)
Northeast _{0.9x} 0.77	X	1.69	x	91.35	x	0.5	x [0.7	=	37.44	(75)
Northeast _{0.9x} 0.77	X	3.55	x	91.35	x	0.5	x [0.7	=	78.65	(75)
Northeast _{0.9x} 0.77	X	1.69	x	97.38	x	0.5	x [0.7	=	39.92	(75)
Northeast _{0.9x} 0.77	X	3.55	x	97.38	x	0.5	x [0.7	=	83.85	(75)
Northeast _{0.9x} 0.77	X	1.69	x	91.1	x	0.5	x [0.7	=	37.34	(75)
Northeast _{0.9x} 0.77	X	3.55	x	91.1	x	0.5	x [0.7	=	78.44	(75)
Northeast _{0.9x} 0.77	X	1.69	x	72.63	x	0.5	x [0.7	=	29.77	(75)
Northeast _{0.9x} 0.77	X	3.55	x	72.63	x	0.5	x [0.7	=	62.54	(75)
Northeast _{0.9x} 0.77	X	1.69	x	50.42	x	0.5	x [0.7	=	20.67	(75)
Northeast _{0.9x} 0.77	X	3.55	x	50.42	x	0.5	x [0.7	=	43.41	(75)
Northeast _{0.9x} 0.77	X	1.69	x	28.07	x	0.5	x [0.7	=	11.51	(75)
Northeast _{0.9x} 0.77	X	3.55	x	28.07	x	0.5	x [0.7	=	24.17	(75)
Northeast _{0.9x} 0.77	X	1.69	x	14.2	x	0.5	x [0.7	=	5.82	(75)
Northeast 0.9x 0.77	X	3.55	x	14.2	X	0.5	x [0.7	=	12.22	(75)
Northeast _{0.9x} 0.77	X	1.69	x	9.21	X	0.5	x [0.7	=	3.78	(75)
Northeast 0.9x 0.77	X	3.55	x	9.21	X	0.5	x [0.7	=	7.93	(75)
Northwest 0.9x 0.77	X	1.39	x	11.28	X	0.63	x [0.7	=	19.17	(81)
Northwest 0.9x 0.77	X	1.39	X	22.97	X	0.63	x [0.7	=	39.03	(81)
Northwest 0.9x 0.77	X	1.39	X	41.38	X	0.63	x [0.7	=	70.31	(81)
Northwest 0.9x 0.77	X	1.39	X	67.96	X	0.63	x [0.7	=	115.47	(81)
Northwest 0.9x 0.77	X	1.39	x	91.35	X	0.63	x [0.7	=	155.22	(81)
Northwest 0.9x 0.77	X	1.39	X	97.38	X	0.63	x [0.7	=	165.48	(81)
Northwest 0.9x 0.77	X	1.39	X	91.1	X	0.63	x	0.7	=	154.8	(81)
Northwest 0.9x 0.77	X	1.39	x	72.63	X	0.63	x [0.7	=	123.41	(81)
Northwest 0.9x 0.77	X	1.39	X	50.42	X	0.63	x [0.7	=	85.68	(81)
Northwest 0.9x 0.77	X	1.39	x	28.07	X	0.63	x [0.7	=	47.69	(81)
Northwest 0.9x 0.77	X	1.39	X	14.2	X	0.63	x [0.7	=	24.12	(81)
Northwest 0.9x 0.77	X	1.39	X	9.21	X	0.63	x	0.7	=	15.66	(81)
Solar gains in watts, calcula	_		_			n = Sum(74)m .		1		1	(05)
(83)m= 33.51 68.22 122.		201.84 271.3		89.25 270.59	215	.71 149.76	83.36	42.17	27.37		(83)
Total gains – internal and so		· , · ,	Ť		400	67 407 44	250.00	220.04	244.04	1	/Q/I\
(84)m= 356.34 388.62 431.	5/	492.02 542.9	<u> </u>	542.8 512.69	463	.67 407.41	359.69	339.84	341.01		(84)

7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livii	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ıble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.98	0.93	0.8	0.65	0.72	0.92	0.99	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.37	19.51	19.78	20.2	20.59	20.87	20.96	20.94	20.71	20.23	19.76	19.38		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(88)m=	19.73	19.74	19.74	19.78	19.78	19.81	19.81	19.82	19.8	19.78	19.77	19.76		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	1	0.99	0.97	0.89	0.71	0.5	0.57	0.87	0.98	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)				
(90)m=	18.26	18.4	18.68	19.12	19.5	19.75	19.8	19.8	19.63	19.16	18.68	18.29		(90)
									1	fLA = Livin	g area ÷ (4	4) =	0.4	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m=	18.7	18.84	19.12	19.55	19.93	20.19	20.26	20.25	20.06	19.59	19.11	18.73		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.7	18.84	19.12	19.55	19.93	20.19	20.26	20.25	20.06	19.59	19.11	18.73		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at st	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
trie ui	Jan	Feb	Mar	using Ta Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	<u> </u>	I May	Juli	Jui	Aug	Гоер	001	1404	Dec		
(94)m=	1	0.99	0.99	0.97	0.9	0.74	0.56	0.63	0.88	0.98	0.99	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (8	4)m		!	!	!	ļ	ļ			
(95)m=	355.11	386.51	426.56	475.14	486.94	401.89	287.29	293.27	359.89	352.13	337.88	340.06		(95)
Montl	nly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			1				=[(39)m	x [(93)m	– (96)m]		ı		
(97)m=	1268.54		1097.4	899.13	690.75	456.96	299.21	313.14	491.9	754.47	1019.64	1247.75		(97)
•			i	i		1	i e	24 x [(97	``	(- `	- 			
(98)m=	679.59	560.13	499.1	305.27	151.63	0	0	0	0	299.34	490.87	675.32		— (00)
								Tota	l per year	(kWh/year	·) = Sum(9	8) _{15,912} =	3661.25	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								60.01	(99)
9a. En	ergy rec	uiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	e heatir	_	nt from s	econdar	y/supple	mentary	svstem					1	0	(201)
				nain syst		mornary	-	(202) = 1	- (201) =				1	(202)
				main sys	. ,			(204) = (2	, ,	(203)] =			1	(204)
			_	ing syste				•	· -	- -			90.3	(206)
	•			• •	y heatin	g systen	ո, %						0	(208)
	,) LL.			,	,						-	 ` ′

												1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ır
Space heating	•	ement (c 499.1	alculate	d above)	0	0	0	0	299.34	490.87	675.20	[
679.59	560.13		<u> </u>		U	U	U	U	299.34	490.07	675.32		(044)
(211)m = {[(98) 752.59	m x (20 620.29	4)] } X 1 552.72	338.06	167.92	0	0	0	0	331.49	543.6	747.86		(211)
							-		ar) =Sum(2			4054.54	(211)
Space heating	g fuel (s	econdar	y), kWh/	month]
= {[(98 <u>)</u> m x (20	•		• •										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		7
							Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}		0	(215)
Water heating Output from wa		tor (calc	ulated a	hovo)									
179.59	156.88	163.22	144.77	140.16	123.45	118.27	131.85	133.3	151.79	162.03	175.38		
Efficiency of wa	ater hea	ter										81	(216)
(217)m= 88.18	88.09	87.82	87.08	85.58	81	81	81	81	86.94	87.8	88.21		(217)
Fuel for water h	0,												
(219)m = (64)r (219)m = 203.66	n x 100 178.1) ÷ (217) 185.87	m 166.24	163.78	152.41	146.02	162.77	164.57	174.59	184.55	198.81		
` '							Tota	I = Sum(2	19a) ₁₁₂ =			2081.38	(219)
Annual totals									k\	Wh/year	•	kWh/year	_
Space heating	fuel use	ed, main	system	1								4054.54	
Water heating	fuel use	d										2081.38	
Electricity for p	umps, fa	ans and	electric	keep-hot	t								
central heating	g pump:										30		(230c)
Total electricity	for the	above, l	κWh/yea	r			sum	of (230a).	(230g) =			30	(231)
Electricity for lig	ghting												_
12a. CO2 emi												282.96	(232)
		– Individ	ual heati	ing syste	ms inclu	ıding mi	cro-CHP					282.96	(232)
	3310113	- Individ	ual heati	ing syste			cro-CHP)					(232)
	3310113	– Individ	ual heati	ing syste	En	ergy	cro-CHP)		ion fac	tor	Emissions	1
Space heating				ing syste	En kW	ergy ′h/year	cro-CHP		kg CO	2/kWh		Emissions kg CO2/yea	r
Space heating	(main s	ystem 1		ing syste	En kW (211	ergy /h/year	cro-CHP		kg CO:	2/kWh	=	Emissions kg CO2/yea	r](261)
Space heating	(main s	ystem 1		ing syste	En kW (211	ergy /h/year) ×	cro-CHP		0.2°	2/kWh	= =	Emissions kg CO2/yea 875.78	r](261)](263)
Space heating Water heating	(main s (second	ystem 1 lary)		ing syste	En kW (211 (215	ergy /h/year /) × /) ×			kg CO:	2/kWh	=	Emissions kg CO2/yea	r](261)](263)](264)
Space heating	(main s (second	ystem 1 lary)		ing syste	En kW (211 (215	ergy /h/year /) × /) ×	cro-CHP + (263) + (0.2°	2/kWh	= =	Emissions kg CO2/yea 875.78	r](261)](263)
Space heating Water heating	(main s (second er heati	ystem 1 lary) ng)		En kW (211 (215 (219 (261	ergy /h/year /) × /) ×			0.2°	2/kWh 16 19	= =	Emissions kg CO2/yea 875.78 0 449.58	r](261)](263)](264)
Space heating Water heating Space and wat	(main s (second er heati umps, fa	ystem 1 lary) ng)		En kW (211 (215 (219 (261	ergy /h/year /) x /) x /) x /) x /) + (262) -			0.2 0.5 0.2 0.2	2/kWh 16 19 16	= =	Emissions kg CO2/yea 875.78 0 449.58	r [(261)] (263) [(264)] (265)
Space heating Water heating Space and wat Electricity for p	(main s (second er heati umps, fa ghting	ystem 1 lary) ng)		En kW (211 (215 (219 (261	ergy /h/year /) × /) × /) × /) + (262) ·		264) =	0.2 0.5 0.5 0.5	2/kWh 16 19 16 19 19	= = =	Emissions kg CO2/yea 875.78 0 449.58 1325.36 15.57	r (261) (263) (264) (265) (267)
Space heating Water heating Space and wat Electricity for p Electricity for light	(main s (second er heati umps, fa ghting year	ystem 1 dary) ng ans and) electric		En kW (211 (215 (219 (261	ergy /h/year /) × /) × /) × /) + (262) ·		264) = sum o	0.2° 0.5° 0.5° 0.5°	2/kWh 16 19 16 19 19	= = =	Emissions kg CO2/yea 875.78 0 449.58 1325.36 15.57 146.86	r [(261)] (263) [(264)] (265) [(267)] (268)
Space heating Water heating Space and wat Electricity for p Electricity for lig Total CO2, kg/y	(main s (second er heati umps, fa ghting year Emissi	ystem 1 dary) ng ans and) electric		En kW (211 (215 (219 (261	ergy /h/year /) × /) × /) × /) + (262) ·		264) = sum o	0.2° 0.5° 0.5° 0.5° (265)(2	2/kWh 16 19 16 19 19	= = =	Emissions kg CO2/yea 875.78 0 449.58 1325.36 15.57 146.86 1487.79	r [(261)] (263) [(264)] (265) [(267)] (268) [(272)]

			User E)etails: _						
Assessor Name:	Chris Hock	nell	050F.L	Strom	a Num	hor		STDO	016363	
Software Name:	Stroma FS			Softwa					on: 1.0.4.26	
Software Name.	Stionia FS		Draparty					VEISIC	лт. т.ט. 4 .20	
A dalue e e .	Flot F. G. Lin		Property			_ean				
Address: 1. Overall dwelling dime		ndfield Garden	s, LONDO	JIN, INVV	6 6 P U					
1. Overall dwelling diffic	ensions.		Λ να	o (m²)		Av. Ua	iabt/m)		Valuma/mi	31
Ground floor				a(m²)	[(10) v		eight(m)	_	Volume(m ³	<u> </u>
				64.3	(1a) x		2.5	(2a) =	160.75	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	64.3	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	160.75	(5)
2. Ventilation rate:										
	main heating	second heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	, + [0] = [0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	= +	0	j = [0	х	20 =	0	(6b)
Number of intermittent fa	ans					3	x	10 =	30	(7a)
Number of passive vents	2				F	0	x	10 =	0	(7b)
·					Ļ			40 =		= ' '
Number of flueless gas f	ires					0	^	40 -	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimne	we flues and fa	anc = (6a) + (6b) + (6b) + (6b) + (6b) + (6a) + (6a) + (6b) + (-(7a)+(7h)+((7c) =	Г					(8)
If a pressurisation test has t					continue fr	30		÷ (5) =	0.19	(6)
Number of storeys in t			, ou to (11),	01.707 17.00	sommas n	om (0) 10	(10)		0	(9)
Additional infiltration	9 (,					[(9))-1]x0.1 =	0	(10)
Structural infiltration: 0).25 for steel or	timber frame	or 0.35 fo	r masoni	rv constr	ruction	I(°,	, .j	0	(11)
if both types of wall are p					•				Ů	(/
deducting areas of openi	• ,		_ , , .							_
If suspended wooden		•	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic met	res per ho	our per s	quare m	etre of e	envelope	area	10	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	+(8), otherw	ise (18) =	(16)				0.69	(18)
Air permeability value applie	es if a pressurisatio	on test has been d	one or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18) x (20) =				0.58	(21)
Infiltration rate modified	for monthly win	d speed						_	•	
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22-) (2	12\m = 4									
Wind Factor $(22a)m = (22a)m $		1.00 0.05	0.05	1 0 00				1	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

djusted infiltr	0.73	0.71	0.64	0.63	0.55	0.55	0.54	0.58	0.63	0.66	0.69		
alculate effe			l									ı	
If mechanica												0	(2
If exhaust air h) = (23a)			0	(2
If balanced with	n heat recov	ery: effic	iency in %	allowing	for in-use f	actor (fron	n Table 4h) =				0	(2
a) If balance					1	<u> </u>	- 	ŕ	, 		' ' '	÷ 100]	10
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance			ı		1		- ^ `	ŕ	 		1 .	1	(0
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse extr n < 0.5 ×			•	•				.5 × (23b)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n	ventilation n = 1, the			•	•				0.5]				
4d)m= 0.78	0.77	0.76	0.71	0.7	0.65	0.65	0.65	0.67	0.7	0.72	0.74		(2
Effective air	change r	ate - er	nter (24a	or (24l	b) or (24	c) or (24	d) in bo	x (25)	-		-		
5)m= 0.78	0.77	0.76	0.71	0.7	0.65	0.65	0.65	0.67	0.7	0.72	0.74		(2
3. Heat losse	s and hea	at loss r	paramete	er:									
LEMENT	Gross area (S	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/F	〈)	k-value kJ/m²·ł		A X k kJ/K
oors					2.2	x	1.3	=	2.86				(2
/indows Type	1				3.55	x1	/[1/(1.3)+	0.04] =	4.39				(2
/indows Type	2				1.39	x1	/[1/(1.3)+	0.04] =	1.72				(2
/indows Type	3				1.39	<u>x</u> 1	/[1/(1.6)+	0.04] =	2.09				(2
/indows Type	e 4				0.72	x1	/[1/(1.6)+	0.04] =	1.08				(2
/indows Type	5				0.52	x1	/[1/(1.6)+	0.04] =	0.78	=			(2
/indows Type	6				0.72	x1	/[1/(1.6)+	0.04] =	1.08	=			(2
/alls Type1	23.74	1	3.87		19.87	, x	0.55	─ = i	10.93	<u> </u>		$\neg \vdash$	(2
/alls Type2	26.23	3	6.33		19.9	x	0.14	= i	2.79	i i		7 F	(2
/alls Type3	4.72		2.2		2.52	x	0.55	-	1.39	=		i i	(2
otal area of e	lements,	m²			54.69	_							(3
arty wall					45.69	x	0	=	0	¬ [7	(3
arty floor					64.3	一						i iii	(3
arty ceiling					64.3	_				[i i	(3
for windows and include the area					alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	L s given in	paragraph	3.2	
abric heat los				.	-		(26)(30)) + (32) =				31.6	(3
		•	•										(`
eat capacity	Cm = S(A)	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	12868.4	41 (3

can be used inste	ad of a de	tailed calci	ulation.										
Thermal bridg				using Ap	pendix I	K						8.2	(36)
if details of therma	•	•		• .	•								(3.2)
Total fabric he	at loss							(33) +	(36) =			39.81	(37)
Ventilation hea	at loss ca	alculated	l monthl	y				(38)m	= 0.33 × ((25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 41.21	40.64	40.08	37.46	36.96	34.68	34.68	34.25	35.56	36.96	37.96	39		(38)
Heat transfer	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m= 81.02	80.45	79.89	77.26	76.77	74.48	74.48	74.06	75.36	76.77	77.76	78.8		
Heat loss para	ameter (H	HLP), W	m²K			-			Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	77.26	(39)
(40)m= 1.26	1.25	1.24	1.2	1.19	1.16	1.16	1.15	1.17	1.19	1.21	1.23		
Number of day	ys in moi	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.2	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/y	ear:	
Assumed occu	inancy l	NI										1	(42)
if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		.1	J	(42)
Annual averag	ge hot wa										.08]	(43)
Reduce the annuant not more that 125							to achieve	a water us	se target o	f		•	
Г.	<u> </u>		· ·	<u> </u>		·	1 A	0	0.4			1	
Jan Hot water usage i	Feb in litres per	Mar dav for ea	Apr ach month	May Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 92.49	89.13	85.76	82.4	79.04	75.67	75.67	79.04	82.4	85.76	89.13	92.49	1	
(44)111- 32.40	00.10	00.70	02.4	75.04	70.07	7 3.07	7 3.04		<u> </u>	m(44) ₁₁₂ =		1008.97	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600					1000.01	` ′
(45)m= 137.16	119.96	123.79	107.92	103.55	89.36	82.8	95.02	96.15	112.06	122.32	132.83]	
	!			!		!			Total = Su	m(45) ₁₁₂ =	=	1322.92	(45)
If instantaneous v	vater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)	•			1	
(46)m= 20.57	17.99	18.57	16.19	15.53	13.4	12.42	14.25	14.42	16.81	18.35	19.92		(46)
Water storage Storage volum) includir	na anv so	olar or W	/WHRS	storane	within sa	ame ves	sel		0	1	(47)
If community h	, ,		•			_					0	J	()
Otherwise if no	_			_			. ,	ers) ente	er '0' in (47)			
Water storage	loss:		•					•	·	,			
a) If manufact	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufact			-									1	(E1)
Hot water stor If community h	_			C Z (KVV	i i/ii ii e /uz	ay <i>)</i>					0	J	(51)
Volume factor	•		-								0]	(52)
Temperature f	actor fro	m Table	2b								0]	(53)

Energy lost from water storage, kWh/year	(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (54) in (55)				0		(55)
Water storage loss calculated for each month	((56)m = (5	55) × (41)m				
(56)m= 0 0 0 0 0 0	0 0	0 0	0	0		(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11	1)] ÷ (50), else (57))m = (56)m where (H11) is fro	m Append	ix H	
(57)m= 0 0 0 0 0 0	0 0	0 0	0	0		(57)
Primary circuit loss (annual) from Table 3				0		(58)
Primary circuit loss calculated for each month (59)m = (58)	3) ÷ 365 × (41)n	n				
(modified by factor from Table H5 if there is solar water I	heating and a	cylinder thermo	stat)			
(59)m= 0 0 0 0 0 0	0 0	0 0	0	0		(59)
Combi loss calculated for each month (61)m = (60) ÷ 365	× (41)m					
(61)m= 47.13 41.02 43.7 40.64 40.28 37.32 38	38.56 40.28	40.64 43.7	43.95	47.13		(61)
Total heat required for water heating calculated for each m	month (62)m = 0	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 184.29 160.98 167.49 148.56 143.83 126.68 12	21.37 135.29	136.79 155.76	166.27	179.96		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative q	quantity) (enter '0'	if no solar contribut	on to wate	er heating)		
(add additional lines if FGHRS and/or WWHRS applies, se	ee Appendix G	i)				
(63)m= 0 0 0 0 0	0 0	0 0	0	0		(63)
Output from water heater						
(64)m= 184.29 160.98 167.49 148.56 143.83 126.68 12	21.37 135.29	136.79 155.76	166.27	179.96		
	Outpu	ut from water heater	r (annual) _{1.}	12	1827.26	(64)
Heat gains from water heating, kWh/month 0.25 $$ [0.85 \times ((45)m + (61)m]] + 0.8 x [(46)m	+ (57)m	+ (59)m]	
(65)m= 57.39 50.14 52.09 46.04 44.5 39.04 3	37.17 41.66	42.13 48.18	51.66	55.95		(65)
include (57)m in calculation of (65)m only if cylinder is in	n the dwelling o	or hot water is fr	om com	munity h	eating	
5. Internal gains (see Table 5 and 5a):						
Metabolic gains (Table 5), Watts						
Jan Feb Mar Apr May Jun .	Jul Aug	Sep Oct	Nov	Dec		
	Jul Aug 05.01 105.01	Sep Oct 105.01 105.01	Nov 105.01	Dec 105.01		(66)
	05.01 105.01	105.01 105.01				(66)
(66)m= 105.01 10	05.01 105.01	105.01 105.01				(66) (67)
(66)m= 105.01 10	05.01 105.01 9a), also see T 6.38 8.29	105.01 105.01 Table 5 11.13 14.13	105.01	105.01		
(66)m= 105.01	05.01 105.01 9a), also see T 6.38 8.29	105.01 105.01 Table 5 11.13 14.13	105.01	105.01		
(66)m= 105.01	05.01 105.01 9a), also see T 6.38 8.29 or L13a), also 37.39 135.48	105.01 105.01 Table 5 11.13 14.13 see Table 5 140.29 150.51	105.01	105.01		(67)
(66)m= 105.01	05.01 105.01 9a), also see T 6.38 8.29 or L13a), also 37.39 135.48	105.01 105.01 Table 5 11.13 14.13 see Table 5 140.29 150.51	105.01	105.01		(67)
(66)m= 105.01	05.01 105.01 9a), also see T 6.38 8.29 or L13a), also 37.39 135.48 L15a), also see	105.01 105.01 Table 5 11.13 14.13 see Table 5 140.29 150.51 e Table 5	105.01 16.5 163.41	105.01 17.59 175.54		(67) (68)
(66)m= 105.01	05.01 105.01 9a), also see T 6.38 8.29 or L13a), also 37.39 135.48 L15a), also see	105.01 105.01 Table 5 11.13 14.13 see Table 5 140.29 150.51 e Table 5	105.01 16.5 163.41	105.01 17.59 175.54		(67) (68)
(66)m= 105.01	05.01 105.01 9a), also see T 6.38 8.29 or L13a), also 37.39 135.48 L15a), also see 33.5 33.5	105.01 105.01 Table 5 11.13 14.13 see Table 5 140.29 150.51 e Table 5 33.5 33.5	105.01 16.5 163.41 33.5	105.01 17.59 175.54		(67) (68) (69)
(66)m= 105.01 10	05.01 105.01 9a), also see T 6.38 8.29 or L13a), also 37.39 135.48 L15a), also see 33.5 33.5	105.01 105.01 Table 5 11.13 14.13 see Table 5 140.29 150.51 e Table 5 33.5 33.5	105.01 16.5 163.41 33.5	105.01 17.59 175.54		(67) (68) (69)
(66)m= 105.01	05.01 105.01 9a), also see T 6.38 8.29 or L13a), also 37.39 135.48 L15a), also see 33.5 33.5	105.01 105.01 Table 5 11.13 14.13 see Table 5 140.29 150.51 e Table 5 33.5 33.5 3 3	105.01 16.5 163.41 33.5	105.01 17.59 175.54 33.5		(67) (68) (69) (70)
(66)m= 105.01 10	05.01 105.01 9a), also see T 6.38 8.29 or L13a), also 37.39 135.48 L15a), also see 33.5 33.5	105.01 105.01 Table 5 11.13 14.13 see Table 5 140.29 150.51 e Table 5 33.5 33.5 3 3	105.01 16.5 163.41 33.5	105.01 17.59 175.54 33.5		(67) (68) (69) (70)
(66)m= 105.01	05.01	105.01 105.01 Table 5 11.13 14.13 see Table 5 140.29 150.51 e Table 5 33.5 33.5 3 3 -84.01 -84.01	105.01 16.5 163.41 33.5 3 -84.01	105.01 17.59 175.54 33.5 3 -84.01		(67) (68) (69) (70)
(66)m= 105.01 10	05.01	105.01 105.01 Table 5 11.13 14.13 see Table 5 140.29 150.51 e Table 5 33.5 33.5 3 3 -84.01 -84.01 58.51 64.76	105.01 16.5 163.41 33.5 3 -84.01	105.01 17.59 175.54 33.5 3 -84.01		(67) (68) (69) (70)

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x}	0.77	X	3.55	x	11.28	x	0.5	x	0.7] =	9.72	(75)
Northeast 0.9x	0.77	x	0.72	x	11.28	x	0.63	x	0.7	=	2.48	(75)
Northeast 0.9x	0.77	x	3.55	x	22.97	x	0.5	x	0.7	=	19.78	(75)
Northeast 0.9x	0.77	x	0.72	x	22.97	x	0.63	x	0.7	=	5.05	(75)
Northeast 0.9x	0.77	x	3.55	x	41.38	x	0.5	x	0.7	=	35.63	(75)
Northeast 0.9x	0.77	x	0.72	x	41.38	x	0.63	x	0.7	=	9.11	(75)
Northeast 0.9x	0.77	x	3.55	x	67.96	x	0.5	X	0.7	=	58.51	(75)
Northeast 0.9x	0.77	x	0.72	x	67.96	x	0.63	x	0.7	=	14.95	(75)
Northeast 0.9x	0.77	x	3.55	x	91.35	x	0.5	x	0.7	=	78.65	(75)
Northeast 0.9x	0.77	x	0.72	x	91.35	x	0.63	x	0.7	=	20.1	(75)
Northeast 0.9x	0.77	X	3.55	X	97.38	X	0.5	X	0.7	=	83.85	(75)
Northeast 0.9x	0.77	x	0.72	x	97.38	x	0.63	x	0.7	=	21.43	(75)
Northeast 0.9x	0.77	x	3.55	x	91.1	x	0.5	X	0.7	=	78.44	(75)
Northeast 0.9x	0.77	x	0.72	x	91.1	x	0.63	x	0.7	=	20.05	(75)
Northeast 0.9x	0.77	x	3.55	x	72.63	x	0.5	X	0.7	=	62.54	(75)
Northeast 0.9x	0.77	x	0.72	X	72.63	X	0.63	X	0.7	=	15.98	(75)
Northeast 0.9x	0.77	x	3.55	X	50.42	X	0.5	X	0.7	=	43.41	(75)
Northeast 0.9x	0.77	x	0.72	x	50.42	x	0.63	x	0.7	=	11.09	(75)
Northeast 0.9x	0.77	x	3.55	X	28.07	X	0.5	X	0.7	=	24.17	(75)
Northeast 0.9x	0.77	x	0.72	х	28.07	x	0.63	X	0.7	=	6.18	(75)
Northeast 0.9x	0.77	x	3.55	x	14.2	x	0.5	x	0.7	=	12.22	(75)
Northeast 0.9x	0.77	x	0.72	x	14.2	x	0.63	x	0.7	=	3.12	(75)
Northeast 0.9x	0.77	x	3.55	x	9.21	x	0.5	x	0.7	=	7.93	(75)
Northeast 0.9x	0.77	x	0.72	x	9.21	x	0.63	x	0.7	=	2.03	(75)
Southeast 0.9x	0.77	x	1.39	x	36.79	X	0.5	X	0.7	=	24.81	(77)
Southeast 0.9x	0.77	x	1.39	x	36.79	x	0.63	X	0.7	=	15.63	(77)
Southeast 0.9x	0.77	x	0.52	X	36.79	X	0.63	X	0.7	=	11.69	(77)
Southeast 0.9x	0.77	x	1.39	x	62.67	x	0.5	X	0.7	=	42.26	(77)
Southeast 0.9x	0.77	x	1.39	x	62.67	x	0.63	X	0.7	=	26.62	(77)
Southeast 0.9x	0.77	x	0.52	x	62.67	X	0.63	X	0.7	=	19.92	(77)
Southeast 0.9x	0.77	x	1.39	x	85.75	X	0.5	X	0.7	=	57.82	(77)
Southeast 0.9x	0.77	x	1.39	x	85.75	x	0.63	X	0.7	=	36.43	(77)
Southeast 0.9x	0.77	x	0.52	X	85.75	X	0.63	X	0.7	=	27.26	(77)
Southeast 0.9x	0.77	x	1.39	X	106.25	X	0.5	X	0.7	=	71.64	(77)
Southeast 0.9x	0.77	X	1.39	x	106.25	x	0.63	x	0.7] =	45.14	(77)
Southeast 0.9x	0.77	X	0.52	x	106.25	x	0.63	x	0.7] =	33.77	(77)
Southeast 0.9x	0.77	X	1.39	x	119.01	x	0.5	x	0.7] =	80.25	(77)
Southeast 0.9x	0.77	X	1.39	x	119.01	x	0.63	x	0.7] =	50.56	(77)
Southeast 0.9x	0.77	X	0.52	x	119.01	x	0.63	x	0.7] =	37.83	(77)

		_											
Southeast _{0.9x}	0.77	X	1.39	х	1	18.15	X	0.5	X	0.7	=	79.67	(77)
Southeast _{0.9x}	0.77	X	1.39	×	1	18.15	X	0.63	X	0.7	=	50.19	(77)
Southeast _{0.9x}	0.77	X	0.52	Х	1	18.15	X	0.63	X	0.7	=	37.55	(77)
Southeast _{0.9x}	0.77	X	1.39	х	1	13.91	X	0.5	x	0.7	=	76.81	(77)
Southeast _{0.9x}	0.77	X	1.39	Х	1	13.91	X	0.63	X	0.7	=	48.39	(77)
Southeast 0.9x	0.77	X	0.52	Х	1	13.91	X	0.63	x	0.7	=	36.2	(77)
Southeast 0.9x	0.77	X	1.39	Х	1	04.39	X	0.5	X	0.7	=	70.39	(77)
Southeast _{0.9x}	0.77	X	1.39	Х	1	04.39	X	0.63	x [0.7	=	44.35	(77)
Southeast _{0.9x}	0.77	X	0.52	Х	1	04.39	X	0.63	x	0.7	=	33.18	(77)
Southeast 0.9x	0.77	X	1.39	Х	((92.85	X	0.5	X	0.7	=	62.61	(77)
Southeast 0.9x	0.77	X	1.39	Х	((92.85	X	0.63	x	0.7	=	39.44	(77)
Southeast 0.9x	0.77	X	0.52	Х	((92.85	X	0.63	x	0.7	=	29.51	(77)
Southeast _{0.9x}	0.77	X	1.39	Х	(69.27	x	0.5	x [0.7	=	46.71	(77)
Southeast 0.9x	0.77	X	1.39	Х	(69.27	X	0.63	x	0.7	=	29.43	(77)
Southeast 0.9x	0.77	X	0.52	Х	(69.27	X	0.63	x	0.7	=	22.02	(77)
Southeast _{0.9x}	0.77	X	1.39	Х	4	14.07	x	0.5	x	0.7	=	29.72	(77)
Southeast 0.9x	0.77	X	1.39	Х		14.07	X	0.63	X	0.7	=	18.72	(77)
Southeast _{0.9x}	0.77	X	0.52	Х		14.07	X	0.63	X	0.7	=	14.01	(77)
Southeast _{0.9x}	0.77	X	1.39	Х	((31.49	X	0.5	x	0.7	=	21.23	(77)
Southeast _{0.9x}	0.77	X	1.39	Х	(31.49	x	0.63	x	0.7	=	13.38	(77)
Southeast _{0.9x}	0.77	X	0.52	Х		31.49	X	0.63	x	0.7	=	10.01	(77)
Southwest _{0.9x}	0.77	X	0.72	Х	((36.79		0.63	x [0.7	=	8.1	(79)
Southwest _{0.9x}	0.77	X	0.72	Х	(62.67		0.63	x [0.7	=	13.79	(79)
Southwest _{0.9x}	0.77	X	0.72	Х	3	35.75]	0.63	x [0.7	=	18.87	(79)
Southwest _{0.9x}	0.77	X	0.72	Х	1	06.25]	0.63	x [0.7	=	23.38	(79)
Southwest _{0.9x}	0.77	X	0.72	Х	1	19.01]	0.63	x	0.7	=	26.19	(79)
Southwest _{0.9x}	0.77	X	0.72	Х	1	18.15]	0.63	x [0.7	=	26	(79)
Southwest _{0.9x}	0.77	X	0.72	Х	1	13.91		0.63	x [0.7	=	25.06	(79)
Southwest _{0.9x}	0.77	X	0.72	Х	1	04.39]	0.63	x	0.7	=	22.97	(79)
Southwest _{0.9x}	0.77	X	0.72	х	(92.85		0.63	x	0.7	=	20.43	(79)
Southwest _{0.9x}	0.77	X	0.72	Х	(69.27]	0.63	x	0.7	=	15.24	(79)
Southwest _{0.9x}	0.77	X	0.72	Х	. 4	14.07		0.63	x [0.7	=	9.7	(79)
Southwest _{0.9x}	0.77	X	0.72	х	((31.49		0.63	x	0.7	=	6.93	(79)
		_											
Solar gains in y			1	- 1		1		= Sum(74)m .	(82)m		1	1	
(83)m= 72.43		5.11			298.69	284.95	249	206.51	143.73	87.49	61.51		(83)
Total gains – ir			` 	` 	` '	·						1	
(84)m= 407.82	460.29 50	5.73	548.73	575.5	561.81	536.19	506	.68 473.94	430.64	396.65	387.34		(84)
7. Mean interr	nal tempera	iture (heating s	eason)									<u></u>
Temperature	during heat	ing pe	eriods in t	the livin	g area	from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation fact	tor for gains	for li	ving area	ı, h1,m	(see Ta	able 9a)							<u> </u>
Jan	Feb N	Mar	Apr	May	Jun	Jul	Aı	ug Sep	Oct	Nov	Dec		

(86)m=	1	1	0.99	0.97	0.91	0.76	0.59	0.64	0.87	0.98	0.99	1		(86)
Mean	internal	temper	ature in	living are	ea T1 (fc	ollow ste	ps 3 to 7	' in Table	e 9c)				•	
(87)m=	19.65	19.8	20.05	20.42	20.72	20.93	20.98	20.98	20.84	20.45	20.01	19.65		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwellina	from Ta	ble 9. Ti	h2 (°C)		•			
(88)m=	19.87	19.88	19.89	19.92	19.92	19.95	19.95	19.96	19.94	19.92	19.91	19.9		(88)
ا د اtilie ا	tion fac	tor for a	aine for i	rest of d	welling I	n2 m (se	a Tahla	0a)		<u> </u>	<u> </u>	<u> </u>		
(89)m=	1	0.99	0.98	0.95	0.87	0.67	0.46	0.51	0.8	0.96	0.99	1		(89)
L	intownol			th a wast	مع ماريمال:	n a TO /f	allaw ata		7 in Tabl	L	<u> </u>	<u> </u>		
(90)m=	18.65	18.81	19.07	the rest	19.73	ng 1∠ (10 19.92	19.95	19.95	7 IN Tabl	e 9c) 19.49	19.04	18.67		(90)
(90)111–	10.00	10.01	19.07	13.44	19.73	19.92	19.90	19.90			g area ÷ (4		0.38	(91)
										271	g aroa (.,	0.36	(31)
Г			· `	r the wh				<u> </u>	·				Ī	(00)
(92)m=	19.02	19.18	19.44	19.81	20.11	20.3	20.34	20.34	20.23	19.85	19.41	19.04		(92)
г	19.02	19.18	ne mean 19.44	internal	tempera 20.11	20.3	m Table	20.34	20.23	19.85	19.41	19.04		(93)
(93)m=			uirement		20.11	20.3	20.34	20.34	20.23	19.00	19.41	19.04		(55)
					e obtain	ed at ste	en 11 of	Table 9	n so tha	t Ti m=(76)m an	d re-calc	culate	
				using Ta		ou at ot	5p 11 01	Table of	o, oo aa	()	r Ojiii aii	a ro ouic	diato	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	ains, hm):									•	
(94)m=	1	0.99	0.98	0.95	0.87	0.7	0.51	0.56	0.82	0.96	0.99	1		(94)
г			<u> </u>	4)m x (84			i	i	i	î		 	ı	
(95)m=	406.04	456.53	496.77	522.79	502.76	393.04	273.34	283.62	389.04	415.06	393.33	386.02		(95)
г				perature			40.0	40.4	444	40.0	7.4	4.0	1	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Г	1192.89		1033.62	al tempe 842.99	645.26	424.46	278.51	291.65	461.71	710.35	957.01	1169.59		(97)
` ′ L				r each n				l		<u> </u>		1100.00		()
(98)m=	585.42	465.26	399.41	230.55	106.01	0	0	0	0	219.7	405.85	582.97		
` ′ [Tota	l per year	L (kWh/year) = Sum(9	8) _{15,912} =	2995.17	(98)
Space	heatin	a requir	ement in	kWh/m²	lvear					`	,		46.58	」 (99)
								:	VID)				40.00	
			ıts – Inai	ividual h	eating sy	ystems i	nciuaing	micro-C	MP)					
•	e heatir on of sp	•	nt from s	econdar	//supple	mentarv	svstem						0	(201)
	•			nain syst	• • •	,	•	(202) = 1 -	- (201) =				1	(202)
				main sys	` ,			(204) = (204)		(203)] =				(204)
			_	-				(204) (20	02) [1	(200)]			1	╡ `
	•	•		ing syste			0/						90.3	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	า, %			r	ī		0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space		<u> </u>		alculate									1	
	585.42	465.26	399.41	230.55	106.01	0	0	0	0	219.7	405.85	582.97		
(211)m		-		00 ÷ (20							Ι.	l .	1	(211)
	648.3	515.23	442.32	255.31	117.4	0	0	0	0	243.3	449.44	645.6		٦.
								lota	ı (KVVN/yea	ar) =Sum(2	211) _{15,1012}	= ?	3316.91	(211)

Space heating fuel (secondary), kWh/month								
$= \{[(98)m \times (201)] \} \times 100 \div (208)$ $(215)m = $	0 0	0	0	0	0	0		
			l (kWh/yea				0	(215)
Water heating						ı		_
Output from water heater (calculated above)				1			l	
	126.68 121.3	135.29	136.79	155.76	166.27	179.96		7(040)
Efficiency of water heater	04 04	1 04	04	00.40	07.00	07.00	81	(216)
(217)m= 87.88 87.71 87.34 86.41 84.7	81 81	81	81	86.19	87.38	87.92		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
` '	156.39 149.8	3 167.03	168.87	180.71	190.28	204.69		
		Tota	il = Sum(2	19a) ₁₁₂ =	-	-	2144.53	(219)
Annual totals				k'	Wh/year		kWh/year	
Space heating fuel used, main system 1							3316.91	╛
Water heating fuel used							2144.53	
Electricity for pumps, fans and electric keep-hot								
Electricity for pumps, fans and electric keep-not								
central heating pump:						30		(230c)
		sum	of (230a).	(230g) =		30	30	(230c) (231)
central heating pump:		sum	of (230a).	(230g) =		30	30 302.17	_
central heating pump: Total electricity for the above, kWh/year	ns including			(230g) =		30		(231)
central heating pump: Total electricity for the above, kWh/year Electricity for lighting	ns including Energy kWh/yea	micro-CHF			ion fac			(231)
central heating pump: Total electricity for the above, kWh/year Electricity for lighting	Energy	micro-CHF		Emiss	ion fac 2/kWh		302.17	(231)
central heating pump: Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	Energy kWh/yea	micro-CHF		Emiss kg CO	ion fac 2/kWh	tor	302.17 Emissions kg CO2/yea	(231) (232)
central heating pump: Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy kWh/yea (211) x	micro-CHF		Emiss kg CO	ion fac 2/kWh 16	tor =	302.17 Emissions kg CO2/yea 716.45	(231) (232) (232) (261)
central heating pump: Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Energy kWh/yea (211) x (215) x (219) x	micro-CHF		Emiss kg CO	ion fac 2/kWh 16	tor =	302.17 Emissions kg CO2/yea 716.45	(231) (232) (232) (261) (263)
central heating pump: Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/yea (211) x (215) x (219) x	micro-CHF ar		Emiss kg CO	ion fac 2/kWh 16 19	tor =	302.17 Emissions kg CO2/yea 716.45 0 463.22	(231) (232) (232) (261) (263) (264)
central heating pump: Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Energy kWh/yea (211) x (215) x (219) x (261) + (26	micro-CHF ar		Emiss kg CO: 0.2 0.5 0.2	ion fac 2/kWh 16 19	tor = [= [302.17 Emissions kg CO2/yea 716.45 0 463.22 1179.67	(231) (232) (232) (261) (263) (264) (265)

 $(272) \div (4) =$

Dwelling CO2 Emission Rate

El rating (section 14)

(273)

(274)

21.03

83

			User D)etails:						
Assessor Name:	Chris Hocknell			Strom	a Num	ber:		STRO	016363	
Software Name:	Stroma FSAP 2			Softwa				Versio	on: 1.0.4.26	
			i i	Address		_ean				
Address :	Flat 6, 6, Lindfiel	d Gardens,	LONDO	DN, NW3	6PU					
1. Overall dwelling dim	ensions:			4 0						. .
Ground floor				a(m²)	(4 -)		ight(m)	1,0-1	Volume(m	<u></u>
				61.76	(1a) x		2.5	(2a) =	154.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+	·(1e)+(1ı	ר)6	31.76	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	154.4	(5)
2. Ventilation rate:	main	oooondo		other		total			m³ nar hau	
	main heating	secondar heating	<u> </u>	other	, –	total			m³ per hou	_
Number of chimneys	0 +	0	_] +	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0] + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				Ī	3	x :	10 =	30	(7a)
Number of passive vent	S				Ē	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	X	40 =	0	(7c)
3					L					(. %)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans =	= (6a)+(6b)+(7	⁷ a)+(7b)+((7c) =	Г	30		÷ (5) =	0.19	(8)
If a pressurisation test has		ended, procee	d to (17),	otherwise o	ontinue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.056 () ()		0.05.6				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (U.25 for steel or time present, use the value co				•	uction			0	(11)
deducting areas of open		irresponding to	Tile great	er wall are	a (anter					
If suspended wooden	floor, enter 0.2 (uns	sealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter	0							0	(13)
Percentage of window	vs and doors draugh	nt stripped							0	(14)
Window infiltration				0.25 - [0.2	` '	-	. (45)		0	(15)
Infiltration rate	50 1:			(8) + (10)					0	(16)
Air permeability value If based on air permeab	• • • •		•	•	•	etre of e	envelope	area	10	(17)
Air permeability value appli	•					is heina u	sed		0.69	(18)
Number of sides shelter				g. 00 a po		.e .e			1	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	19)] =			0.92	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18) x (20) =				0.64	(21)
Infiltration rate modified	for monthly wind sp	eed								
Jan Feb	Mar Apr M	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Easter (22a)== (6	22\m ÷ 4									
Wind Factor (22a)m = $(22a)m = (22a)m $	 	B 005	0.05	0.02	1	1.00	1 12	1 10	1	
(22a)m= 1.27 1.25	1.23 1.1 1.0	8 0.95	0.95	0.92	1	1.08	1.12	1.18	J	

Adjusted infiltra	ation rate (al	llowing for s	helter an	ıd wind s	speed) =	(21a) x	(22a)m					
0.82	0.8 0.	79 0.71	0.69	0.61	0.61	0.59	0.64	0.69	0.72	0.75		
Calculate effect		-	the appli	cable ca	se				!		·	
If mechanica			23h) - (23a	a) v Emy (auation (I	VEVV other	anvico (23h	v) = (23a)			0	(23a)
If balanced with)) = (23a)			0	(23b)
	-	-	_					Ol- \ /	006) [4 (00-)	0	(23c)
a) If balance		ai ventilatior	with ne	at recove	ery (MV)	HR) (248	a)m = (2 <i>i</i> 0	2b)m + (1 0	23b) × [1	0	1 ÷ 100]	(24a)
` '												(244)
b) If balance				neat rec	overy (i	0 0	0	26)m + (. 0	0	0	1	(24b)
		ļ	<u> </u>	<u> </u>								(215)
c) If whole he	อนรัย extract า < 0.5 × (23		•					.5 × (23b	o)			
(24c)m= 0	`	0 0	0	0	0	0	0	0	0	0		(24c)
d) If natural v	ventilation o	r whole hou	se positiv	ve input	uentilatio	on from	loft		<u> </u>	<u> </u>	l	
,	n = 1, then (2			•				0.5]				
(24d)m= 0.84	0.82 0.	81 0.75	0.74	0.69	0.69	0.68	0.71	0.74	0.76	0.78		(24d)
Effective air	change rate	- enter (24a	a) or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.84	0.82 0.	81 0.75	0.74	0.69	0.69	0.68	0.71	0.74	0.76	0.78		(25)
3. Heat losses	s and heat lo	oss paramet	er:									
ELEMENT	Gross	Openir	ngs	Net Ar		U-val		AXU		k-value		AXk
Doors	area (m²)) n	n²	A ,r		W/m2		(W/I	K)	kJ/m²·	Λ.	kJ/K
Doors	4			2.2	×	1.3	=	2.86	=			(26)
Windows Type				5.42		/[1/(1.6)+		8.15	=			(27)
Windows Type				0.53		/[1/(1.6)+		0.8	ᆗ			(27)
Windows Type				0.45		/[1/(1.6)+		0.68	_			(27)
Windows Type	4			2.85	x1	/[1/(1.6)+	0.04] =	4.29	╝.			(27)
Walls Type1	56.44	11.2	.9	45.15	, X	0.55	=	24.83				(29)
Walls Type2	16.52	2.2		14.32	<u>x</u>	0.55	=	7.88				(29)
Total area of e	lements, m²			72.96	3							(31)
Party wall				24.38	3 X	0	=	0				(32)
Party floor				61.76	3							(32a)
Party ceiling				61.76	5				Ī		\neg	(32b)
* for windows and ** include the area					ated using	formula 1	1/[(1/U-valu	ue)+0.04] a	s given in	paragraph	3.2	
Fabric heat los	s, W/K = S ((A x U)	·			(26)(30) + (32) =				52.55	(33)
Heat capacity (Cm = S(A x	k)					((28).	(30) + (32	2) + (32a).	(32e) =	12139.	
Thermal mass	parameter (TMP = Cm	÷ TFA) ir	า kJ/m²K			Indica	ntive Value	: Medium		250	(35)
For design assess can be used instea			construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge			using Ap	pendix I	<						10.94	(36)
if details of therma	,			•								
Total fabric hea	at loss						(33) +	(36) =			63.49	(37)

Ventila	ition hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	42.56	41.89	41.24	38.19	37.62	34.96	34.96	34.47	35.98	37.62	38.77	39.98		(38)
Heat tr	ansfer o	coefficier	nt, W/K	•		•		•	(39)m	= (37) + (3	38)m	•		
(39)m=	106.05	105.38	104.73	101.68	101.11	98.45	98.45	97.96	99.47	101.11	102.26	103.47		
Heat Id	oss para	meter (H	HLP), W	/m²K				•		Average = = (39)m ÷		12 /12=	101.68	(39)
(40)m=	1.72	1.71	1.7	1.65	1.64	1.59	1.59	1.59	1.61	1.64	1.66	1.68		
Numbe	er of day	s in moi	nth (Tab	le 1a)						Average =	Sum(40) ₁	12 /12=	1.65	(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 requi	irement:								kWh/ye	ear:	
٨٥٥٠١٣٥	ad agai	ınanaı l	N I											(40)
if TF			+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.		03		(42)
		•	ater usag	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		82	2.43		(43)
		-	hot water			-	-	to achieve	a water us	se target o	f			, ,
not more			person per I					ı			<u> </u>	1		
Hot wot	Jan	Feb	Mar day for ea	Apr	May	Jun	Jul Table 10 Y	Aug	Sep	Oct	Nov	Dec		
		· ·		·		·		· <i>′</i>						
(44)m=	90.68	87.38	84.08	80.79	77.49	74.19	74.19	77.49	80.79	84.08	87.38	90.68		—
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600		Total = Su oth (see Ta			989.22	(44)
(45)m=	134.47	117.61	121.36	105.81	101.53	87.61	81.18	93.16	94.27	109.86	119.92	130.23		_
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1297.02	(45)
(46)m=	20.17	17.64	18.2	15.87	15.23	13.14	12.18	13.97	14.14	16.48	17.99	19.53		(46)
	storage													
•		` ') includir				•		ame ves	sel		0		(47)
Otherw	-	stored	nd no ta hot wate		_			. ,	ers) ente	er '0' in (47)			
	•		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
•			m Table			,	• • • • • • • • • • • • • • • • • • • •					0		(49)
•			storage		ear			(48) x (49) =			0		(50)
			eclared o	-		or is not		, , ,						()
		_	factor fr		e 2 (kW	h/litre/da	ay)					0		(51)
	-	_	ee secti	on 4.3										
		from Ta	bie 2a m Table	2h								0		(52)
					oor			(A7) v (E4	\ v (EQ\ v /	53) —		0		(53)
		m water (54) in (5	storage	, KVV11/ye	zai			(47) x (51) X (O∠) X (JJ) =		0		(54) (55)
	` '	. , .	culated t	for each	month			((56)m = (55) × (41)	m		U		(55)
	0 0	0	0	0	0	0	0	0	0	0	0			(56)
(56)m=	U		<u> </u>	<u> </u>	U U	L "	I ^u	I ^U	I "	<u> </u>	L "	0		(30)

		u solal sio	rage, (57)r	11 – (36)111	x [(30) – ()] · (0	0), 0.00 (0	7)111 – (30)	m wnere (mii) is iid	m Append	lix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circ	cuit loss (ar	nual) fro	om Table	3		-		-			0		(58)
Primary circ				•	,	,	, ,						
(modified	by factor f	rom Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)		•	
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss	calculated	for each	month (61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 46.2	21 40.22	42.85	39.84	39.49	36.59	37.81	39.49	39.84	42.85	43.09	46.21		(61)
Total heat r	equired for	water he	eating ca	lculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 180.	68 157.83	164.21	145.65	141.01	124.2	118.99	132.65	134.11	152.71	163.02	176.44		(62)
Solar DHW inp	out calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add additio	nal lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)				_	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
(64)m= 180.	68 157.83	164.21	145.65	141.01	124.2	118.99	132.65	134.11	152.71	163.02	176.44		_
							Outp	out from wa	ater heate	r (annual)₁	12	1791.49	(64)
Heat gains	from water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m]	
(65)m= 56.2	26 49.16	51.07	45.14	43.63	38.28	36.44	40.85	41.3	47.24	50.65	54.85		(65)
include (5	57)m in cal	culation o	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Interna	gains (see	Table 5	and 5a):									
Metabolic g	ains (Table	e 5). Wat	ts										
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 101.	55 101.55	101.55	101.55	101.55	101.55	101.55	101.55	101.55	101.55	101.55	101.55		(66)
Lighting gai	ns (calcula	ted in Ar	pendix	_, equati	ion L9 o	r L9a), a	lso see	T-1-1- F				•	
(67)m= 16.1	1 14.31							i abie 5					
		11.64	8.81	6.59	5.56	6.01	7.81	10.48	13.31	15.53	16.56		(67)
Appliances	gains (calc		<u> </u>				7.81	10.48		15.53	16.56		(67)
Appliances (68)m= 177.	```		<u> </u>				7.81	10.48		15.53 157.82	16.56]	(67) (68)
··· —	36 179.2	culated in	164.69	lix L, equ	uation L	13 or L1 132.69	7.81 3a), also 130.85	10.48 see Tal 135.49	ble 5 145.36	ļ I	I		` '
(68)m= 177.	36 179.2 ins (calcula	culated in	164.69	lix L, equ	uation L	13 or L1 132.69	7.81 3a), also 130.85	10.48 see Tal 135.49	ble 5 145.36	ļ I	I]	` '
(68)m= 177. Cooking ga	36 179.2 ins (calcula 5 33.15	ted in Ap 33.15	n Append 164.69 ppendix 33.15	lix L, equ 152.23 L, equat	uation L 140.51 ion L15	13 or L1 132.69 or L15a)	7.81 3a), also 130.85), also se	10.48 see Tal 135.49 ee Table	ble 5 145.36 5	157.82	169.54] 	(68)
(68)m= 177. Cooking ga (69)m= 33.	36 179.2 ins (calcula 5 33.15	ted in Ap 33.15	n Append 164.69 ppendix 33.15	lix L, equ 152.23 L, equat	uation L 140.51 ion L15	13 or L1 132.69 or L15a)	7.81 3a), also 130.85), also se	10.48 see Tal 135.49 ee Table	ble 5 145.36 5	157.82	169.54		(68)
(68)m= 177. Cooking ga (69)m= 33. Pumps and	36 179.2 ins (calcula 5 33.15 fans gains 3	ated in Ap 33.15 (Table 5	164.69 ppendix 33.15 5a)	152.23 L, equat 33.15	uation L 140.51 ion L15 33.15	13 or L1 132.69 or L15a) 33.15	7.81 3a), also 130.85), also se 33.15	10.48 o see Tal 135.49 ee Table 33.15	ble 5 145.36 5 33.15	157.82 33.15	169.54 33.15		(68) (69)
(68)m= 177. Cooking ga (69)m= 33. Pumps and (70)m= 3	36 179.2 ins (calcula 33.15 fans gains 3 evaporatio	ated in Ap 33.15 (Table 5	164.69 ppendix 33.15 5a)	152.23 L, equat 33.15	uation L 140.51 ion L15 33.15	13 or L1 132.69 or L15a) 33.15	7.81 3a), also 130.85), also se 33.15	10.48 o see Tal 135.49 ee Table 33.15	ble 5 145.36 5 33.15	157.82 33.15	169.54 33.15		(68) (69)
(68)m= 177. Cooking ga (69)m= 33. Pumps and (70)m= 3 Losses e.g. (71)m= -81.	36 179.2 ins (calcula 5 33.15 fans gains 3 evaporatio 24 -81.24	ated in Ap 33.15 (Table 5 3 on (negation -81.24	n Appendix 33.15 5a) 3	lix L, equ 152.23 L, equat 33.15 3 es) (Tab	uation L 140.51 ion L15 33.15 3 le 5)	13 or L1 132.69 or L15a) 33.15	7.81 3a), also 130.85), also se 33.15	10.48 2 see Tal 135.49 2 see Table 33.15	ble 5 145.36 5 33.15	33.15 3	33.15 3		(68) (69) (70)
(68)m= 177. Cooking ga (69)m= 33. Pumps and (70)m= 3 Losses e.g.	36 179.2 ins (calcula 5 33.15 fans gains 3 evaporatic 24 -81.24 ng gains (7	ated in Ap 33.15 (Table 5 3 on (negation -81.24	n Appendix 33.15 5a) 3	lix L, equ 152.23 L, equat 33.15 3 es) (Tab	uation L 140.51 ion L15 33.15 3 le 5)	13 or L1 132.69 or L15a) 33.15	7.81 3a), also 130.85), also se 33.15	10.48 2 see Tal 135.49 2 see Table 33.15	ble 5 145.36 5 33.15	33.15 3	33.15 3		(68) (69) (70)
(68)m= 177. Cooking ga (69)m= 33. Pumps and (70)m= 3 Losses e.g. (71)m= -81. Water heati (72)m= 75.6	36 179.2 ins (calcula 15 33.15 fans gains 3 evaporatio 24 -81.24 ng gains (7 73.16 73.16	tulated in 174.57 ated in April 33.15 (Table 5 at 24 a	n Appendix 164.69 ppendix 33.15 5a) 3 tive value -81.24	152.23 L, equat 33.15 3 es) (Tab	uation L 140.51 ion L15 33.15 3 le 5) -81.24	13 or L1 132.69 or L15a) 33.15 3 -81.24	7.81 3a), also 130.85), also se 33.15 3 -81.24	10.48 2 see Tal 135.49 3 see Table 33.15	ble 5 145.36 5 33.15 3 -81.24	33.15 3 -81.24	33.15 3 -81.24		(68) (69) (70) (71)
(68)m= 177. Cooking ga (69)m= 33. Pumps and (70)m= 3 Losses e.g. (71)m= -81. Water heati	36 179.2 179.2 179.2 179.2 189.2 1	tulated in 174.57 ated in April 33.15 (Table 5 at 24 a	n Appendix 164.69 ppendix 33.15 5a) 3 tive value -81.24	152.23 L, equat 33.15 3 es) (Tab	uation L 140.51 ion L15 33.15 3 le 5) -81.24	13 or L1 132.69 or L15a) 33.15 3 -81.24	7.81 3a), also 130.85), also se 33.15 3 -81.24	10.48 2 see Tal 135.49 2 see Table 33.15 3 -81.24	ble 5 145.36 5 33.15 3 -81.24	33.15 3 -81.24	33.15 3 -81.24		(68) (69) (70) (71)
(68)m= 177. Cooking ga (69)m= 33. Pumps and (70)m= 3 Losses e.g. (71)m= -81. Water heati (72)m= 75.6 Total intern	36 179.2 ins (calcula 5 33.15 fans gains 3 evaporatio 24 -81.24 ng gains (7 73.16 nal gains = 56 323.13	ated in Apart at a street at a	164.69 ppendix 33.15 5a) 3 tive value -81.24	lix L, equat 152.23 L, equat 33.15 3 es) (Tab -81.24	uation L 140.51 ion L15 33.15 3 le 5) -81.24 53.16 (66)	13 or L1 132.69 or L15a) 33.15 3 -81.24 48.99 m + (67)m	7.81 3a), also 130.85), also se 33.15 3 -81.24 54.9 1+ (68)m+	10.48 2 see Tal 135.49 33.15 3 -81.24 57.37 + (69)m + (ole 5 145.36 5 33.15 3 -81.24 63.5 (70)m + (7	33.15 3 -81.24 70.34 1)m + (72)	33.15 3 -81.24 73.73		(68) (69) (70) (71) (72)
(68)m= 177. Cooking ga (69)m= 33. Pumps and (70)m= 3 Losses e.g. (71)m= -81. Water heati (72)m= 75.6 Total interi (73)m= 325. 6. Solar ga	36 179.2 ins (calcula 5 33.15 fans gains 3 evaporatio 24 -81.24 ng gains (7 73.16 nal gains = 56 323.13	ated in Apart at a street at a	164.69 ppendix 33.15 5a) 3 tive value -81.24 62.7	33.15 3 es) (Tab -81.24	uation L 140.51 ion L15 33.15 3 le 5) -81.24 53.16 (66) 255.7	13 or L1: 132.69 or L15a) 33.15 3 -81.24 48.99 m + (67)m 244.15	7.81 3a), also 130.85), also se 33.15 3 -81.24 54.9 1+ (68)m+	10.48 2 see Tal 135.49 3 see Table 33.15 3 -81.24 57.37 + (69)m + (259.8	ole 5 145.36 5 33.15 3 -81.24 63.5 (70)m + (7 278.63	33.15 3 -81.24 70.34 1)m + (72) 300.16	33.15 3 -81.24 73.73		(68) (69) (70) (71) (72)
(68)m= 177. Cooking ga (69)m= 33. Pumps and (70)m= 3 Losses e.g. (71)m= -81. Water heati (72)m= 75.6 Total interi (73)m= 325. 6. Solar ga	36	culated in 174.57 ated in Apart ated in Apar	164.69 ppendix 33.15 5a) 3 tive value -81.24 62.7	33.15 3 es) (Tab -81.24	uation L 140.51 ion L15 33.15 3 le 5) -81.24 53.16 (66) 255.7 and associ	13 or L1 132.69 or L15a) 33.15 3 -81.24 48.99 om + (67)m 244.15	7.81 3a), also 130.85 3, also se 33.15 3 -81.24 54.9 1+ (68)m+ 250.02	10.48 2 see Tal 135.49 3 see Table 33.15 3 -81.24 57.37 + (69)m + (259.8	ole 5 145.36 5 33.15 3 -81.24 63.5 (70)m + (7 278.63	33.15 3 -81.24 70.34 1)m + (72) 300.16	33.15 3 -81.24 73.73	Gains (W)	(68) (69) (70) (71) (72)

o		-		1		_		1		1		_
Southwest _{0.9x}	0.77	X	5.42	X	36.79	Ļ	0.63	X	0.7] =	60.95	(79)
Southwest _{0.9x}	0.77	X	0.53	X	36.79		0.63	X	0.7	=	23.84	(79)
Southwest _{0.9x}	0.77	X	0.45	X	36.79		0.63	X	0.7	=	10.12	(79)
Southwest _{0.9x}	0.77	X	2.85	X	36.79		0.63	X	0.7	=	32.05	(79)
Southwest _{0.9x}	0.77	X	5.42	X	62.67		0.63	X	0.7	=	103.81	(79)
Southwest _{0.9x}	0.77	X	0.53	X	62.67		0.63	X	0.7	=	40.61	(79)
Southwest _{0.9x}	0.77	X	0.45	X	62.67		0.63	X	0.7	=	17.24	(79)
Southwest _{0.9x}	0.77	X	2.85	X	62.67		0.63	X	0.7] =	54.59	(79)
Southwest _{0.9x}	0.77	X	5.42	X	85.75		0.63	X	0.7	=	142.04	(79)
Southwest _{0.9x}	0.77	X	0.53	x	85.75		0.63	X	0.7	=	55.56	(79)
Southwest _{0.9x}	0.77	X	0.45	x	85.75		0.63	X	0.7	=	23.59	(79)
Southwest _{0.9x}	0.77	X	2.85	x	85.75		0.63	X	0.7	=	74.69	(79)
Southwest _{0.9x}	0.77	X	5.42	x	106.25		0.63	x	0.7] =	176	(79)
Southwest _{0.9x}	0.77	X	0.53	x	106.25		0.63	X	0.7] =	68.84	(79)
Southwest _{0.9x}	0.77	X	0.45	x	106.25		0.63	X	0.7	=	29.22	(79)
Southwest _{0.9x}	0.77	X	2.85	x	106.25		0.63	X	0.7] =	92.54	(79)
Southwest _{0.9x}	0.77	X	5.42	x	119.01	Ī	0.63	x	0.7] =	197.13	(79)
Southwest _{0.9x}	0.77	X	0.53	x	119.01		0.63	x	0.7	=	77.11	(79)
Southwest _{0.9x}	0.77	X	0.45	x	119.01	Ī	0.63	x	0.7] =	32.73	(79)
Southwest _{0.9x}	0.77	X	2.85	x	119.01	Ī	0.63	x	0.7	j =	103.66	(79)
Southwest _{0.9x}	0.77	X	5.42	x	118.15	Ī	0.63	x	0.7	Ī =	195.71	(79)
Southwest _{0.9x}	0.77	X	0.53	x	118.15	Ī	0.63	x	0.7	j =	76.55	(79)
Southwest _{0.9x}	0.77	X	0.45	x	118.15	Ī	0.63	x	0.7	j =	32.5	(79)
Southwest _{0.9x}	0.77	X	2.85	x	118.15	Ī	0.63	x	0.7	j =	102.91	(79)
Southwest _{0.9x}	0.77	X	5.42	x	113.91	Ī	0.63	x	0.7	j =	188.68	(79)
Southwest _{0.9x}	0.77	X	0.53	x	113.91	Ī	0.63	x	0.7	j =	73.8	(79)
Southwest _{0.9x}	0.77	X	0.45	x	113.91	Ī	0.63	x	0.7	j =	31.33	(79)
Southwest _{0.9x}	0.77	x	2.85	x	113.91	Ī	0.63	х	0.7	j =	99.21	(79)
Southwest _{0.9x}	0.77	x	5.42	x	104.39	Ī	0.63	x	0.7] =	172.91	(79)
Southwest _{0.9x}	0.77	X	0.53	x	104.39	Ē	0.63	х	0.7] =	67.63	(79)
Southwest _{0.9x}	0.77	X	0.45	x	104.39	Ī	0.63	х	0.7	=	28.71	(79)
Southwest _{0.9x}	0.77	X	2.85	x	104.39	Ī	0.63	х	0.7] =	90.92	(79)
Southwest _{0.9x}	0.77	X	5.42	x	92.85	Ē	0.63	x	0.7	j =	153.8	(79)
Southwest _{0.9x}	0.77	X	0.53	x	92.85	Ē	0.63	x	0.7	j =	60.16	(79)
Southwest _{0.9x}	0.77	X	0.45	x	92.85	F	0.63	x	0.7	j =	25.54	(79)
Southwest _{0.9x}	0.77	X	2.85	×	92.85	F	0.63	X	0.7	j =	80.87	(79)
Southwest _{0.9x}	0.77	X	5.42	x	69.27	F	0.63	x	0.7	j =	114.74	(79)
Southwest _{0.9x}	0.77	X	0.53	×	69.27	F	0.63	x	0.7] =	44.88	(79)
Southwest _{0.9x}	0.77	X	0.45	X	69.27	F	0.63	X	0.7] =	19.05	(79)
Southwest _{0.9x}	0.77	X	2.85	x	69.27	F	0.63	X	0.7] =	60.33	(79)
Southwest _{0.9x}	0.77	X	5.42	X	44.07	F	0.63	X	0.7] =	73	(79)
L		_		1		<u> </u>		1		1		

Southwest _{0.9x} 0.77	Х	0.5	53	x	44.07		0.63	x [0.7	=	28.55	(79)
Southwest _{0.9x} 0.77	x	0.4	5	x	44.07		0.63	x	0.7	=	12.12	(79)
Southwest _{0.9x} 0.77	х	2.8	35	x	44.07		0.63	х	0.7	=	38.39	(79)
Southwest _{0.9x} 0.77	X	5.4	2	x	31.49		0.63	x	0.7	=	52.16	(79)
Southwest _{0.9x} 0.77	x	0.5	53	x	31.49		0.63	x	0.7	=	20.4	(79)
Southwest _{0.9x} 0.77	x	0.4	5	x	31.49		0.63	x	0.7	=	8.66	(79)
Southwest _{0.9x} 0.77	×	2.8	35	x	31.49		0.63	x [0.7	=	27.43	(79)
Solar gains in watts, c						ì	Sum(74)m .	- 			I	(00)
(83)m= 126.95 216.25	295.88	366.61	410.63	407.6		360.19	320.37	239	152.06	108.64		(83)
Total gains – internal a	607.18	659.27	684.55	663.3		610.21	580.17	517.63	452.22	424.93		(84)
` '				<u> </u>	3 037.17	010.21	360.17	317.03	452.22	424.93		(04)
7. Mean internal tem		`		,								_
Temperature during I	٠.			•		ble 9, 11	11 (°C)				21	(85)
Utilisation factor for g	1 1			r `		1	Can		Nev	Daa		
(86)m= 1 0.99	Mar 0.98	Apr 0.95	May 0.9	Jun 0.78	Jul 0.62	0.66	Sep 0.86	Oct 0.97	0.99	Dec 1		(86)
(**)	<u> </u>						<u> </u>	0.97	0.99	_ '		(00)
Mean internal temper					_i	1		T 00 00	T 40.04	10.47	İ	(07)
(87)m= 19.18 19.39	19.72	20.16	20.54	20.84	20.95	20.93	20.73	20.23	19.64	19.17		(87)
Temperature during I	, , ,			T T	-	1	1 ` ´	1	<u> </u>	1	I	
(88)m= 19.53 19.54	19.54	19.58	19.59	19.62	19.62	19.62	19.61	19.59	19.57	19.56		(88)
Utilisation factor for g	ains for r	est of d	welling,	h2,m (see Table	9a)	1	,	•	•	ı	
(89)m= 0.99 0.99	0.97	0.94	0.85	0.67	0.45	0.5	0.77	0.95	0.99	0.99		(89)
Mean internal temper	rature in	the rest	of dwell	ng T2	(follow st	eps 3 to	7 in Tab	le 9c)	_	_	•	
(90)m= 17.92 18.14	18.47	18.93	19.28	19.54	19.61	19.61	19.47	19	18.42	17.94		(90)
							1	fLA = Livir	ig area ÷ (4	4) =	0.41	(91)
Mean internal temper	rature (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1 – f	LA) × T2					
(92)m= 18.44 18.66	18.98	19.43	19.8	20.08	_	20.15	19.99	19.51	18.92	18.45		(92)
Apply adjustment to t	1					1		. 			I	(00)
(93)m= 18.44 18.66	18.98	19.43	19.8	20.08	20.16	20.15	19.99	19.51	18.92	18.45		(93)
8. Space heating req Set Ti to the mean in			ro obtoir	od at	stop 11 of	Table (h so tha	t Ti m=/	76)m an	d ro colo	sulata	
the utilisation factor f				icu at i	step i i oi	Table 3	ib, 50 tila	it 11,111—(rojili ali	u re-carc	uiate	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for g	ains, hm	:										
(94)m= 0.99 0.98	0.97	0.93	0.86	0.71	0.52	0.57	0.8	0.95	0.98	0.99		(94)
Useful gains, hmGm	` `	<u> </u>			T	1	1				1	(0.5)
(95)m= 448.73 530.68	588.07	615.13	586.93	468.6	7 334.13	345.68	463.24	489.23	445.39	422.12		(95)
Monthly average exterior (96)m= 4.3 4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for me	ļ .			l		<u> </u>	1			7.2		(55)
(97)m= 1499.37 1449.68	1 1		819.13	539.0		367.53	585.49	900.43	1208.97	1474.17		(97)
Space heating requir	ement fo	r each m	nonth, k	Vh/mc	nth = 0.0	24 x [(97	')m – (95	i)m] x (4	1)m	!	l	
(98)m= 781.68 617.57	535.32	328.23	172.76	0	0	0	0	305.93	549.78	782.73		
											-	

									ı		—
					Tota	ıl per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	4074	(98)
Space heating requirement in	n kWh/m ²	²/year							l	65.96	(99)
9a. Energy requirements – Inc	dividual h	eating sy	ystems i	including	micro-C	CHP)					
Space heating: Fraction of space heat from s	secondar	v/supple	mentary	/ svstem					[0	(201)
Fraction of space heat from r			·····,	-	(202) = 1	- (201) =			 	1	(202)
Fraction of total heating from	•	` ,			(204) = (2	02) × [1 –	(203)] =		[[1	(204)
Efficiency of main space hea	-									90.3	(206)
Efficiency of secondary/supp	lementar	y heating	g systen	n, %						0	(208)
Jan Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ப ear
Space heating requirement (calculate	d above)				•				
781.68 617.57 535.32	328.23	172.76	0	0	0	0	305.93	549.78	782.73		
$(211)m = \{[(98)m \times (204)] \} x$	 	T .	1								(211)
865.64 683.91 592.83	363.49	191.32	0	0	0 Tota	0	338.8	608.84	866.81		
Connection final (connection		/ 4l-			TOLE	ıl (kWh/yea	ar) –Sum(Z I I) _{15,1012}	2	4511.62	(211)
Space heating fuel (seconda = $\{[(98)\text{m x}(201)]\}$ x 100 ÷ (201)	- /	montn									
(215)m =	0	0	0	0	0	0	0	0	0		
			Į.		Tota	l (kWh/yea	ar) =Sum(215),5,101	=	0	(215)
Water heating									•		_
Output from water heater (calc	ulated a	bove) 141.01	124.2	118.99	132.65	134.11	152.71	163.02	176.44		
Efficiency of water heater	145.05	141.01	124.2	110.99	132.03	134.11	132.71	103.02	170.44	81	(216)
(217)m= 88.39 88.24 87.93	87.22	85.87	81	81	81	81	86.98	87.99	88.43		(217)
Fuel for water heating, kWh/m	ionth	I									
(219) m = (64) m x $100 \div (217)$		l		T	l	T	l	T	1		
(219)m= 204.4 178.87 186.75	166.99	164.22	153.33	146.9		165.57 al = Sum(2	175.58	185.27	199.52	0004.45	7(040)
Annual totals					TOLE	ii – Oum(2		Wh/yeaı	. l	2091.15 kWh/yea	(219)
Space heating fuel used, mair	n system	1					, ,	vviii y cai		4511.62	<u>-</u>
Water heating fuel used									ľ	2091.15	ヺ
Electricity for pumps, fans and	l electric	keep-ho	t						L		
central heating pump:		·							30		(230c)
Total electricity for the above,	kWh/yea	ar			sum	of (230a).	(230g) =			30	(231)
Electricity for lighting	•								[284.52	(232)
12a. CO2 emissions – Individ	dual heat	ing syste	ems incl	uding mi	cro-CHF				L		
							Emiss	ion fac	tor	Emission	
				lergy Vh/year			kg CO		W	kg CO2/ye	
Space heating (main system	1)		(21	1) x			0.2	16	= [974.51	(261)
Space heating (secondary)			(21	5) x			0.5		= [0	(263)
									L	-	 ` ′

Water heating	(219) x	0.216 =	451.69	(264)
Space and water heating	(261) + (262) + (263) + (264) =		1426.2	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	15.57	(267)
Electricity for lighting	(232) x	0.519 =	147.67	(268)
Total CO2, kg/year	sum	of (265)(271) =	1589.44	(272)
Dwelling CO2 Emission Rate	(272)) ÷ (4) =	25.74	(273)
El rating (section 14)			80	(274)

			User D	etails:						
Access Names	Chris Hast	noll	USCITL		• N	har-		CTDO	016262	
Assessor Name:	Chris Hock			Strom					016363	
Software Name:	Stroma FS		_	Softwa				versic	n: 1.0.4.26	
			Property			_ean				
Address :		dfield Gardens	s, LONDO	ON, NW3	6PU					
1. Overall dwelling dime	ensions:									
			Are	a(m²)		Av. He	eight(m)	_	Volume(m	<u>-</u>
Ground floor				37.6	(1a) x	1	1.86	(2a) =	69.94	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	37.6	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	69.94	(5)
2. Ventilation rate:										
	main heating	seconda heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+	0] = [0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	╡ + ┌	0	ī = Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ans					2	x	10 =	20	(7a)
Number of passive vents	S				Ĺ	0	x	10 =	0	(7b)
Number of flueless gas f					F	0	×	40 =	0	(7c)
g					L					(, ,
								Air ch	anges per h	our
Infiltration due to chimne	ys, flues and fa	ans = $(6a)+(6b)+$	(7a)+(7b)+(7c) =	Г	20		÷ (5) =	0.29	(8)
If a pressurisation test has b	peen carried out or	is intended, proce	ed to (17),	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in t	he dwelling (ns	5)							0	(9)
Additional infiltration							[(9])-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber frame o	or 0.35 fo	r masonı	ry consti	ruction			0	(11)
if both types of wall are p deducting areas of openi			to the great	er wall are	a (after					
If suspended wooden	floor, enter 0.2	(unsealed) or (0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic metr	es per ho	our per s	quare m	etre of e	envelope	e area	10	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20] +$	(8), otherw	ise (18) = ((16)				0.79	(18)
Air permeability value applie	es if a pressurisatio	on test has been do	one or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x ([*]	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18) x (20) =				0.67	(21)
Infiltration rate modified	for monthly win	d speed	_						-	
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a)m = (2	2\m ÷ 1									
Wind Factor (22a)m = $(2^{2})^{2}$		1.00 0.05	T 0.05	I 0.02		1 4 00	1	1	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ition rate (a	allowin	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m						
0.85	0.84 0	.82	0.73	0.72	0.63	0.63	0.62	0.67	0.72	0.75	0.78			
Calculate effect		-	ate for t	he appli	cable ca	se			!			· 		٦,,,,
If mechanical			ndiv N. (2	3h) - (23a	a) v Emy (c	auation (I	VEVV otho	nvico (23h) = (232)				0	(23a)
If balanced with) – (23a)				0	(23b)
	_		-	_					01- \ <i>(</i>	005) [4 (00-)		0	(23c)
a) If balanced	0 mechanic	o l	ntilation	with nea	at recove	ery (MV)	$\frac{HR}{0}$ (248	a)m = (22 0	2b)m + (.	23b) × [1 – (23c) 1 0	100j		(24a)
, ,			-											(244)
b) If balanced		0 T	0	without 0	0	0 0	0 0	0	0	23D) 0	0]		(24b)
	I	!			<u> </u>		<u> </u>	<u> </u>		0				(2.5)
c) If whole ho	< 0.5 × (23			•	•				.5 × (23b))				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]		(24c)
d) If natural v	entilation o	or who	ole hous	e positiv	ve input	ventilatio	on from	loft		<u> </u>	!	J		
,	= 1, then (•	•				0.5]					
(24d)m= 0.86	0.85 0	.83	0.77	0.76	0.7	0.7	0.69	0.72	0.76	0.78	0.81			(24d)
Effective air	change rate	e - ent	ter (24a) or (24k	o) or (24	c) or (24	d) in bo	x (25)				_		
(25)m= 0.86	0.85 0	.83	0.77	0.76	0.7	0.7	0.69	0.72	0.76	0.78	0.81			(25)
3. Heat losses	and heat l	loss pa	aramete	er:										
ELEMENT	Gross area (m²		Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	()	k-value kJ/m²·l		A > kJ/	
Daara	S	,								\)	NJ/III I			
Doors								 = [`	<u>\)</u>	KJ/III 1			
	1				2.2	x	1.3	= [2.86		KJ/III 1			(26)
Windows Type					3.63	x x1	1.3 /[1/(1.6)+	0.04] =	2.86	\) 	KJ/III 1			(26) (27)
Windows Type Windows Type					2.2 3.63 2.67	x x1 x1	1.3 /[1/(1.6)+ /[1/(1.6)+	= [0.04] = [0.04] = [2.86 5.46 4.02		KJ/III 1			(26) (27) (27)
Windows Type Windows Type Rooflights	2	- 1	63	_	2.2 3.63 2.67 0.82	x1 x1 x1	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) +	= [0.04] = [0.04] = [2.86 5.46 4.02 1.066		KJ/III 1	` 		(26) (27) (27) (27b)
Windows Type Windows Type Rooflights Walls Type1	10.35] !	6.3		2.2 3.63 2.67 0.82 4.05	x1 x1 x1 x1 x1 x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) +	= [0.04] = [0.04] = [2.86 5.46 4.02 1.066 2.23		KJ/III 1	` [(26) (27) (27) (27b) (29)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2	10.35		2.2		2.2 3.63 2.67 0.82 4.05	x x1 x1 x1 x1 x x x x x x x x x x x x x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) + 0.55	= [0.04] = [0.04] = [0.04] = [= [2.86 5.46 4.02 1.066 2.23 7.91		KJ/III 1	`] [] [(26) (27) (27) (27b) (29) (29)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1	10.35 16.58 35.62		2.2		2.2 3.63 2.67 0.82 4.05 14.38 33.98	x x1 x1 x1 x1 x x x x x x x x x x x x x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) +	= [0.04] = [0.04] = [0.04] = [= [= [2.86 5.46 4.02 1.066 2.23 7.91 6.12		KJ/III 1	`] [] [(26) (27) (27) (27b) (29) (29) (30)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2	2 10.35 16.58 35.62 13.82		2.2		2.2 3.63 2.67 0.82 4.05 14.38 33.98	x x1 x1 x1 x1 x1 x x x x x x x x x x x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) + 0.55	= [0.04] = [0.04] = [0.04] = [= [2.86 5.46 4.02 1.066 2.23 7.91		KJ/III 1	` 		(26) (27) (27) (27b) (29) (29) (30) (30)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of ele	2 10.35 16.58 35.62 13.82		2.2		2.2 3.63 2.67 0.82 4.05 14.38 33.98 13.82 76.37	x x1 x1 x1 x1 x x x x x x x x x x x x x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) +	= [0.04] = [0.04] = [0.04] = [= [= = [2.86 5.46 4.02 1.066 2.23 7.91 6.12 1.93		KJ/III 1	` 		(26) (27) (27) (27b) (29) (29) (30) (30) (31)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of eleparty wall	2 10.35 16.58 35.62 13.82		2.2		2.2 3.63 2.67 0.82 4.05 14.38 33.98 13.82 76.37	x x1 x1 x1 x1 x x x1 x x x x x x x x x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) +	= [0.04] = [0.04] = [0.04] = [= [= [2.86 5.46 4.02 1.066 2.23 7.91 6.12		KJ/III 1	` 		(26) (27) (27) (27b) (29) (29) (30) (30) (31) (32)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of ele Party wall Party floor	10.35 16.58 35.62 13.82 ements, m ²		2.2 1.64		2.2 3.63 2.67 0.82 4.05 14.38 33.98 13.82 76.37 15.11 37.6	x x1 x1 x1 x1 x x x x x x x x x x x x x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) + 0.55 0.55 0.18 0.14	= [0.04] = [0.04] = [0.04] = [= [= = [= = [2.86 5.46 4.02 1.066 2.23 7.91 6.12 1.93					(26) (27) (27) (27b) (29) (29) (30) (30) (31)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of eleparty wall	10.35 16.58 35.62 13.82 ements, managements, managements, managements	use eff	2.2 1.64 0	ndow U-va	2.2 3.63 2.67 0.82 4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calcul	x x1 x1 x1 x1 x x x x x x x x x x x x x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) + 0.55 0.55 0.18 0.14	= [0.04] = [0.04] = [0.04] = [= [= = [= = [2.86 5.46 4.02 1.066 2.23 7.91 6.12 1.93					(26) (27) (27) (27b) (29) (29) (30) (30) (31) (32)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of ele Party wall Party floor * for windows and it	10.35 16.58 35.62 13.82 ements, marks on both side	use eff	2.2 1.64 0	ndow U-va	2.2 3.63 2.67 0.82 4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calcul	x x1 x1 x1 x1 x x x x x x x x x x x x x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) + 0.55 0.55 0.18 0.14	= [0.04] = [0.04] = [0.04] = [= [= [= [= [= [= []	2.86 5.46 4.02 1.066 2.23 7.91 6.12 1.93				2.55	(26) (27) (27) (27b) (29) (29) (30) (30) (31) (32)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of ele Party wall Party floor * for windows and in ** include the areas	10.35 16.58 35.62 13.82 ements, many coof windows, so on both sides, w/K = S	use eff es of inte (A x U	2.2 1.64 0	ndow U-va	2.2 3.63 2.67 0.82 4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calcul	x x1 x1 x1 x1 x x x x x x x x x x x x x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) +	= [0.04] = [0.04] = [0.04] = [= [= [= []	2.86 5.46 4.02 1.066 2.23 7.91 6.12 1.93	as given in	paragraph] [(26) (27) (27) (27b) (29) (30) (30) (31) (32) (32a)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of ele Party wall Party floor * for windows and r ** include the areas Fabric heat loss	10.35 16.58 35.62 13.82 ements, marginal control windows, so on both side s, W/K = S Cm = S(A x	use effes of inte (A x U	2.2 1.64 0 fective windermal wall J)	ndow U-ve	2.2 3.63 2.67 0.82 4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calculatitions	x x1 x1 x1 x1 x1 x1 x1 x1 xx xx xx xx xx	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) +	= [0.04] = [0.04] = [0.04] = [0.04] = [= [= [= [] = [] + (32) = ((28)	2.86 5.46 4.02 1.066 2.23 7.91 6.12 1.93		paragraph	32	2.55	(26) (27) (27) (27b) (29) (30) (30) (31) (32) (32a)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of ele Party wall Party floor * for windows and re * include the areas Fabric heat loss Heat capacity C	10.35 16.58 35.62 13.82 ements, maximum of windows, son both side s, W/K = S Cm = S(A x parameter ments where s	use effes of inte (A x U k) (TMP	2.2 1.64 0 fective windernal wall J) = Cm ÷	ndow U-va ls and part	2.2 3.63 2.67 0.82 4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calculatitions	x x1 x1 x1 x1 x1 x2 x x x x x x x x x x	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) +	= [0.04] = [0.04] = [0.04] = [0.04] = [= [= [= [] = [] = [] + (32) = ((28) Indica	2.86 5.46 4.02 1.066 2.23 7.91 6.12 1.93 0 ue)+0.04] a	s given in (2) + (32a).	paragraph (32e) =	32	2.55	(26) (27) (27) (27b) (29) (29) (30) (30) (31) (32) (32a) (333) (34)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of ele Party wall Party floor * for windows and r ** include the areas Fabric heat loss Heat capacity C Thermal mass p	10.35 16.58 35.62 13.82 ements, many and the second windows, so on both sides, W/K = S Cm = S(A x parameter ments where and of a detailed	use effes of inte (A x U k) (TMP the deta	2.2 1.64 0 fective windernal wall J) = Cm ÷ ails of the lation.	ndow U-vals and part	2.2 3.63 2.67 0.82 4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calculatitions	x x1 x1 x1 x1 xx xx xx xx xx xx xx xx xx	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) +	= [0.04] = [0.04] = [0.04] = [0.04] = [= [= [= [] = [] = [] + (32) = ((28) Indica	2.86 5.46 4.02 1.066 2.23 7.91 6.12 1.93 0 ue)+0.04] a	s given in (2) + (32a).	paragraph (32e) =	32 390 2	2.55	(26) (27) (27) (27b) (29) (29) (30) (30) (31) (32) (32a) (333) (34)
Windows Type Windows Type Rooflights Walls Type1 Walls Type2 Roof Type1 Roof Type2 Total area of ele Party wall Party floor * for windows and r ** include the areas Fabric heat loss Heat capacity O Thermal mass p For design assesses can be used instead	10.35 16.58 35.62 13.82 ements, many and the side of a detailed of a detailed of a religious and the side of a detailed of a det	use effes of inte (A x L k) (TMP the deta d calcul	2.2 1.64 0 fective windernal wall J) = Cm ÷ ails of the plation. culated to	ndow U-vals and part - TFA) ir construct	2.2 3.63 2.67 0.82 4.05 14.38 33.98 13.82 76.37 15.11 37.6 alue calculatitions n kJ/m²K copendix k	x x1 x1 x1 x1 xx xx xx xx xx xx xx xx xx	1.3 /[1/(1.6)+ /[1/(1.6)+ /[1/(1.6)+ /[1/(1.3) +	= [0.04] = [0.04] = [0.04] = [2.86 5.46 4.02 1.066 2.23 7.91 6.12 1.93 0 ue)+0.04] a	s given in (2) + (32a).	paragraph (32e) =	32 390 2	2.55 06.27 50	(26) (27) (27) (27b) (29) (30) (30) (31) (32) (32a) (333) (34) (35)

Ventila	ition hea	at loss ca	alculated	l monthl	y				(38)m	= 0.33 × ((25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	19.91	19.59	19.27	17.77	17.49	16.19	16.19	15.95	16.69	17.49	18.06	18.65		(38)
Heat tr	ansfer o	coefficie	nt, W/K				!	!	(39)m	= (37) + (37)	38)m	!		
(39)m=	63.92	63.59	63.27	61.77	61.49	60.19	60.19	59.95	60.69	61.49	62.06	62.65		
Heat Id	oss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	61.77	(39)
(40)m=	1.7	1.69	1.68	1.64	1.64	1.6	1.6	1.59	1.61	1.64	1.65	1.67		
Numbe	er of day	s in mo	nth (Tab	le 1a)			•	•	,	Average =	Sum(40) ₁	12 /12=	1.64	(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 heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
\ ccum	and accu	ıpancy, l	NI									0.4	İ	(40)
if TF	A > 13.9	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.34		(42)
	A £ 13.9	,						(O.E. A.I.)					Ī	
			ater usaç hot water							se target o		5.12		(43)
		-	person per			-	-			Ū				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	<u> </u>			Table 1c x		<u>'</u>	<u> </u>	!	!		
(44)m=	72.73	70.09	67.45	64.8	62.16	59.51	59.51	62.16	64.8	67.45	70.09	72.73		
Eneray o	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd.n	n x nm x D)Tm / 3600			m(44) ₁₁₂ = ables 1b. 1		793.47	(44)
(45)m=	107.86	94.34	97.35	84.87	81.44	70.27	65.12	74.72	75.62	88.12	96.19	104.46		
. ,			l				l			L Total = Su	m(45) ₁₁₂ =	<u> </u> =	1040.37	(45)
If instant	taneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					
(46)m=	16.18	14.15	14.6	12.73	12.22	10.54	9.77	11.21	11.34	13.22	14.43	15.67		(46)
	storage		\ inaludir	a ony o	olar or M	WHDC	otorogo	within o	ama vaa	ool			Ī	(47)
•		` ') includir	•			•		ame ves	sei		0		(47)
	-	_	ind no ta hot wate		_			. ,	ers) ente	er 'O' in <i>(</i>	47)			
	storage			(,		, ,			
a) If m	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(48) x (49) =			0		(50)
			eclared o	-										
		_	factor fr		e 2 (kW	h/litre/da	ay)					0		(51)
	-	from Ta	ee secti	011 4.3								0		(52)
			m Table	2b								0		(53)
			storage		ear			(47) x (51) x (52) x (53) =		0	! 	(54)
		(54) in (5	•	,y				() // (01	, (=) ^ (/	-	0		(55)
	` '	. , .	culated t	for each	month			((56)m = (55) × (41)	m			ı	•
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
(55)				L	L	L				L			1	(55)

If cylinder contair	ns dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circui	t loss (ar	nnual) fro	m Table	⇒ 3	•			•			0		(58)
Primary circui	•	•			59)m = ((58) ÷ 36	65 × (41)	m				•	
(modified b	y factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	alculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 37.06	32.26	34.37	31.96	31.67	29.35	30.33	31.67	31.96	34.37	34.56	37.06		(61)
Total heat red	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= 144.93	126.6	131.72	116.83	113.11	99.62	95.44	106.4	107.57	122.49	130.76	141.53		(62)
Solar DHW input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add additiona	al lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	iter											
(64)m= 144.93	126.6	131.72	116.83	113.11	99.62	95.44	106.4	107.57	122.49	130.76	141.53		_
							Outp	out from wa	ater heate	r (annual)₁	12	1436.99	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m]	
(65)m= 45.13	39.43	40.96	36.21	35	30.7	29.23	32.76	33.13	37.89	40.63	44		(65)
include (57	m in cal	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	leating	
5. Internal g	ains (see	e Table 5	and 5a):									
Metabolic gai	ns (Table	e 5). Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 67.21	67.21	67.21	67.21	67.21	67.21	67.21	67.21	67.21	67.21	67.21	67.21		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 10.3	9.15	7.44	5.63	4.21	3.55	3.84	4.99	6.7	8.51	9.93	10.59		(67)
Appliances ga	ains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5			•	
(68)m= 115.55	116.75	113.73	107.29	99.17	91.54	86.44	85.24	88.27	94.7	102.82	110.45		(68)
Cooking gains	s (calcula	ated in A	ppendix	L, equat	ion L15	or L15a), also se	ee Table	5			•	
(69)m= 29.72	29.72	29.72	29.72	29.72	29.72	29.72	29.72	29.72	29.72	29.72	29.72		(69)
Pumps and fa	ıns gains	(Table 5	5а)									•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)	Į.	l.			Į.	Į.		
(71)m= -53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76	-53.76		(71)
Water heating	ı gains (⅂	rable 5)		l		l	l						
(72)m= 60.66	58.68	55.05	50.29	47.04	42.64	39.29	44.04	46.02	50.93	56.42	59.14		(72)
Total interna	l gains =	:	<u> </u>	ļ.	(66)	ı m + (67)m	ı + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	m	ı	
(73)m= 232.67	, 	222.38	209.38	196.58	183.9	175.74	180.44	187.15	200.3	215.34	226.34		(73)
6. Solar gain	s:												
Solar gains are		using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	nvert to th	e applicat	le orientat	ion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	x ble 6a	Т	g_ able 6b	Ta	FF able 6c		Gains (W)	
												` '	

Northeast _{0.9x}	0.77	x	3.63	X	11.28	x	0.63	x [0.7	=	12.52	(75)
Northeast _{0.9x}	0.77	x	3.63	x	22.97	x	0.63	X	0.7	=	25.48	(75)
Northeast _{0.9x}	0.77	x	3.63	X	41.38	x	0.63	x	0.7	=	45.9	(75)
Northeast _{0.9x}	0.77	x	3.63	X	67.96	x	0.63	X	0.7	=	75.39	(75)
Northeast _{0.9x}	0.77	x	3.63	x	91.35	x	0.63	= x [0.7	=	101.34	(75)
Northeast _{0.9x}	0.77	x	3.63	x	97.38	х	0.63	x [0.7	=	108.04	(75)
Northeast _{0.9x}	0.77	×	3.63	x	91.1	х	0.63	_ x [0.7	=	101.07	(75)
Northeast _{0.9x}	0.77	×	3.63	x	72.63	x	0.63	_ x [0.7	=	80.57	(75)
Northeast _{0.9x}	0.77	×	3.63	x	50.42	x	0.63	×	0.7	=	55.94	(75)
Northeast _{0.9x}	0.77	×	3.63	X	28.07	x	0.63	= x [0.7	_ =	31.14	(75)
Northeast _{0.9x}	0.77	×	3.63	X	14.2	x	0.63	_ x [0.7	=	15.75	(75)
Northeast _{0.9x}	0.77	×	3.63	x	9.21	x	0.63	×	0.7	=	10.22	(75)
Northwest _{0.9x}	0.77	×	2.67	x	11.28	x	0.63		0.7	-	9.21	(81)
Northwest _{0.9x}	0.77	×	2.67	X	22.97	x	0.63	= x [0.7	=	18.74	(81)
Northwest _{0.9x}	0.77	×	2.67	X	41.38	x	0.63	= x [0.7	=	33.76	(81)
Northwest _{0.9x}	0.77	×	2.67	X	67.96	x	0.63	_ x [0.7	_ =	55.45	(81)
Northwest _{0.9x}	0.77	×	2.67	x	91.35	х	0.63	x [0.7		74.54	(81)
Northwest _{0.9x}	0.77	x	2.67	x	97.38	x	0.63	= x [0.7	=	79.46	(81)
Northwest 0.9x	0.77	x	2.67	x	91.1	x	0.63	= x [0.7		74.34	(81)
Northwest _{0.9x}	0.77	x	2.67	x	72.63	x	0.63	= x	0.7	=	59.26	(81)
Northwest _{0.9x}	0.77	x	2.67	X	50.42	x	0.63	x	0.7	=	41.14	(81)
Northwest _{0.9x}	0.77	×	2.67	x	28.07	x	0.63	_ x [0.7	=	22.9	(81)
Northwest _{0.9x}	0.77	x	2.67	X	14.2	х	0.63	x	0.7	=	11.58	(81)
Northwest 0.9x	0.77	x	2.67	X	9.21	x	0.63	x [0.7	=	7.52	(81)
Rooflights _{0.9x}	1	x	0.82	X	15.92	x	0.5	x [0.8	=	9.4	(82)
Rooflights _{0.9x}	1	x	0.82	X	32.51	X	0.5	x [0.8	=	19.19	(82)
Rooflights 0.9x	1	x	0.82	X	59.5	X	0.5	x [0.8	=	35.13	(82)
Rooflights 0.9x	1	x	0.82	X	100.03	X	0.5	x [0.8	=	59.06	(82)
Rooflights _{0.9x}	1	x	0.82	X	136.88	X	0.5	x [0.8	=	80.81	(82)
Rooflights 0.9x	1	X	0.82	X	147.03	X	0.5	x [0.8	=	86.81	(82)
Rooflights _{0.9x}	1	x	0.82	X	137.1	X	0.5	x [0.8	=	80.94	(82)
Rooflights _{0.9x}	1	×	0.82	X	107.76	X	0.5	x [0.8	=	63.62	(82)
Rooflights 0.9x	1	X	0.82	X	73.17	X	0.5	X	0.8	=	43.2	(82)
Rooflights _{0.9x}	1	X	0.82	X	39.91	X	0.5	X	0.8	=	23.56	(82)
Rooflights _{0.9x}	1	×	0.82	X	20.03	X	0.5	X	0.8	=	11.83	(82)
Rooflights _{0.9x}	1	X	0.82	X	13.01	X	0.5	X	0.8	=	7.68	(82)
Solar gains in w					74.04 050.05		n = Sum(74)m.		20.40	05.40	1	(83)
(83)m= 31.12 Total gains – inf		14.8 solar	$\begin{array}{c c} 189.9 & 256.6 \\ \hline (84)m = (73)r \end{array}$		74.31 256.35	203	.46 140.28	77.6	39.16	25.42		(63)
			399.28 453.2	<u> </u>	58.21 432.09	383	.89 327.42	277.9	254.5	251.76	1	(84)
` '					102.00	000	.50 527.12	217.0	1 201.0	201.70	İ	(= -)
7. Mean intern		•			area from Tal	olo O	Th1 (°C)				0.4	/05\
Temperature of	•	•		_		JIE 9,	, 1111 (C)				21	(85)
Utilisation facto	<u>`</u> _			Ť		Δ	ug Sep	Oct	Nov	Dec		
Stroma FSA 2012	Version 1.0	<u>.4.26 (1</u> 5	SAP 9:92] - http://	Mww.	stromal.com ^{ui}	^	ag Geb	001	INOV	שפט	Page	5 of 7

(86)m=	1	0.99	0.99	0.96	0.87	0.72	0.57	0.65	0.88	0.98	0.99	1		(86)
Mean	internal	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				'	
(87)m=	19.17	19.34	19.67	20.16	20.6	20.87	20.96	20.94	20.7	20.16	19.6	19.17		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9. T	h2 (°C)		•		I	
(88)m=	19.54	19.55	19.55	19.58	19.59	19.61	19.61	19.62	19.6	19.59	19.58	19.57		(88)
l Itilie	etion fac	tor for a	ains for	rest of d	welling	h2 m (se	L Tahla	02)					l .	
(89)m=	0.99	0.99	0.98	0.94	0.82	0.61	0.41	0.48	0.8	0.96	0.99	1		(89)
								l		l			l	, ,
		18.09	ature in	the rest	of dwelli	ng 12 (fo	ollow ste	eps 3 to 19.6	7 in Tabl	le 9c) 18.93	18.38	17.04		(90)
(90)m=	17.92	16.09	10.42	10.93	19.33	19.50	19.0	19.0			ig area ÷ (4	17.94	0.00	(91)
										ILA - LIVIII	ig alca · (•	+) -	0.89	(91)
			ature (fo					+ (1 – fL	A) × T2				Ī	
(92)m=	19.04	19.2	19.53	20.03	20.46	20.73	20.82	20.8	20.56	20.02	19.47	19.04		(92)
			r					r	ere appro	·	1		I	
(93)m=	19.04	19.2	19.53	20.03	20.46	20.73	20.82	20.8	20.56	20.02	19.47	19.04		(93)
			uirement											
				•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the u			or gains			lun	lul	Aug	Con	Oct	Nov	Doo	1	
l Itilie	Jan stion fac	Feb tor for a	Mar ains, hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	İ	
(94)m=	0.99	0.99	0.98	0.94	0.86	0.7	0.55	0.63	0.86	0.97	0.99	0.99		(94)
			, W = (9 ²			0.7	0.00	0.00	0.00	0.07	0.00	0.00		()
(95)m=		291.21	330.12	376.6	387.71	321.76	239.52	240.92	281.45	268.99	251.94	250.44		(95)
			rnal tem					1						, ,
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	loss rate	for mea	ı an intern	al tempe	erature.	Lm . W =	∟ =[(39)m :	ı x [(93)m	– (96)m	 1				
(97)m=	942.09	909.56	824.72	687.5	538.74	369.18	253.78	263.52	392.32	579.55	767.9	929.67		(97)
Space	e heating	g require	ement fo	r each n	nonth, k\	Mh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	ļ	1	
(98)m=	505.89	415.54	367.98	223.85	112.37	0	0	0	0	231.06	371.49	505.35		
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2733.51	(98)
Spac	e heatin	a require	ement in	kWh/m²	² /vear								72.7	(99)
	· ·	•)				12.1	
			nts – Indi	viduai n	eating sy	ystems i	ncluaing	micro-C	SHP)					
•	e heatir	•	nt from s	econdar	u/sunnle	mentarv	svetem						0	(201)
						memary	-	(202) = 1	(201) =					≓
	•		nt from m	-	` ,					(000)7			1	(202)
			ng from	-				(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1								90.3	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heating	g require	ement (c	alculate	d above))		•	•		•		ı	
	505.89	415.54	367.98	223.85	112.37	0	0	0	0	231.06	371.49	505.35		
(211)m	n = {[(98)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
•	560.23	460.17	407.5	247.89	124.44	0	0	0	0	255.88	411.4	559.63		
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	3027.15	(211)
													1	_

Space heating fuel (secondary), kWh/month									
$= \{[(98)\text{m x } (201)] \} \text{ x } 100 \div (208)$ $(215)\text{m} = $	0	0	0	0	0	0	0		
					ar) =Sum(2			0	(215)
Water heating									_
Output from water heater (calculated above)						•		•	
	99.62	95.44	106.4	107.57	122.49	130.76	141.53		_
Efficiency of water heater						•		81	(216)
(217)m= 88.05 87.94 87.65 86.88 85.38	81	81	81	81	86.85	87.68	88.09		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m						_	_		
(219)m= 164.6 143.96 150.28 134.47 132.47 1	122.99 1	117.83	131.36	132.81	141.05	149.13	160.66		
			Tota	I = Sum(2	19a) ₁₁₂ =			1681.61	(219)
Annual totals					k\	Wh/yeaı	r	kWh/year	_
Space heating fuel used, main system 1								3027.15	
Water heating fuel used								1681.61	
Electricity for pumps, fans and electric keep-hot									
central heating pump:							30		(230c)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			30	(231)
Electricity for lighting								181.92	(232)
12a. CO2 emissions – Individual heating system	ns includ	ing mid	cro-CHP						
	Ene r kWh	rgy /year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ar
Space heating (main system 1)	(211)	x			0.2	16	=	653.86	(261)
Space heating (secondary)	(215)	x			0.5	19	=	0	(263)
Water heating	(219)	x			0.2	16	=	363.23	(264)
Space and water heating	(261) -	+ (262) -	+ (263) + (264) =				1017.09	(265)
Electricity for pumps, fans and electric keep-hot	(231)	X			0.5	19	=	15.57	(267)
Electricity for lighting	(232)	x			0.5	19	=	94.42	(268)
Total CO2, kg/year				sum o	of (265)(2	271) =		1127.08	(272)

El rating (section 14)

(274)

			l lear F	Details:						
Assessor Name:	Chris Hock	nell	U3GFL	Strom	a Nive	bor:		STD()	016363	
Software Name:	Stroma FS			Softwa					on: 1.0.4.26	
Software Name:	Stionia FS.	AP 2012	Duananti					versic)II. 1.U.4.ZO	
A 1.1		ما الما الما الما الما الما الما الما ا	Property			_ean				
Address :		ndfield Garden	s, LONDO	JN, NVV3	6PU					
Overall dwelling dime	ensions:		•							0)
Crayind flags				a(m²)	l., ,		eight(m)	_	Volume(m	<u> </u>
Ground floor				12.28	(1a) x	2	2.06	(2a) =	87.1	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	12.28	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	87.1	(5)
2. Ventilation rate:										
	main heating	second heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [0] = [0	Х	40 =	0	(6a)
Number of open flues	0		= +	0	j = [0	x	20 =	0	(6b)
Number of intermittent fa	ans					2	x	10 =	20	(7a)
Number of passive vents	2				F	0	x	10 =	0	(7b)
·					Ļ			40 =	_	=
Number of flueless gas f	ires					0	^	40 -	0	(7c)
								Air ch	nanges per h	our
Infiltration due to chimne	evs flues and fa	ans = (6a) + (6b)	+(7a)+(7b)+	(7c) =	Г	20		÷ (5) =	0.23	(8)
If a pressurisation test has t					continue fr			. (3) –	0.23	(0)
Number of storeys in t						o (o) to	(1.5)		0	(9)
Additional infiltration	9 (,					[(9))-1]x0.1 =	0	(10)
Structural infiltration: 0).25 for steel or	timber frame	or 0.35 fo	r masoni	rv constr	ruction	I(°,	, .j	0	(11)
if both types of wall are p					•				Ů	(/
deducting areas of openi	• ,									_
If suspended wooden		•	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic me	res per ho	our per s	quare m	etre of	envelope	area	10	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	+(8), otherw	rise (18) = ((16)				0.73	(18)
Air permeability value applie	es if a pressurisatio	on test has been o	lone or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18) x (20) =				0.62	(21)
Infiltration rate modified	for monthly win	d speed								
Jan Feb	Mar Apr	May Jur	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a)m = (2	12\m ÷ 4									
Wind Factor (22a)m = $(2^{2})^{2}$		100 005	0.05	Ι , ,,,	Ι.	1		1	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ation rate (allow	ing for shelter	and wind spe	eed) = (21a) x	(22a)m					
0.79	0.78 0.76	0.68 0.67	1	0.59 0.57	0.62	0.67	0.7	0.73		
Calculate effect	tive air change	rate for the ap	plicable case	;	•			·		
	ar vermanom. eat pump using App	nendix N (23h) = (23a) x Emy (eq	uation (N5)) othe	erwise (23h	n) = (23a)		L	0	(23a
	heat recovery: effi	, , ,	, , , ,	` ''	•	, (200)		L T	0	(23b
	d mechanical v	-				2h\m + (2	3h) x [[1 _ (23c)	0 ÷ 1001	(230
(24a)m= 0			0	0 0	0		0	0	. 100]	(24a
` '	d mechanical v									•
(24b)m= 0	0 0	0 0	0	0 0	0		0	0		(24b
c) If whole he	ouse extract ve ouse x(23b),	•				5 x (23h)				
(24c)m = 0	0 0		0	0 0	T 0	0	0	0		(240
, ,	ventilation or w					<u> </u>				•
	n = 1, then (24d					0.5]				
(24d)m= 0.81	0.8 0.79	0.73 0.72	0.67	0.67 0.66	0.69	0.72	0.74	0.77		(240
Effective air	change rate - e	nter (24a) or (2	24b) or (24c)	or (24d) in bo	x (25)			<u> </u>		
(25)m= 0.81	0.8 0.79	0.73 0.72	0.67	0.67 0.66	0.69	0.72	0.74	0.77		(25)
3. Heat losses	s and heat loss	parameter:		-						
ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²			A X U (W/K)	k-value kJ/m²·k		A X k kJ/K
Doors			2.2	x 1.3	=	2.86				(26)
Windows			2.73	x1/[1/(1.3)-	+ 0.04] =	3.37				(27)
Rooflights Type	e 1		0.82	x1/[1/(1.3) +	0.04] =	1.066	Ħ			(27t
Rooflights Type	e 2		0.82	x1/[1/(1.3) +	0.04] =	1.066				(271
Rooflights Type	e 3		0.36	X1/[1/(1.3) +	0.04] =	0.468				(27b
Walls Type1	1.98	0	1.98	X 0.55	=	1.09	Ϊſ		7	(29)
Walls Type2	6.4	2.2	4.2	X 0.55	=	2.31	i i		i i	(29)
Walls Type3	8.72	2.73	5.99	x 0.14		0.84	- - - -		i	(29)
Roof Type1	25.2	0	25.2	x 0.18		4.54	-		i H	(30)
Roof Type2	23.07	0.36	22.71	x 0.14		3.18			╡⊨	(30)
Roof Type3	4.86	3.28	1.58	x 0.14	=	0.22	_		╡⊨	(30)
Total area of el		0.20	70.23	^ <u></u>		L 0.22	[(31)
Party wall			33.48	x		0			-	(31)
Party floor				^		L			╡┝	(32)
. arry 11001	roof windows, use			l ed using formula	1/[(1/U-valu	ue)+0.04] as	given in	paragraph	3.2	(\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\
	s on both sides of	nternal walls and i								
	is on both sides of R is, W/K = S (A)		, artition o	(26)(30	0) + (32) =			ſ	22.91	(33)
** include the area	s, W/K = S (A)		on unione	(26)(30		(30) + (32)	+ (32a).	(32e) =	22.91 4606.9	==
** include the area. Fabric heat los Heat capacity (s, W/K = S (A)	(U)		(26)(30	((28).	(30) + (32) ative Value: I		(32e) = [==

n be u	al bridge		v V) col	culatad i	ucina An	nondiv I	/						10.50	
	•	`	are not kn		• •	•	N.						10.53	(3
	abric he		aro mot kin	omn (00)	0.00 x (0	• /			(33) +	(36) =			33.44	(3
entila	tion hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m=	23.36	23.01	22.67	21.06	20.76	19.36	19.36	19.1	19.9	20.76	21.37	22		(3
eat tr	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
9)m=	56.8	56.45	56.11	54.5	54.2	52.8	52.8	52.54	53.34	54.2	54.81	55.44		
eat Ic	ss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) _{1.} (4)	12 /12=	54.5	(
0)m=	1.34	1.34	1.33	1.29	1.28	1.25	1.25	1.24	1.26	1.28	1.3	1.31		
umbe	er of day	s in moi	nth (Tabl	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.29	(
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(
. Wa	iter heat	ting ene	rgy requi	rement:								kWh/y	ear:	
			NI.										1	
		ipancy, l		[1 ovn	/_n nnn3	849 v (TE	-A -13 9	12)1 + 0 (0013 x (ΓFA -13.		47		•
			+ 1.76 X	[i - exp	(-0.000	7-10 X (11	71 10.0	<i>)</i> _/] · O.(,		• ,			
if TF	A £ 13.9	9, N = 1			•	,		(25 x N)	`			1.07	1	(
if TF nnual duce	A £ 13.9 I averag the annua	9, N = 1 e hot wa al average	ater usag hot water	ge in litre	es per da 5% if the o	ay Vd,av Iwelling is	erage = designed	, . <u>.</u>	+ 36		69	0.07]	(
if TF nnual _{duce}	A £ 13.9 I averag the annua	9, N = 1 e hot wa al average litres per p	ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	69	· ·		(
if TF nnual duce t more	A £ 13.9 I averag the annua e that 125 Jan	P, N = 1 e hot wa al average litres per p	ater usag hot water person per Mar	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36		69	.07 Dec]	(
if TF inual duce more	A £ 13.9 I averag the annua that 125 Jan er usage in	9, N = 1 e hot wa al average litres per p Feb n litres per	nter usag hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa	ay Vd,av Iwelling is that and co	erage = designed in the latest section Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	e target o	Nov	Dec		(
if TF inual duce more	A £ 13.9 I averag the annua e that 125 Jan	9, N = 1 e hot wa al average litres per p	ater usag hot water person per Mar	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us Sep	Oct	Nov 73.21	Dec 75.98	828 83	
if TF nnual duce t more t wate	A £ 13.9 I average the annual enthat 125 Jan er usage in 75.98	P, N = 1 e hot wa al average litres per p Feb n litres per	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month 67.69	es per da 5% if the d vater use, I May Vd,m = fa 64.92	ay Vd,av lwelling is not and co Jun ctor from 1	erage = designed id) Jul Table 1c x 62.16	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	Oct 70.45 Fotal = Su	Nov 73.21 m(44) ₁₁₂ =	Dec 75.98	828.83	
if TF inual duce more t wate	A £ 13.9 I average the annual enthat 125 Jan er usage in 75.98	P, N = 1 e hot wa al average litres per p Feb n litres per	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month 67.69	es per da 5% if the d vater use, I May Vd,m = fa 64.92	ay Vd,av lwelling is not and co Jun ctor from 1	erage = designed id) Jul Table 1c x 62.16	(25 x N) to achieve Aug (43) 64.92	+ 36 a water us Sep	Oct 70.45 Fotal = Su	Nov 73.21 m(44) ₁₁₂ =	Dec 75.98	828.83	
if TF innual duce t more t wate i)m= ergy co i)m=	A £ 13.9 I average the annual of that 125 Jan Per usage in 75.98 content of 112.67	P, N = 1 The hot was all average litres per per per litres per per per per per per per per per per	Mar 70.45 used - calc	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65	es per da 5% if the of	ay Vd,av lwelling is not and co Jun ctor from 7 62.16 190 x Vd,r	erage = designed in designed i	(25 x N) to achieve Aug (43) 64.92 07m / 3600 78.05	+ 36 a water us Sep 67.69 a kWh/mon 78.99	Oct 70.45 Fotal = Su th (see Ta 92.05	73.21 m(44) ₁₁₂ = ables 1b, 1	75.98 	828.83 1086.72	
if TF innual iduce it more it wate i)m= ergy company	A £ 13.9 I average the annual of that 125 Jan Per usage in 75.98 content of 112.67	P, N = 1 The hot was all average litres per per per litres per per per per per per per per per per	Mar 70.45 used - calc	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65	es per da 5% if the of	ay Vd,av lwelling is not and co Jun ctor from 7 62.16 190 x Vd,r	erage = designed in designed i	(25 x N) to achieve Aug (43) 64.92	+ 36 a water us Sep 67.69 a kWh/mon 78.99	Oct 70.45 Fotal = Su th (see Ta 92.05	73.21 m(44) ₁₁₂ = 100.48	75.98 		
if TF innual duce t more t water t water innual i	A £ 13.9 I average the annual enthat 125 Jan Per usage in 75.98 content of 112.67 raneous w	P, N = 1 The hot was all average litres per	Mar 70.45 used - calc	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65	es per da 5% if the of	ay Vd,av lwelling is not and co Jun ctor from 7 62.16 190 x Vd,r	erage = designed in designed i	(25 x N) to achieve Aug (43) 64.92 07m / 3600 78.05	+ 36 a water us Sep 67.69 a kWh/mon 78.99	Oct 70.45 Fotal = Su th (see Ta 92.05	73.21 m(44) ₁₁₂ = 100.48	75.98 		
if TF innual iduce it more it water it water it water it water it water it more	A £ 13.9 I average the annual enthal 125 Jan To 15.98 content of 112.67 raneous w 16.9 storage	P, N = 1 Pe hot wa All average litres per l Peb Politres per Politres	Mar day for ea 101.69 ng at point 15.25	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65 of use (no	es per da 5% if the orater use, I May Vd,m = fa 64.92 onthly = 4. 85.06 o hot water 12.76	ay Vd,av lwelling is not and co Jun ctor from 7 62.16 190 x Vd,r 73.4	erage = designed in did did did did did did did did did	(25 x N) to achieve Aug (43) 64.92 78.05 boxes (46) 11.71	+ 36 a water us Sep 67.69 kWh/mon 78.99 to (61) 11.85	Oct 70.45 Total = Su th (see Ta 92.05 Total = Su 13.81	73.21 m(44) ₁₁₂ = ables 1b, 1 100.48 m(45) ₁₁₂ =	Dec 75.98 = c, 1d) 109.11 = 16.37		
if TF innual duce t more t t wate t t wate ergy c instant orag	A £ 13.9 I average the annual enthal 125 Jan Per usage in 75.98 content of 112.67 raneous w 16.9 storage e volum	P, N = 1 The hot was all average litres per	Mar Mar 70.45 used - calc 101.69 ng at point 15.25	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65 of use (no	es per da 5% if the orater use, I May Vd,m = fa 64.92 onthly = 4. 85.06 o hot water 12.76	ay Vd,av lwelling is that and co Jun ctor from 7 62.16 190 x Vd,r 73.4 storage), 11.01	erage = designed in designed i	(25 x N) to achieve Aug (43) 64.92 78.05 boxes (46) 11.71 within sa	+ 36 a water us Sep 67.69 kWh/mon 78.99 to (61) 11.85	Oct 70.45 Total = Su th (see Ta 92.05 Total = Su 13.81	73.21 m(44) ₁₁₂ = ables 1b, 1 100.48 m(45) ₁₁₂ =	75.98 		
if TF innual duce t more t wate innual innual duce t more limit innual innua	A £ 13.9 I average the annual enthat 125 Jan 75.98 content of 112.67 taneous w 16.9 storage enthat yellow the annual enthat 125 storage enthat yellow the annual enthat 12.67	P, N = 1 The hot was all average litres per per per per per per per per per per	Mar Mar Mar 70.45 101.69 ng at point 15.25 includinated no tale	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65 of use (no 13.3	es per da 5% if the of vater use, I May Vd,m = fa 64.92 onthly = 4. 85.06 o hot water 12.76 colar or Water velling, e	ay Vd,av welling is not and co Jun ctor from 7 62.16 190 x Vd,r 73.4 r storage), 11.01 WHRS	erage = designed id) Jul Table 1c x 62.16 m x nm x E 68.02 enter 0 in 10.2 storage) litres in	(25 x N) to achieve Aug (43) 64.92 78.05 boxes (46) 11.71 within sa (47)	+ 36 a water us Sep 67.69 68.99 10 to (61) 11.85 ame vess	Oct 70.45 Total = Su 92.05 Total = Su 13.81 sel	Nov 73.21 m(44) ₁₁₂ = sibles 1b, 1 100.48 m(45) ₁₁₂ =	Dec 75.98 = c, 1d) 109.11 = 16.37		
if TF innual duce t more t t wate t wate instant ater orage commitherware	A £ 13.9 I average the annual enthat 125 Jan 75.98 content of 112.67 taneous w 16.9 storage enthat yellow the annual enthat 125 storage enthat yellow the annual enthat 12.67	P, N = 1 The hot was all average litres per	Mar Mar Mar 70.45 101.69 ng at point 15.25 includinated no tale	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65 of use (no 13.3	es per da 5% if the of vater use, I May Vd,m = fa 64.92 onthly = 4. 85.06 o hot water 12.76 colar or Water velling, e	ay Vd,av welling is not and co Jun ctor from 7 62.16 190 x Vd,r 73.4 r storage), 11.01 WHRS	erage = designed id) Jul Table 1c x 62.16 m x nm x E 68.02 enter 0 in 10.2 storage) litres in	(25 x N) to achieve Aug (43) 64.92 78.05 boxes (46) 11.71 within sa	+ 36 a water us Sep 67.69 68.99 10 to (61) 11.85 ame vess	Oct 70.45 Total = Su 92.05 Total = Su 13.81 sel	Nov 73.21 m(44) ₁₁₂ = sibles 1b, 1 100.48 m(45) ₁₁₂ =	Dec 75.98 = c, 1d) 109.11 = 16.37		
if TF innual if TF	A £ 13.9 I average the annual enthal 125 Jan T5.98 content of 112.67 faneous w 16.9 storage e volume thal the proper in the p	P, N = 1 The hot was all average litres per	Mar Mar Mar 70.45 101.69 ng at point 15.25 includinated no tale	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65 of use (no 13.3 ag any so nk in dw er (this in	es per da 5% if the of water use, I May Vd,m = fa 64.92 onthly = 4. 85.06 o hot water 12.76 olar or W velling, e	ay Vd,av lwelling is hot and co Jun ctor from 7 62.16 190 x Vd,r 73.4 r storage), 11.01 /WHRS nter 110 nstantar	erage = designed in designed i	(25 x N) to achieve Aug (43) 64.92 78.05 boxes (46) 11.71 within sa (47)	+ 36 a water us Sep 67.69 68.99 10 to (61) 11.85 ame vess	Oct 70.45 Total = Su 92.05 Total = Su 13.81 sel	Nov 73.21 m(44) ₁₁₂ = hbles 1b, 1 100.48 m(45) ₁₁₂ = 15.07	Dec 75.98 = c, 1d) 109.11 = 16.37		
if TF nnual duce t more t wate t wate sis)m= nstant orag commisherwater) If m	A £ 13.9 I average the annual enthat 125 Jan 75.98 content of 112.67 aneous w 16.9 storage e volum munity he vise if no storage transfact	P, N = 1 The hot was all average litres per	Mar Mar Mar 70.45 101.69 15.25 including and no tall hot water	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65 of use (no 13.3 ag any so ank in dw er (this in	es per da 5% if the of water use, I May Vd,m = fa 64.92 onthly = 4. 85.06 o hot water 12.76 olar or W velling, e	ay Vd,av lwelling is hot and co Jun ctor from 7 62.16 190 x Vd,r 73.4 r storage), 11.01 /WHRS nter 110 nstantar	erage = designed in designed i	(25 x N) to achieve Aug (43) 64.92 78.05 boxes (46) 11.71 within sa (47)	+ 36 a water us Sep 67.69 68.99 10 to (61) 11.85 ame vess	Oct 70.45 Total = Su 92.05 Total = Su 13.81 sel	Nov 73.21 m(44) ₁₁₂ = sbles 1b, 1 100.48 m(45) ₁₁₂ = 15.07	Dec 75.98 = c, 1d) 109.11 = 16.37		
if TF innual iduce it more it water is si)m= instant orag committee ater i) If m empe nergy)	A £ 13.9 I average the annual of that 125 Jan 75.98 content of 112.67 aneous w 16.9 storage e volum munity h vise if no storage lanufact erature far of lost fro	P, N = 1 The hot was all average litres per per per per per per per per per per	Mar Mar Mar Mar Mar Mar Mar Mar Mar Mar	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65 of use (no 13.3 ng any so nk in dw er (this in oss facto 2b , kWh/ye	es per da 5% if the a vater use, I May Vd,m = fa 64.92 onthly = 4. 85.06 o hot water 12.76 colar or Wayelling, e includes i or is known ear	ay Vd,av lwelling is not and co Jun ctor from 7 62.16 190 x Vd,r 73.4 r storage), 11.01 /WHRS enter 110 nstantar wn (kWh	erage = designed in designed i	(25 x N) to achieve Aug (43) 64.92 78.05 boxes (46) 11.71 within sa (47)	+ 36 a water us Sep 67.69 78.99 1 to (61) 11.85 ame vess ers) ente	Oct 70.45 Total = Su 92.05 Total = Su 13.81 sel	Nov 73.21 m(44) ₁₁₂ = ables 1b, 1 100.48 m(45) ₁₁₂ = 15.07	Dec 75.98 = c, 1d) 109.11 = 16.37		
if TF nnual iduce it more it wate ergy of ergy of orag commitherw ater) If m ergy if mergy	A £ 13.9 I average the annual enthal 125 Jan 75.98 content of 112.67 aneous w 16.9 storage e volume munity he wise if no storage annufact erature for annufact that is a content of annufact erature for annufact that is a content of annufact erature for annufa	P, N = 1 The hot was all average litres per	Mar Mar Mar Mar 70.45 101.69 15.25 including the thorough the thoro	ge in litre usage by day (all w Apr ach month 67.69 culated mo 13.3 ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l	es per da 5% if the o vater use, I May Vd,m = fa 64.92 onthly = 4. 85.06 o hot water 12.76 olar or W velling, e ncludes i or is kno ear loss fact	ay Vd,av lwelling is not and co Jun ctor from 7 62.16 190 x Vd,r 73.4 storage), 11.01 /WHRS enter 110 nstantar wn (kWh	erage = designed in designed i	(25 x N) to achieve Aug (43) 64.92 78.05 boxes (46) 11.71 within sa (47) ombi boil	+ 36 a water us Sep 67.69 78.99 1 to (61) 11.85 ame vess ers) ente	Oct 70.45 Total = Su 92.05 Total = Su 13.81 sel	Nov 73.21 m(44) ₁₁₂ = ables 1b, 1 100.48 m(45) ₁₁₂ = 15.07	Dec 75.98 = c, 1d) 109.11 = 16.37 0 0 0 0 0		
if TF innual induce it more it water it water instant orag committeew fater if if m instant it water instant it water instant it water instant it water instant it water instant it water it wat	A £ 13.9 I average the annual enthal 125 Jan T5.98 content of 112.67 faneous w 16.9 storage e volum munity he wise if no storage enthal 125 rature far of lost from anufact enter storage the storage enthal 125 I lost from anufact enter storage enthal 125 I lost from anufact enter storage enthal 125 I lost from anufact enter storage enthal 125 I lost from anufact enter storage enthal 125 I lost from anufact enter storage enthal 125 I lost from anufact enter storage enthal 125 I lost from anufact e	P, N = 1 The hot was all average litres per	Mar Mar Mar Mar Mar Mar Mar Mar Mar Mar	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65 of use (no 13.3 ag any so ink in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	es per da 5% if the o vater use, I May Vd,m = fa 64.92 onthly = 4. 85.06 o hot water 12.76 olar or W velling, e ncludes i or is kno ear loss fact	ay Vd,av lwelling is not and co Jun ctor from 7 62.16 190 x Vd,r 73.4 storage), 11.01 /WHRS enter 110 nstantar wn (kWh	erage = designed in designed i	(25 x N) to achieve Aug (43) 64.92 78.05 boxes (46) 11.71 within sa (47) ombi boil	+ 36 a water us Sep 67.69 78.99 1 to (61) 11.85 ame vess ers) ente	Oct 70.45 Total = Su 92.05 Total = Su 13.81 sel	Nov 73.21 m(44) ₁₁₂ = ables 1b, 1 100.48 m(45) ₁₁₂ = 15.07	Dec 75.98 = c, 1d) 109.11 = 16.37		
if TF innual induce it more intuitiv	A £ 13.9 I average the annual entat 125 Jan 75.98 2001tent of 112.67 16.9 Storage entatorage in anuity heritary is annufact erature for annufact interstorage munity heritary is annufact erature for annufact interstorage munity heritary is annufact interstorage munity heritary is annufact interstorage munity heritary is annufact interstorage munity heritary is annufact interstorage munity heritary in annufact interstorage munity heritary is annufact interstorage munity heritary in annufact interstorage munity heritary in annufact interstorage munity heritary in annufact in	P, N = 1 The hot was all average litres per	Mar Mar Mar Mar Mar 70.45 101.69 15.25 including at point and no tale and to water a storage eclared of factor free sections.	ge in litre usage by day (all w Apr ach month 67.69 culated mo 88.65 of use (no 13.3 ag any so ink in dw er (this in oss facto 2b , kWh/ye cylinder l com Tabl	es per da 5% if the o vater use, I May Vd,m = fa 64.92 onthly = 4. 85.06 o hot water 12.76 olar or W velling, e ncludes i or is kno ear loss fact	ay Vd,av lwelling is not and co Jun ctor from 7 62.16 190 x Vd,r 73.4 storage), 11.01 /WHRS enter 110 nstantar wn (kWh	erage = designed in designed i	(25 x N) to achieve Aug (43) 64.92 78.05 boxes (46) 11.71 within sa (47) ombi boil	+ 36 a water us Sep 67.69 78.99 1 to (61) 11.85 ame vess ers) ente	Oct 70.45 Total = Su 92.05 Total = Su 13.81 sel	Nov 73.21 m(44) ₁₁₂ = ables 1b, 1 100.48 m(45) ₁₁₂ = 15.07	Dec 75.98 = c, 1d) 109.11 = 16.37 0 0 0 0 0		

Energy lost from w	•	e, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54)	` ,									0		(55)
Water storage loss	calculated	for each	month			((56)m = ((55) × (41)ı -	m 				
(56)m= 0		0	0	0	0	0	0	0	0	0		(56)
If cylinder contains ded	cated solar sto	orage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss	(annual) fr	om Table	e 3							0		(58)
Primary circuit loss	calculated	for each	month (59)m = ((58) ÷ 36	65 × (41))m					
(modified by fact	or from Tab	le H5 if t	here is s	olar wat	ter heati	ng and a	cylinde	r thermo	stat)		•	
(59)m= 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calcula	ted for each	n month	(61)m =	(60) ÷ 36	65 × (41)m						
(61)m= 38.72 33	7 35.9	33.38	33.08	30.66	31.68	33.08	33.38	35.9	36.11	38.72		(61)
Total heat required	for water h	eating ca	alculated	for eac	h month	(62)m =	: 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 151.39 132	24 137.59	122.03	118.15	104.06	99.7	111.14	112.37	127.95	136.59	147.83		(62)
Solar DHW input calcul	ated using App	pendix G o	r Appendix	: H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	r heating)	l	
(add additional line	s if FGHRS	and/or \	WHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water	neater										l	
(64)m= 151.39 132		122.03	118.15	104.06	99.7	111.14	112.37	127.95	136.59	147.83		
, ,		1	<u> </u>		<u> </u>	<u> </u>	out from wa	L ater heate	l r (annual)₁	12	1501.02	(64)
Heat gains from wa	iter heating	kWh/m	onth 0.2	5 ′ [0 85	× (45)m						1	_
Tiout gaine from W	itoi noating	,	011111 0.2	Ե լԵ.ԵԵ								
(65)m= 47 14 41	19 42 79	37.82	36 56	32 07	- ` ´ 	- ` ´	_	-``	·	·		(65)
(65)m= 47.14 41.		37.82	36.56	32.07	30.54	34.22	34.61	39.58	42.44	45.96		(65)
include (57)m in	calculation	of (65)m	only if c	<u> </u>	30.54	34.22	34.61	39.58	42.44	45.96		(65)
include (57)m in 5. Internal gains	calculation see Table	of (65)m 5 and 5a	only if c	<u> </u>	30.54	34.22	34.61	39.58	42.44	45.96		(65)
include (57)m in 5. Internal gains Metabolic gains (T	calculation see Table : able 5), Wa	of (65)m 5 and 5a tts	only if c	ylinder i	30.54 s in the o	34.22 dwelling	34.61 or hot w	39.58 ater is fr	42.44 rom com	45.96 munity h		(65)
include (57)m in 5. Internal gains Metabolic gains (T Jan F	calculation see Table : able 5), Wa	of (65)m 5 and 5a tts Apr	only if c): May	ylinder i	30.54 s in the o	34.22 dwelling	34.61 or hot w	39.58 ater is fr	42.44 om com	45.96 munity h		
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73	calculation see Table : able 5), Wa b Mar 41 73.41	of (65)m 5 and 5a tts Apr 73.41	only if c): May 73.41	Jun 73.41	30.54 s in the o	34.22 dwelling Aug 73.41	34.61 or hot w Sep 73.41	39.58 ater is fr	42.44 rom com	45.96 munity h		(65)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (cale	calculation see Table s able 5), Wa eb Mar 41 73.41 culated in A	of (65)m 5 and 5a tts Apr 73.41 ppendix	only if construction only if c	Jun 73.41	30.54 s in the o Jul 73.41 r L9a), a	34.22 dwelling Aug 73.41 lso see	34.61 or hot w Sep 73.41 Table 5	39.58 ater is fr Oct 73.41	42.44 om com Nov 73.41	45.96 munity h		(66)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73	calculation see Table s able 5), Wa eb Mar 41 73.41 culated in A	of (65)m 5 and 5a tts Apr 73.41	only if c): May 73.41	Jun 73.41	30.54 s in the o	34.22 dwelling Aug 73.41	34.61 or hot w Sep 73.41	39.58 ater is fr	42.44 om com	45.96 munity h		
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (cale	calculation see Table s able 5), Wa eb Mar 41 73.41 culated in A	of (65)m 6 and 5a tts Apr 73.41 ppendix 6.32	only if constraints only i	Jun 73.41 ion L9 o	30.54 s in the o Jul 73.41 r L9a), a 4.31	34.22 dwelling Aug 73.41 lso see 5.6	34.61 or hot w Sep 73.41 Table 5	39.58 ater is fr Oct 73.41 9.55	42.44 om com Nov 73.41	45.96 munity h		(66)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (calc (67)m= 11.56 10	calculation see Table : able 5), Wa b Mar 11 73.41 culated in A 27 8.35 calculated in	of (65)m 6 and 5a tts Apr 73.41 ppendix 6.32	only if constraints only i	Jun 73.41 ion L9 o	30.54 s in the o Jul 73.41 r L9a), a 4.31	34.22 dwelling Aug 73.41 lso see 5.6	34.61 or hot w Sep 73.41 Table 5	39.58 ater is fr Oct 73.41 9.55	42.44 om com Nov 73.41	45.96 munity h		(66)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (calc (67)m= 11.56 10 Appliances gains (calculation see Table s able 5), Wa eb Mar 41 73.41 culated in A 27 8.35 calculated in 63 125.3	of (65)m 5 and 5a tts Apr 73.41 ppendix 6.32 n Append 118.21	only if construction only if c	Jun 73.41 ion L9 o 3.99 uation L 100.86	30.54 s in the o Jul 73.41 r L9a), a 4.31 13 or L1 95.24	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92	34.61 or hot w Sep 73.41 Table 5 7.52 o see Tal 97.25	39.58 ater is fr Oct 73.41 9.55 ble 5 104.34	42.44 om com Nov 73.41	45.96 munity h Dec 73.41		(66) (67)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (calc (67)m= 11.56 10 Appliances gains ((68)m= 127.31 128	calculation see Table s able 5), Wa eb Mar 41 73.41 culated in A 27 8.35 calculated in 63 125.3 culated in A	of (65)m 5 and 5a tts Apr 73.41 ppendix 6.32 n Append 118.21	only if construction only if c	Jun 73.41 ion L9 o 3.99 uation L 100.86	30.54 s in the o Jul 73.41 r L9a), a 4.31 13 or L1 95.24	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92	34.61 or hot w Sep 73.41 Table 5 7.52 o see Tal 97.25	39.58 ater is fr Oct 73.41 9.55 ble 5 104.34	42.44 om com Nov 73.41	45.96 munity h Dec 73.41		(66) (67)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (calc (67)m= 11.56 10 Appliances gains ((68)m= 127.31 128 Cooking gains (calc	calculation see Table : able 5), Wa b Mar 41 73.41 culated in A 27 8.35 calculated ii 63 125.3 culated in A 34 30.34	of (65)m 5 and 5a tts Apr 73.41 ppendix 6.32 Appendix 118.21 Appendix 30.34	only if construction is the construction of th	Jun 73.41 ion L9 o 3.99 uation L 100.86 ion L15	30.54 s in the o Jul 73.41 r L9a), a 4.31 13 or L1 95.24 or L15a	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92), also se	34.61 or hot w Sep 73.41 Table 5 7.52 o see Tal 97.25 ee Table	39.58 ater is fr Oct 73.41 9.55 ble 5 104.34 5	42.44 om com Nov 73.41 11.15	45.96 munity h		(66) (67) (68)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (calc (67)m= 11.56 10 Appliances gains ((68)m= 127.31 128 Cooking gains (calc (69)m= 30.34 30	calculation see Table able 5), Wa able 5), Wa able 6) Mar 41 73.41 culated in A 27 8.35 calculated in 63 125.3 culated in A 34 30.34 ains (Table	of (65)m 5 and 5a tts Apr 73.41 ppendix 6.32 Appendix 118.21 Appendix 30.34	only if construction is the construction of th	Jun 73.41 ion L9 o 3.99 uation L 100.86 ion L15	30.54 s in the o Jul 73.41 r L9a), a 4.31 13 or L1 95.24 or L15a	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92), also se	34.61 or hot w Sep 73.41 Table 5 7.52 o see Tal 97.25 ee Table	39.58 ater is fr Oct 73.41 9.55 ble 5 104.34 5	42.44 om com Nov 73.41 11.15	45.96 munity h		(66) (67) (68)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (cale (67)m= 11.56 10 Appliances gains ((68)m= 127.31 128 Cooking gains (cale (69)m= 30.34 30 Pumps and fans gains (70)m= 3 33	calculation see Table : able 5), Wa eb Mar 41 73.41 culated in A 27 8.35 calculated in A 30.34 ains (Table 3	of (65)m 5 and 5a tts Apr 73.41 ppendix 6.32 Appendix 118.21 Appendix 30.34 5a) 3	only if co): May 73.41 L, equat 4.73 dix L, eq 109.27 L, equat 30.34	Jun 73.41 ion L9 o 3.99 uation L 100.86 iion L15 30.34	30.54 s in the o Jul 73.41 r L9a), a 4.31 13 or L1 95.24 or L15a 30.34	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92), also se 30.34	34.61 or hot w Sep 73.41 Table 5 7.52 o see Tal 97.25 ee Table 30.34	39.58 ater is fr Oct 73.41 9.55 ble 5 104.34 5 30.34	42.44 om com Nov 73.41 11.15 113.28	45.96 munity h Dec 73.41 11.88 121.69		(66) (67) (68) (69)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (calc (67)m= 11.56 10 Appliances gains ((68)m= 127.31 128 Cooking gains (calc (69)m= 30.34 30 Pumps and fans gains	calculation see Table : able 5), Wa b Mar 41 73.41 culated in A 27 8.35 calculated in A 30.34 dins (Table 3 ation (negation)	of (65)m 5 and 5a tts Apr 73.41 ppendix 6.32 Appendix 118.21 Appendix 30.34 5a) 3	only if co): May 73.41 L, equat 4.73 dix L, eq 109.27 L, equat 30.34	Jun 73.41 ion L9 o 3.99 uation L 100.86 iion L15 30.34	30.54 s in the o Jul 73.41 r L9a), a 4.31 13 or L1 95.24 or L15a 30.34	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92), also se 30.34	34.61 or hot w Sep 73.41 Table 5 7.52 o see Tal 97.25 ee Table 30.34	39.58 ater is fr Oct 73.41 9.55 ble 5 104.34 5 30.34	42.44 om com Nov 73.41 11.15 113.28	45.96 munity h Dec 73.41 11.88 121.69		(66) (67) (68) (69)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (calcomic gains) (calcomic gains	calculation see Table s able 5), Wa ab Mar 41 73.41 sulated in A 27 8.35 calculated in 63 125.3 culated in A 34 30.34 sins (Table 3 ation (nega 73 -58.73	of (65)m 5 and 5a tts Apr 73.41 ppendix 6.32 n Appendix 118.21 ppendix 30.34 5a) 3	only if co): May 73.41 L, equat 4.73 dix L, eq 109.27 L, equat 30.34 3 es) (Tab	Jun 73.41 ion L9 o 3.99 uation L 100.86 ion L15 30.34 3	30.54 s in the o Jul 73.41 r L9a), a 4.31 13 or L1 95.24 or L15a 30.34	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92), also se 30.34	34.61 or hot w Sep 73.41 Table 5 7.52 see Tal 97.25 ee Table 30.34	39.58 ater is fr Oct 73.41 9.55 ble 5 104.34 5 30.34	42.44 om com Nov 73.41 11.15 113.28 30.34	45.96 munity h Dec 73.41 11.88 121.69 30.34		(66) (67) (68) (69) (70)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (cale (67)m= 11.56 10 Appliances gains (68)m= 127.31 128 Cooking gains (cale (69)m= 30.34 30 Pumps and fans gains (70)m= 3 3 Losses e.g. evapo (71)m= -58.73 -58 Water heating gains	calculation see Table : able 5), Wa ab Mar 41 73.41 culated in A 27 8.35 calculated in A 34 30.34 culated in A 31 30.34 culated in A 32 30.34 culated in A 33 30.34 culated in A 34 30.34 culated in A 35 30.34 culated in A 36 30.34 culated in A 37 30.34 culated in A 38 30.34 culated in A 39 30.34 culated in A 30 30.34 culated in A 30 30.34 culated in A 30 30.34 culated in A 30 30.34 culated in A 30 30.34 culated in A 30 30.34 culated in A 30 30 30 30 culated in A 30 30 30 30 culated in A 30 30 30 30 culated in A 30 30 30 30 culated in A 30 30 30 30 culated in A 30 30 30 30 culated in A 30 30 30 30 culated in A 30 30 30 30 culated in A 30 30 30 30 culated in A 30 30 30 30 culated in A 30 30 30 30	of (65)m 5 and 5a tts Apr 73.41 ppendix 6.32 n Appendix 118.21 ppendix 30.34 5a) 3	only if co): May 73.41 L, equat 4.73 dix L, eq 109.27 L, equat 30.34 3 es) (Tab	Jun 73.41 ion L9 o 3.99 uation L 100.86 ion L15 30.34 3	30.54 s in the o Jul 73.41 r L9a), a 4.31 13 or L1 95.24 or L15a 30.34	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92), also se 30.34	34.61 or hot w Sep 73.41 Table 5 7.52 see Tal 97.25 ee Table 30.34	39.58 ater is fr Oct 73.41 9.55 ble 5 104.34 5 30.34	42.44 om com Nov 73.41 11.15 113.28 30.34	45.96 munity h Dec 73.41 11.88 121.69 30.34		(66) (67) (68) (69) (70)
include (57)m in 5. Internal gains Metabolic gains (T	calculation see Table : able 5), Wa eb Mar 41 73.41 sulated in A 27 8.35 calculated in A 34 30.34 sins (Table 3 -58.73 s (Table 5) 29 57.51	of (65)m 5 and 5a tts	only if co): May 73.41 L, equat 4.73 dix L, eq 109.27 L, equat 30.34 3 es) (Tab	Jun 73.41 ion L9 o 3.99 uation L 100.86 ion L15 30.34 3 le 5) -58.73	30.54 s in the o Jul 73.41 r L9a), a 4.31 13 or L1 95.24 or L15a 30.34 3 -58.73	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92), also se 30.34 3	34.61 or hot w Sep 73.41 Table 5 7.52 see Tal 97.25 ee Table 30.34 3 -58.73	39.58 ater is fr Oct 73.41 9.55 ble 5 104.34 5 30.34 3 -58.73	42.44 om com Nov 73.41 11.15 113.28 30.34 3 -58.73	45.96 munity h Dec 73.41 11.88 121.69 30.34 3 -58.73		(66) (67) (68) (69) (70) (71)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 73.41 73 Lighting gains (cale (67)m= 11.56 10 Appliances gains (68)m= 127.31 128 Cooking gains (cale (69)m= 30.34 30 Pumps and fans gains (70)m= 3 3 Losses e.g. evapo (71)m= -58.73 -58 Water heating gains (72)m= 63.36 61 Total internal gains	calculation see Table shable 5), Wa able 5), Wa able 5), Wa able 6), Wa able 6), Wa able 6), Wa able 73.41 sulated in A 27 8.35 calculated in A 34 30.34 sins (Table 3 ation (nega 73 -58.73 s (Table 5) 29 57.51	of (65)m 5 and 5a tts	only if construction only if c	Jun 73.41 ion L9 o 3.99 uation L 100.86 ion L15 30.34 3 le 5) -58.73	30.54 s in the of Jul 73.41 r L9a), a 4.31 13 or L1 95.24 or L15a 30.34 3 -58.73 41.04 om + (67)m	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92), also se 30.34 3 -58.73	34.61 or hot w Sep 73.41 Table 5 7.52 see Talle 30.34 3 -58.73 48.07 + (69)m + (39.58 ater is fr Oct 73.41 9.55 ble 5 104.34 5 30.34 3 -58.73	42.44 om com Nov 73.41 11.15 113.28 30.34 3 -58.73 58.94 1)m + (72)	45.96 munity h Dec 73.41 11.88 121.69 30.34 3 -58.73		(66) (67) (68) (69) (70) (71)
include (57)m in 5. Internal gains Metabolic gains (T	calculation see Table shable 5), Wa able 5), Wa able 5), Wa able 6), Wa able 6), Wa able 6), Wa able 73.41 sulated in A 27 8.35 calculated in A 34 30.34 sins (Table 3 ation (nega 73 -58.73 s (Table 5) 29 57.51	of (65)m 5 and 5a tts	only if co): May 73.41 L, equat 4.73 dix L, eq 109.27 L, equat 30.34 3 es) (Tab	Jun 73.41 ion L9 o 3.99 uation L 100.86 ion L15 30.34 3 le 5) -58.73	30.54 s in the o Jul 73.41 r L9a), a 4.31 13 or L1 95.24 or L15a 30.34 3 -58.73	34.22 dwelling 73.41 lso see 5.6 3a), also 93.92), also se 30.34 3	34.61 or hot w Sep 73.41 Table 5 7.52 see Tal 97.25 ee Table 30.34 3 -58.73	39.58 ater is fr Oct 73.41 9.55 ble 5 104.34 5 30.34 3 -58.73	42.44 om com Nov 73.41 11.15 113.28 30.34 3 -58.73	45.96 munity h Dec 73.41 11.88 121.69 30.34 3 -58.73		(66) (67) (68) (69) (70) (71)

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

	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	X	2.73	x	11.28	x	0.5	x	0.7	=	7.47	(75)
Northeast 0.9x	0.77	x	2.73	x	22.97	x	0.5	x	0.7	=	15.21	(75)
Northeast 0.9x	0.77	x	2.73	x	41.38	x	0.5	x	0.7	=	27.4	(75)
Northeast 0.9x	0.77	x	2.73	x	67.96	x	0.5	x	0.7	=	45	(75)
Northeast 0.9x	0.77	x	2.73	x	91.35	x	0.5	x	0.7	=	60.49	(75)
Northeast 0.9x	0.77	x	2.73	x	97.38	x	0.5	x	0.7	=	64.48	(75)
Northeast 0.9x	0.77	x	2.73	x	91.1	x	0.5	x	0.7	=	60.32	(75)
Northeast 0.9x	0.77	X	2.73	x	72.63	x	0.5	X	0.7	=	48.09	(75)
Northeast 0.9x	0.77	x	2.73	x	50.42	x	0.5	x	0.7	=	33.39	(75)
Northeast 0.9x	0.77	x	2.73	x	28.07	x	0.5	x	0.7	=	18.59	(75)
Northeast 0.9x	0.77	X	2.73	X	14.2	X	0.5	X	0.7	=	9.4	(75)
Northeast 0.9x	0.77	x	2.73	x	9.21	x	0.5	x	0.7	=	6.1	(75)
Rooflights 0.9x	1	x	0.82	x	15.92	x	0.5	X	0.8	=	9.4	(82)
Rooflights 0.9x	1	x	0.82	x	40.5	x	0.5	x	0.8	=	23.91	(82)
Rooflights 0.9x	1	x	0.36	x	26	x	0.5	X	0.8	=	3.37	(82)
Rooflights 0.9x	1	x	0.82	x	32.51	x	0.5	X	0.8	=	19.19	(82)
Rooflights 0.9x	1	x	0.82	x	73.74	x	0.5	X	0.8	=	43.54	(82)
Rooflights 0.9x	1	x	0.36	x	54	x	0.5	x	0.8	=	7	(82)
Rooflights 0.9x	1	x	0.82	x	59.5	x	0.5	x	0.8	=	35.13	(82)
Rooflights 0.9x	1	x	0.82	x	111.06	x	0.5	x	0.8	=	65.57	(82)
Rooflights 0.9x	1	x	0.36	x	96	x	0.5	x	0.8	=	12.44	(82)
Rooflights 0.9x	1	x	0.82	x	100.03	x	0.5	x	0.8	=	59.06	(82)
Rooflights 0.9x	1	x	0.82	x	150.59	x	0.5	x	0.8	=	88.91	(82)
Rooflights 0.9x	1	x	0.36	x	150	x	0.5	x	0.8	=	19.44	(82)
Rooflights 0.9x	1	x	0.82	x	136.88	x	0.5	x	0.8	=	80.81	(82)
Rooflights 0.9x	1	x	0.82	x	177.61	x	0.5	X	0.8	=	104.86	(82)
Rooflights 0.9x	1	x	0.36	x	192	x	0.5	X	0.8	=	24.88	(82)
Rooflights 0.9x	1	x	0.82	x	147.03	x	0.5	X	0.8	=	86.81	(82)
Rooflights 0.9x	1	x	0.82	x	179.47	x	0.5	X	0.8	=	105.96	(82)
Rooflights 0.9x	1	x	0.36	x	200	x	0.5	x	0.8	=	25.92	(82)
Rooflights 0.9x	1	x	0.82	x	137.1	x	0.5	X	0.8	=	80.94	(82)
Rooflights 0.9x	1	x	0.82	x	171.77	x	0.5	x	0.8	=	101.42	(82)
Rooflights 0.9x	1	x	0.36	x	189	x	0.5	x	0.8	=	24.49	(82)
Rooflights 0.9x	1	x	0.82	x	107.76	x	0.5	x	0.8	=	63.62	(82)
Rooflights 0.9x	1	x	0.82	x	151.65	x	0.5	x	0.8] =	89.54	(82)
Rooflights 0.9x	1	X	0.36	x	157	x	0.5	x	0.8] =	20.35	(82)
Rooflights 0.9x	1	X	0.82	x	73.17	x	0.5	x	0.8] =	43.2	(82)
Rooflights 0.9x	1	X	0.82	x	125.02	x	0.5	x	0.8	j =	73.81	(82)
Rooflights 0.9x	1	X	0.36	x	115	x	0.5	x	0.8	j =	14.9	(82)
				-		-		•		-		_

					_										
Rooflights 0.9)x 1	X	3.0	32	x	3	9.91	X		0.5	X	8.0	=	23.56	(82)
Rooflights 0.9)x 1	X	3.0	32	x	84	4.48	X		0.5	x	0.8	=	49.88	(82)
Rooflights 0.9)x 1	X	0.3	36	x [66	X		0.5	x	0.8	=	8.55	(82)
Rooflights 0.9)x 1	x	3.0	32	x	20	0.03	X		0.5	x [0.8	=	11.83	(82)
Rooflights 0.9)x 1	X	3.0	32	x	4	9.44	X		0.5	x [0.8	=	29.19	(82)
Rooflights 0.9)x 1	X	0.3	36	x		33	X		0.5	x	0.8	=	4.28	(82)
Rooflights 0.9)x 1	X	3.0	32	x	1:	3.01	X		0.5	x [0.8	=	7.68	(82)
Rooflights 0.9)x 1	X	3.0	32	x	34	4.03	X		0.5	x	0.8	=	20.09	(82)
Rooflights 0.9)x 1	X	0.3	36	x		21	X		0.5	x	0.8	=	2.72	(82)
Solar gains	in watts, c	alculated	for eac	h month	_			(83)m	ı = Su	ım(74)m .	(82)m			_	
(83)m= 44.1	5 84.94	140.54	212.41	271.04	28	3.17	267.18	221	1.6	165.3	100.58	54.69	36.59		(83)
Total gains	internal a	and solar	(84)m =	= (73)m	+ (8	33)m ,	watts								
(84)m= 294.	4 333.15	379.72	437.49	482.19	48	0.58	455.8	415.	.15	366.16	315.69	286.08	279.96		(84)
7. Mean in	ternal tem	perature	(heating	season)										
Temperatu			,			area f	rom Tab	ole 9.	Th1	l (°C)				21	(85)
Utilisation	•	•			•			,	,	(-)					`` ′
Ja	<u> </u>	Mar	Apr	May	È	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	7	
(86)m= 1	0.99	0.98	0.94	0.84	_	.66	0.5	0.5		0.83	0.97	0.99	1	╡	(86)
—— Mean inter	nal tempe	ratura in	livina ar	aa T1 /f/	المرالد	N star	ne 3 to 7	in T	ahle	. Oc)		1	<u> </u>	_	
(87)m= 19.5	_ -	20.05	20.47	20.78		0.95	20.99	20.9		20.86	20.44	19.97	19.59	7	(87)
` ′		l .	l	<u> </u>				l				1			, ,
Temperatu					_	~~				<u> </u>	10.00	1	1	7	(00)
(88)m= 19.8	19.81	19.82	19.85	19.86	18	9.88	19.88	19.8	89	19.87	19.86	19.84	19.83		(88)
Utilisation	factor for g	ains for	rest of d	welling,	h2,r	m (se	e Table	9a)						_	
(89)m= 0.99	0.99	0.98	0.92	0.78	0	.56	0.38	0.4	14	0.75	0.95	0.99	1		(89)
Mean inter	nal tempei	rature in	the rest	of dwelli	ing [·]	T2 (fc	ollow ste	ps 3	to 7	in Tabl	e 9c)				
(90)m= 18.5	 · _ · _	19.01	19.43	19.72	-	9.86	19.88	19.8	$\overline{}$	19.8	19.42	18.95	18.56	7	(90)
	!			!		1				f	LA = Livi	ng area ÷ (4) =	0.88	(91)
M	1 4	 /£ .	41		II:	\ _ £I	ΛΤ4	. /4	£ı	۸) TO					
Mean inter		, · · ·	1		T			_ `_	T		00.04	1 40 04	10.47	٦	(02)
(92)m= 19.4		19.92	20.34	20.65		0.82	20.85	20.8		20.73	20.31	19.84	19.47	_	(92)
Apply adju		i e	i -	 	_				-			1 40 04	10.47	٦	(03)
(93)m= 19.4		19.92	20.34	20.65		0.82	20.85	20.8	85	20.73	20.31	19.84	19.47		(93)
8. Space h						-4 -4-	446	.	01	41	4 T:	(70)			
Set Ti to the the utilisati					ned	at ste	ep 11 of	labi	e 9b	, so tha	t II,m=	(76)m an	d re-cal	culate	
Ja		Mar	Apr	May	Π.	Jun	Jul	Δι	ug	Sep	Oct	Nov	Dec	7	
Utilisation			<u> </u>	I Way		Jan	- Oui		ug į	ОСР	000	1101	500	_	
(94)m= 0.99		0.98	0.93	0.82	0	.64	0.48	0.5	55	0.81	0.96	0.99	1	7	(94)
Useful gair		ļ	<u> </u>												
(95)m= 292.	1	370.81	407.71	397.51	30	8.76	220.39	226.	.61	296.13	303.02	283.2	278.71	7	(95)
Monthly av		l .	<u> </u>	l	<u> </u>						<u> </u>	1	<u>i </u>	_	
(96)m= 4.3		6.5	8.9	11.7	_	4.6	16.6	16.	.4	14.1	10.6	7.1	4.2	7	(96)
Heat loss i		ļ										1	<u> </u>	J	•
(97)m= 861.3		753.14	623.35	485.25	_	8.28	224.53	233.	_	353.43	526.52	698.27	846.37	7	(97)
			<u> </u>	<u> </u>				<u> </u>					L	_	

8)m= 423.01	337.12	ement fo 284.46	155.26	65.28	0	0	0	0	166.28	298.85	422.33		
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2152.58	(98
Space heating	g require	ement in	kWh/m²	/year							Ī	50.91	(99)
a. Energy req	uiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)					
Space heatin	_			./							г		
Fraction of spa Fraction of spa					mentary	•	(202) = 1 -	_ (201) =			L	0	(20)
Fraction of tot			•	` ,			(204) = (204)		(203)] =		Ļ	1	(20
Efficiency of n		•	•				(204) (20	02) [1	(200)]		L	90.3	(20
Efficiency of s	•				n svetem	n %					L	0	(20
Jan	Feb	Mar	Apr	May	Jun	Jul	Λιια	Sep	Oct	Nov	Dec	kWh/ye	
ر القدا Space heating						Jui	Aug	Seb	Oct	INOV	Dec	KVVII/yt	zai
423.01	337.12	284.46	155.26	65.28	0	0	0	0	166.28	298.85	422.33		
:11)m = {[(98))m x (20	4)] } x 1	00 ÷ (20)6)									(21
468.45	373.33	315.01	171.94	72.29	0	0	0	0	184.15	330.95	467.7		
							Tota	I (kWh/yea	ar) =Sum(2	211),15,1012	=	2383.81	(21
Space heating	• •	-	• •	month									
{[(98)m x (20		· 1	r										
15)m= 0	0	0	0	0	0	0	0 Tota	0 L(k\\/h/yes	0 ar) =Sum(3	0 215),5,1012	0	0	(21
later heating	ı						Tota	i (kwii) you	ar) Gurri(2	- 10/15,1012	L	0	(21
utput from wa		ter (calc	ulated al	oove)									
151.39	132.24	137.59	122.03	118.15	104.06	99.7	111.14	112.37	127.95	136.59	147.83		
fficiency of wa	ater hea	ter										81	(21
17)m= 87.65	87.47	87.04	85.96	84.08	81	81	81	81	86.01	87.16	87.69		(21
uel for water l :19)m = (64)r	•												
19)m= 172.72	151.18	158.07	141.97	140.52	128.47	123.08	137.21	138.72	148.77	156.7	168.58		
							Tota	I = Sum(2	19a) ₁₁₂ =			1766	(21
nnual totals									k\	Wh/year	, <u> </u>	kWh/yea	<u></u>
	fuel use	ed, main	system	1								2383.81	
pace heating		d										1766	
J	fuel use	-											
pace heating fater heating t ectricity for p			electric l	keep-ho	t								
ater heating t	umps, fa	ans and	electric	keep-ho	t						30		(23
ater heating t	umps, fa	ans and		·	t		sum	of (230a).	(230g) =		30	30	(23

Energy

kWh/year

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Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216 =	514.9	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216 =	381.46	(264)
Space and water heating	(261) + (262) + (263) + (264) =		896.36	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	15.57	(267)
Electricity for lighting	(232) x	0.519 =	105.96	(268)
Total CO2, kg/year	sum	of (265)(271) =	1017.9	(272)
Dwelling CO2 Emission Rate	(272	?) ÷ (4) =	24.08	(273)
El rating (section 14)			84	(274)

			User D	etails:						
Assessor Name:	Chris Hock	nell		Strom	a Nive	bor:		QTD()	016363	
Software Name:	Stroma FS			Softwa					on: 1.0.4.26	
Software Name:	Stroma FS		Duran anti-					versic	л. т.о.4.26	
A 11			Property			_ean				
Address :		ndfield Garden	s, LONDO	JN, NVV3	6PU					
1. Overall dwelling dime	ensions:									. .
Cround floor				a(m²)	(4 -)		eight(m)	_	Volume(m ³	<u>.</u>
Ground floor				66.9	(1a) x	2	2.05	(2a) =	137.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	66.9	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	137.14	(5)
2. Ventilation rate:										
	main heating	second heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	, + [0] = [0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	= +	0		0	х	20 =	0	(6b)
Number of intermittent fa	ans				 _	3	x	10 =	30	(7a)
Number of passive vents	2				L	0	x	10 =	0	(7b)
·					Ļ			40 =	_	= '
Number of flueless gas f	ires					0	^	40 -	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs flues and fa	ans = (6a) + (6b) + (-(7a)+(7b)+((7c) =	Г	30		÷ (5) =	0.22	(8)
If a pressurisation test has l					continue fr			. (3) –	0.22	(0)
Number of storeys in t						o (o) to	(1.5)		0	(9)
Additional infiltration	9 (,					[(9))-1]x0.1 =	0	(10)
Structural infiltration: 0).25 for steel or	timber frame	or 0.35 fo	r masonı	v constr	ruction	I(°,	, .j	0	(11)
if both types of wall are p					•				<u> </u>	(```
deducting areas of openi	• ,		_ , , .							_
If suspended wooden		•	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic met	res per ho	our per s	quare m	etre of	envelope	e area	10	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	+(8), otherw	ise (18) = (16)				0.72	(18)
Air permeability value applie	es if a pressurisatio	on test has been d	one or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltered	ed								1	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.92	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18) x (20) =				0.66	(21)
Infiltration rate modified	for monthly win	d speed								
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 7							_	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (00-) (0	10) 1 4									
Wind Factor $(22a)m = (23a)m $		1.00 0.05	0.05	1 0 00			T	1	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.85	0.83	0.81	0.73	0.71	0.63	0.63	0.61	0.66	0.71	0.75	0.78]	
Calculate effec		_	rate for t	he appli	cable ca	se							
If mechanicate of the street o			endiv N (2	3h) = (23s	a) x Emy (e	guation (N	NSN othe	nwise (23h) = (23a)			0	(2
If balanced with									, (20u)			0	(2
a) If balance		•	-	_					2h)m + ('	23h) x [1 – (23c)		(2
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
b) If balance	ed mech	anical ve	entilation	without	heat rec	overy (N	л ЛV) (24b)m = (22	2b)m + (2	23b)	1	J	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h	ouse ex	tract ver	ntilation c	or positiv	re input v	entilatio	n from o	utside					
if (22b)r	n < 0.5 ×	(23b), t	hen (24d	c) = (23b); otherv	vise (24	c) = (22h	o) m + 0	5 × (23b)	_	_	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural				•	•				0.51				
If (22b)n 4d)m= 0.86	n = 1, the 0.85	en (24d) _{0.83}	m = (22)	0.76	erwise (2	4a)m = 0 0.7	0.5 + [(2	2b)m² x 0.72	0.5]	0.78	0.81	1	(2
Effective air					اـــــا				0.70	0.76	0.01	J	(2
5)m= 0.86	0.85	0.83	0.77	0.76	0.7	0.7	0.69	0.72	0.76	0.78	0.81	1	(2
<u> </u>	l		l] 0.7	0.1	0.00	0.72	0.70	0.70	0.01	J	,
B. Heat losse	s and he	at loss r											
LEMENT	Gros area		Openin m		Net Are A ,n		U-val W/m2		A X U (W/ł	<)	k-value kJ/m²·l		A X k kJ/K
oors		()			2.2	x	1.3	=	2.86	<u>'</u>			(
/indows Type	e 1				1.78		/[1/(1.6)+	0.04] =	2.68	╡			(
indows Type	e 2				1.75	x1,	/[1/(1.6)+	0.04] =	2.63	=			(
indows Type	e 3				1.55	x1,	/[1/(1.6)+	0.04] =	2.33	╡			(
ooflights Typ	e 1				0.82	x1	/[1/(1.3) +	0.04] =	1.066	╡			(
ooflights Typ	e 2				0.82		/[1/(1.3) +	0.04] =	1.066				(
ooflights Typ					0.36		/[1/(1.3) +	0.04] =	0.468				(
alls Type1	32.0	3	6.83		25.2	x	0.55		13.86	=			· · · · · · · · · · · · · · · · · · ·
alls Type2	17.0	_	2.2		14.86	x	0.55	= =	8.17	≓ ¦		7 F	(
alls Type3	3.9		0		3.91	x	0.14	= =	0.55	≓ ¦		7 F	(
• •	49.4		4.1	=	45.33	=	0.18	_	8.16	=		╡┝	`
oof Type1			0.72	=	24.95	=	0.14	_	3.49	=		╡┝	`
• •	l 25.6			_	13.6	x	0.14	_	1.9	=		╡┝	`
oof Type2	25.6	3	n										(:
poof Type2	13.6		0			=							
oof Type2 oof Type3 otal area of e	13.6		0		141.7	=	n		n	– 1			- t
oof Type2 oof Type3 otal area of e arty wall	13.6		0		141.7	=	0	=	0				
oof Type2 oof Type3 otal area of e arty wall arty floor or windows and	13.6 elements	, m²	effective wi		141.7 18.94 66.9	x				s given in	n paragraph	1 3.2	
oof Type2 oof Type3 otal area of e arty wall arty floor or windows and include the area	13.6 elements	, m² ows, use e sides of in	effective win		141.7 18.94 66.9	x ated using		/[(1/U-valu		s given ir	n paragraph		(1
coof Type1 coof Type3 cotal area of every wall carty floor for windows and cinclude the area abric heat los	13.6 elements I roof windows on both ss, W/K =	, m² ows, use e sides of in = S (A x	effective win		141.7 18.94 66.9	x ated using	formula 1	/[(1/U-valu) + (32) =				55.22	

can be used inste				ueina An	nendiy l	<i>x</i>						04.00	7(26)
if details of therma	`	,		• •	•							21.26	(36)
Total fabric he	0 0	4.0 7.00 1.17	omn (00)	0.00 X (0	• /			(33) +	(36) =			76.48	(37)
Ventilation hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × ([25)m x (5])		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 38.89	38.26	37.64	34.73	34.19	31.66	31.66	31.19	32.63	34.19	35.29	36.44		(38)
Heat transfer of	coefficier	nt, W/K				•		(39)m	= (37) + (38)m		•	
(39)m= 115.37	114.74	114.12	111.21	110.67	108.13	108.13	107.67	109.11	110.67	111.77	112.92		
Heat loss para	meter (H	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) ₁ · (4)	12 /12=	111.21	(39)
(40)m= 1.72	1.72	1.71	1.66	1.65	1.62	1.62	1.61	1.63	1.65	1.67	1.69		
Number of day	e in moi	nth (Tah	(د1 ما					,	Average =	Sum(40) ₁	12 /12=	1.66	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31	1	(41)
	l		l	l	l				Į.			J	
4. Water heat	ting ene	rgy requi	irement:								kWh/y	ear:	
Assumed see	inanav l	N I										1	(40)
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.17	J	(42)
Annual averag	e hot wa										5.7	1	(43)
Reduce the annua not more that 125							to achieve	a water us	se target o	f		•	
Jan	Feb	Mar	· ·	<u> </u>	Jun	Jul	Δυα	Sep	Oct	Nov	Dec	1	
Hot water usage in			Apr ach month	May Vd,m = fa			Aug (43)	Seh	Oct	INOV	Dec]	
(44)m= 94.27	90.85	87.42	83.99	80.56	77.13	77.13	80.56	83.99	87.42	90.85	94.27	1	
L	<u>!</u>	ļ	<u>!</u>	<u>!</u>	<u>!</u>	<u>!</u>	Į		rotal = Su	m(44) ₁₁₂ :	! =	1028.44	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	Tm / 3600	kWh/mon	th (see Ta	ables 1b, 1	c, 1d)	•	
(45)m= 139.81	122.28	126.18	110	105.55	91.08	84.4	96.85	98.01	114.22	124.68	135.39		_
If instantaneous w	ater heatii	na at point	of use (no	hot water	storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ :	=	1348.45	(45)
(46)m= 20.97	18.34	18.93	16.5	15.83	13.66	12.66	14.53	14.7	17.13	18.7	20.31	1	(46)
Water storage	l	10.00	10.0	10.00	10.00	12.00	14.00	14.7	17.10	10.7	20.01]	(10)
Storage volum	e (litres)) includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0]	(47)
If community h	-			-			, ,						
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/dav):					0	1	(48)
Temperature f					("uay).					0]	(49)
Energy lost fro				ear			(48) x (49)) =			0]]	(50)
b) If manufact	urer's de	eclared o	cylinder l	oss fact		known:	. , ()					J	()
Hot water store	_			e 2 (kW	h/litre/da	ay)					0		(51)
If community h Volume factor	_		UII 4.3								0	1	(52)
Temperature f			2b							-	0	1	(52)

Energy lost from w	_	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54)	` ,	for oach	month			((EG)m = (EE\ ~ (41\)	~		0		(55)
Water storage loss						., , ,	55) × (41)r				I	(50)
(56)m= 0 (0	0 = (56)m	0	0	0	0 7\m = (F6)	0	0	0	iv I I	(56)
·											ıx m I	
(57)m= 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss										0		(58)
Primary circuit loss			•		` '	, ,						
(modified by fact	1	1	i	i					- 		I	(50)
(59)m= 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calcula	ted for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 48.04 41	31 44.55	41.42	41.05	38.04	39.31	41.05	41.42	44.55	44.8	48.04		(61)
Total heat required	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= 187.85 164	09 170.72	151.42	146.6	129.12	123.71	137.91	139.43	158.77	169.48	183.44		(62)
Solar DHW input calcul	ated using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	contributi	ion to wate	er heating)		
(add additional line	s if FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water	neater											
(64)m= 187.85 164	09 170.72	151.42	146.6	129.12	123.71	137.91	139.43	158.77	169.48	183.44		
	•					Outp	out from wa	ater heate	r (annual) ₁	12	1862.53	(64)
		1.3.4.1. /										
Heat gains from wa	iter heating	, kvvn/m	onth 0.2	5 [0.85]	× (45)m	ı + (61)m	า] + 0.8 x	: [(46)m	+ (57)m	+ (59)m]	
Heat gains from Wa (65) m= 58.5 51		46.93	45.36	39.79	× (45)m 37.89	+ (61)m 42.47	1] + 0.8 x 42.94	49.11	+ (57)m 52.66	+ (59)m 57.03]	(65)
	11 53.09	46.93	45.36	39.79	37.89	42.47	42.94	49.11	52.66	57.03		(65)
(65)m= 58.5 51 include (57)m in	11 53.09 calculation	46.93 of (65)m	45.36 only if c	39.79	37.89	42.47	42.94	49.11	52.66	57.03		(65)
include (57)m in 5. Internal gains	53.09 calculation see Table	46.93 of (65)m 5 and 5a	45.36 only if c	39.79	37.89	42.47	42.94	49.11	52.66	57.03		(65)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T	53.09 calculation see Table	46.93 of (65)m 5 and 5a	45.36 only if c	39.79	37.89	42.47 dwelling	42.94 or hot w	49.11	52.66	57.03		(65)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T	53.09 calculation see Table sable 5), Wa b Mar	46.93 of (65)m 5 and 5a	45.36 only if c	39.79 ylinder i	37.89 s in the c	42.47	42.94	49.11 ater is fr	52.66 om com	57.03 munity h		(65)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T	53.09 calculation see Table sable 5), Wa b Mar 43 108.43	46.93 of (65)m 6 and 5a tts Apr 108.43	45.36 only if co: May 108.43	39.79 ylinder is Jun 108.43	37.89 s in the c	42.47 dwelling Aug 108.43	42.94 or hot w Sep 108.43	49.11 ater is fr	52.66 om com	57.03 munity h		
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 Lighting gains (calculate)	53.09 calculation see Table sable 5), Wa b Mar 43 108.43 culated in A	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix	45.36 only if c): May 108.43 L, equati	Jun 108.43	37.89 s in the o Jul 108.43 r L9a), a	42.47 dwelling Aug 108.43 lso see	42.94 or hot w Sep 108.43 Table 5	49.11 ater is fr Oct 108.43	52.66 om com	57.03 munity h		
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (calc (67)m= 17.04 15	53.09 calculation see Table 5 able 5), Wa ab Mar 43 108.43 culated in A	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32	45.36 only if c): May 108.43 L, equati 6.97	39.79 ylinder is Jun 108.43 ion L9 of 5.88	37.89 s in the c Jul 108.43 r L9a), a 6.36	42.47 dwelling Aug 108.43 lso see 8.26	42.94 or hot w Sep 108.43 Table 5	49.11 ater is fr Oct 108.43	52.66 om com Nov 108.43	57.03 munity h		(66)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (cale (67)m= 17.04 15 Appliances gains (calculation see Table sable 5), Wa b Mar 43 108.43 culated in A 14 12.31 calculated in	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Append	45.36 only if c): May 108.43 L, equati 6.97 dix L, eq	Jun 108.43 ion L9 of 5.88 uation L	37.89 s in the c Jul 108.43 r L9a), a 6.36 13 or L1	Aug 108.43 Iso see 8.26 3a), also	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal	49.11 ater is fr Oct 108.43 14.08 ble 5	52.66 om com Nov 108.43	57.03 munity h		(66) (67)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (calc (67)m= 17.04 15 Appliances gains ((68)m= 189.96 191	calculation see Table s able 5), Wa b Mar 43 108.43 culated in A 12.31 calculated ii 93 186.96	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Appendix 176.39	45.36 only if c): May 108.43 L, equati 6.97 dix L, eq 163.04	Jun 108.43 ion L9 of 5.88 uation L	Jul 108.43 r L9a), a 6.36 13 or L1: 142.11	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11	49.11 ater is fr Oct 108.43 14.08 ole 5 155.68	52.66 om com Nov 108.43	57.03 munity h		(66)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (cale (67)m= 17.04 15 Appliances gains ((68)m= 189.96 191 Cooking gains (cale (68)m= (68)m= (68)m=	calculation see Table s able 5), Wa ab Mar 43 108.43 sulated in A 14 12.31 calculated ii 93 186.96 culated in A	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Append 176.39 ppendix	45.36 only if c): May 108.43 L, equati 6.97 dix L, eq 163.04 L, equat	39.79 ylinder is Jun 108.43 ion L9 of 5.88 uation L 150.49 ion L15	Jul 108.43 r L9a), a 6.36 13 or L1 142.11 or L15a)	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14), also se	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11 ee Table	49.11 ater is fr Oct 108.43 14.08 ole 5 155.68 5	52.66 om com Nov 108.43 16.43	57.03 munity h		(66) (67) (68)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (cale (67)m= 17.04 15 Appliances gains ((68)m= 189.96 191 Cooking gains (cale (69)m= 33.84 33	calculation see Table sable 5), Wa able 5), Wa able 5), Wa able 108.43 108.43 sulated in A 14 12.31 calculated in 93 186.96 culated in A 33.84	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Append 176.39 ppendix 33.84	45.36 only if c): May 108.43 L, equati 6.97 dix L, eq 163.04	Jun 108.43 ion L9 of 5.88 uation L	Jul 108.43 r L9a), a 6.36 13 or L1: 142.11	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11	49.11 ater is fr Oct 108.43 14.08 ole 5 155.68	52.66 om com Nov 108.43	57.03 munity h		(66) (67)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (cale (67)m= 17.04 15 Appliances gains ((68)m= 189.96 191 Cooking gains (cale (69)m= 33.84 33 Pumps and fans gains	calculation see Table sable 5), Wa beb Mar 43 108.43 culated in A 14 12.31 calculated ii 93 186.96 culated in A 33.84 sins (Table	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Append 176.39 ppendix 33.84 5a)	45.36 only if c): May 108.43 L, equati 6.97 dix L, eq 163.04 L, equat 33.84	Jun 108.43 ion L9 of 5.88 uation L 150.49 tion L15 33.84	Jul 108.43 r L9a), a 6.36 13 or L1: 142.11 or L15a) 33.84	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14), also se 33.84	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11 ee Table 33.84	49.11 ater is fr Oct 108.43 14.08 ble 5 155.68 5 33.84	52.66 om com Nov 108.43 16.43	57.03 munity h		(66) (67) (68) (69)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (cale (67)m= 17.04 15 Appliances gains ((68)m= 189.96 191 Cooking gains (cale (69)m= 33.84 33 Pumps and fans gains (70)m= 3 3	calculation see Table s able 5), Wa ab Mar 43 108.43 sulated in A 14 12.31 calculated in A 186.96 culated in A 33.84 sins (Table	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Append 176.39 ppendix 33.84 5a) 3	45.36 only if c): May 108.43 L, equati 6.97 dix L, equ 163.04 L, equat 33.84	Jun 108.43 ion L9 of 5.88 uation L 150.49 ion L15 33.84	Jul 108.43 r L9a), a 6.36 13 or L1 142.11 or L15a)	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14), also se	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11 ee Table	49.11 ater is fr Oct 108.43 14.08 ole 5 155.68 5	52.66 om com Nov 108.43 16.43	57.03 munity h		(66) (67) (68)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (cale (67)m= 17.04 15 Appliances gains (cale (68)m= 189.96 191 Cooking gains (cale (69)m= 33.84 33 Pumps and fans gains (70)m= 3 3 Losses e.g. evapo	calculation see Table sable 5), Wa beb Mar 43 108.43 culated in A 14 12.31 calculated in A 14 33.84 culated in A 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 35 186.96 culated in A 36 33.84 culated in A 37 33.84 culated in A 38 33 84 culated in A 38 33 84 culated in A 38 33 84 culated in A 38 38 60 culated in A 38 38 60 culated in A 38 38 60 culated in A 38 38 60 culated in A 38 38 60 culated in A 38 60 culated in A 60 60 culated in A	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Appendi 176.39 ppendix 33.84 5a) 3 tive valu	45.36 only if c): May 108.43 L, equati 6.97 dix L, eq 163.04 L, equat 33.84 3 es) (Tab	Jun 108.43 ion L9 of 5.88 uation L 150.49 ion L15 33.84	37.89 S in the control of the contr	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14), also se 33.84	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11 ee Table 33.84	49.11 ater is fr Oct 108.43 14.08 ole 5 155.68 5 33.84	52.66 om com Nov 108.43 16.43 169.03	57.03 munity h Dec 108.43 17.52 181.58 33.84		(66) (67) (68) (69) (70)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (calc (67)m= 17.04 15 Appliances gains ((68)m= 189.96 191 Cooking gains (calc (69)m= 33.84 33 Pumps and fans gains (70)m= 3 3 Losses e.g. evapo (71)m= -86.74 -86	calculation see Table sable 5), Wa beb Mar 43 108.43 culated in A 14 12.31 calculated ii 93 186.96 culated in A 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84 culated in A 34 33.84	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Append 176.39 ppendix 33.84 5a) 3	45.36 only if c): May 108.43 L, equati 6.97 dix L, equ 163.04 L, equat 33.84	Jun 108.43 ion L9 of 5.88 uation L 150.49 ion L15 33.84	Jul 108.43 r L9a), a 6.36 13 or L1: 142.11 or L15a) 33.84	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14), also se 33.84	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11 ee Table 33.84	49.11 ater is fr Oct 108.43 14.08 ble 5 155.68 5 33.84	52.66 om com Nov 108.43 16.43	57.03 munity h		(66) (67) (68) (69)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (calcommoderate) 17.04 15 Appliances gains (calcommoderate) 189.96 191 Cooking gains (calcommoderate) 191 Cooking gains (calcommoderate) 100 100 Loseing gains (70)m= 3 3 Losses e.g. evapo 100 100 100 Vater heating gain 100 100 100 100 Vater heating gain 100 <td>calculation see Table s able 5), Wa ab Mar 43 108.43 sulated in A 14 12.31 calculated in A 186.96 culated in A 33.84 sins (Table 3 ation (nega 74 -86.74 s (Table 5)</td> <td>46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Append 176.39 ppendix 33.84 5a) 3 tive valu -86.74</td> <td>45.36 only if c): May 108.43 L, equati 6.97 dix L, equat 163.04 L, equat 33.84 3 es) (Tab</td> <td>Jun 108.43 ion L9 of 5.88 uation L 150.49 ion L15 33.84 3 le 5) -86.74</td> <td>37.89 s in the co Jul 108.43 r L9a), a 6.36 13 or L1 142.11 or L15a) 33.84 3</td> <td>42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14), also se 33.84 3</td> <td>42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11 ee Table 33.84 3 -86.74</td> <td>49.11 ater is fr Oct 108.43 14.08 ble 5 155.68 5 33.84 3</td> <td>52.66 om com Nov 108.43 16.43 169.03 33.84 3</td> <td>57.03 munity h Dec 108.43 17.52 181.58 33.84 3</td> <td></td> <td>(66) (67) (68) (69) (70)</td>	calculation see Table s able 5), Wa ab Mar 43 108.43 sulated in A 14 12.31 calculated in A 186.96 culated in A 33.84 sins (Table 3 ation (nega 74 -86.74 s (Table 5)	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Append 176.39 ppendix 33.84 5a) 3 tive valu -86.74	45.36 only if c): May 108.43 L, equati 6.97 dix L, equat 163.04 L, equat 33.84 3 es) (Tab	Jun 108.43 ion L9 of 5.88 uation L 150.49 ion L15 33.84 3 le 5) -86.74	37.89 s in the co Jul 108.43 r L9a), a 6.36 13 or L1 142.11 or L15a) 33.84 3	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14), also se 33.84 3	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11 ee Table 33.84 3 -86.74	49.11 ater is fr Oct 108.43 14.08 ble 5 155.68 5 33.84 3	52.66 om com Nov 108.43 16.43 169.03 33.84 3	57.03 munity h Dec 108.43 17.52 181.58 33.84 3		(66) (67) (68) (69) (70)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (calc (67)m= 17.04 15 Appliances gains ((68)m= 189.96 191 Cooking gains (calc (69)m= 33.84 33 Pumps and fans gains (70)m= 3 3 Losses e.g. evapo (71)m= -86.74 -86	calculation see Table s able 5), Wa ab Mar 43 108.43 sulated in A 14 12.31 calculated in A 186.96 culated in A 33.84 sins (Table 3 ation (nega 74 -86.74 s (Table 5)	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Appendi 176.39 ppendix 33.84 5a) 3 tive valu	45.36 only if c): May 108.43 L, equati 6.97 dix L, eq 163.04 L, equat 33.84 3 es) (Tab	39.79 ylinder is Jun 108.43 ion L9 of 5.88 uation L 150.49 ion L15 33.84 3 le 5) -86.74	37.89 s in the c Jul 108.43 r L9a), a 6.36 13 or L1: 142.11 or L15a) 33.84 3 -86.74	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14), also se 33.84 3 -86.74	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11 ee Table 33.84 3 -86.74	49.11 ater is fr Oct 108.43 14.08 ble 5 155.68 5 33.84 3 -86.74	52.66 om com Nov 108.43 16.43 169.03 33.84 3 -86.74	57.03 munity h Dec 108.43 17.52 181.58 33.84 3 -86.74		(66) (67) (68) (69) (70)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (calc (67)m= 17.04 15 Appliances gains ((68)m= 189.96 191 Cooking gains (calc (69)m= 33.84 33 Pumps and fans gains (70)m= 3 3 Losses e.g. evapo (71)m= -86.74 -86 Water heating gains (72)m= 78.62 76 Total internal gains	53.09 calculation see Table sable 5), Wa eb Mar 43 108.43 sulated in A 12.31 calculated in A 33.84 sins (Table 3 ation (negative 74 -86.74 s (Table 5) 26 71.36 s =	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Append 176.39 ppendix 33.84 5a) 3 tive valu -86.74	45.36 only if c): May 108.43 L, equati 6.97 dix L, equat 163.04 L, equat 33.84 3 es) (Tab	39.79 ylinder is Jun 108.43 ion L9 of 5.88 uation L 150.49 tion L15 33.84 3 lle 5) -86.74 55.27 (66)	37.89 s in the co Jul 108.43 r L9a), a 6.36 13 or L1 142.11 or L15a) 33.84 3 -86.74 50.93 m + (67)m	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14), also se 33.84 3 -86.74	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11 ee Table 33.84 3 -86.74	49.11 ater is fr Oct 108.43 14.08 ble 5 155.68 5 33.84 3 -86.74	52.66 om com Nov 108.43 16.43 169.03 33.84 3 -86.74	57.03 munity h Dec 108.43 17.52 181.58 33.84 3 -86.74		(66) (67) (68) (69) (70)
(65)m= 58.5 51 include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 108.43 108 Lighting gains (cale (67)m= 17.04 15 Appliances gains (cale (68)m= 189.96 191 Cooking gains (cale (69)m= 33.84 33 Pumps and fans gain (70)m= 3 3 Losses e.g. evapo (71)m= -86.74 -86 Water heating gair (72)m= 78.62 76	53.09 calculation see Table sable 5), Wa eb Mar 43 108.43 sulated in A 12.31 calculated in A 33.84 sins (Table 3 ation (negative 74 -86.74 s (Table 5) 26 71.36 s =	46.93 of (65)m 5 and 5a tts Apr 108.43 ppendix 9.32 n Append 176.39 ppendix 33.84 5a) 3 tive valu -86.74	45.36 only if c): May 108.43 L, equati 6.97 dix L, equat 163.04 L, equat 33.84 3 es) (Tab	39.79 ylinder is Jun 108.43 ion L9 of 5.88 uation L 150.49 ion L15 33.84 3 le 5) -86.74	37.89 s in the c Jul 108.43 r L9a), a 6.36 13 or L1: 142.11 or L15a) 33.84 3 -86.74	42.47 dwelling Aug 108.43 lso see 8.26 3a), also 140.14), also se 33.84 3 -86.74	42.94 or hot w Sep 108.43 Table 5 11.09 o see Tal 145.11 ee Table 33.84 3 -86.74	49.11 ater is fr Oct 108.43 14.08 ble 5 155.68 5 33.84 3 -86.74	52.66 om com Nov 108.43 16.43 169.03 33.84 3 -86.74	57.03 munity h Dec 108.43 17.52 181.58 33.84 3 -86.74		(66) (67) (68) (69) (70)

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

Orientation: Access Fa	actor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x 0.77	x	1.78	x	36.79	x	0.63	x	0.7] =	20.02	(77)
Southeast 0.9x 0.77	х	1.78	X	62.67	x	0.63	x	0.7	=	34.09	(77)
Southeast 0.9x 0.77	x	1.78	X	85.75	x	0.63	x	0.7] =	46.65	(77)
Southeast 0.9x 0.77	x	1.78	X	106.25	x	0.63	x	0.7] =	57.8	(77)
Southeast 0.9x 0.77	x	1.78	X	119.01	x	0.63	x	0.7] =	64.74	(77)
Southeast 0.9x 0.77	х	1.78	X	118.15	x	0.63	x	0.7] =	64.27	(77)
Southeast 0.9x 0.77	Х	1.78	X	113.91	X	0.63	x	0.7	=	61.97	(77)
Southeast 0.9x 0.77	X	1.78	X	104.39	x	0.63	x	0.7	=	56.79	(77)
Southeast 0.9x 0.77	X	1.78	X	92.85	x	0.63	x	0.7] =	50.51	(77)
Southeast 0.9x 0.77	X	1.78	X	69.27	x	0.63	x	0.7] =	37.68	(77)
Southeast 0.9x 0.77	X	1.78	X	44.07	x	0.63	x	0.7	=	23.97	(77)
Southeast 0.9x 0.77	X	1.78	X	31.49	x	0.63	x	0.7] =	17.13	(77)
Southwest _{0.9x} 0.77	X	1.75	X	36.79		0.63	x	0.7] =	39.36	(79)
Southwest _{0.9x} 0.77	X	1.75	X	62.67]	0.63	x	0.7	=	67.04	(79)
Southwest _{0.9x} 0.77	X	1.75	X	85.75]	0.63	x	0.7] =	91.72	(79)
Southwest _{0.9x} 0.77	X	1.75	X	106.25		0.63	x	0.7] =	113.65	(79)
Southwest _{0.9x} 0.77	X	1.75	X	119.01]	0.63	x	0.7	=	127.3	(79)
Southwest _{0.9x} 0.77	X	1.75	X	118.15		0.63	x	0.7	=	126.38	(79)
Southwest _{0.9x} 0.77	X	1.75	X	113.91		0.63	x	0.7] =	121.84	(79)
Southwest _{0.9x} 0.77	X	1.75	X	104.39]	0.63	x	0.7	=	111.66	(79)
Southwest _{0.9x} 0.77	X	1.75	X	92.85		0.63	x	0.7	=	99.32	(79)
Southwest _{0.9x} 0.77	X	1.75	X	69.27		0.63	x	0.7	=	74.09	(79)
Southwest _{0.9x} 0.77	X	1.75	X	44.07]	0.63	X	0.7	=	47.14	(79)
Southwest _{0.9x} 0.77	X	1.75	X	31.49]	0.63	x	0.7	=	33.68	(79)
Northwest 0.9x 0.77	X	1.55	X	11.28	X	0.63	X	0.7	=	5.34	(81)
Northwest 0.9x 0.77	X	1.55	X	22.97	X	0.63	X	0.7	=	10.88	(81)
Northwest 0.9x 0.77	X	1.55	X	41.38	X	0.63	X	0.7	=	19.6	(81)
Northwest 0.9x 0.77	X	1.55	X	67.96	X	0.63	X	0.7	=	32.19	(81)
Northwest 0.9x 0.77	X	1.55	X	91.35	X	0.63	X	0.7	=	43.27	(81)
Northwest 0.9x 0.77	X	1.55	X	97.38	X	0.63	X	0.7	=	46.13	(81)
Northwest 0.9x 0.77	X	1.55	X	91.1	X	0.63	X	0.7	=	43.15	(81)
Northwest 0.9x 0.77	X	1.55	X	72.63	X	0.63	x	0.7	=	34.4	(81)
Northwest 0.9x 0.77	X	1.55	X	50.42	X	0.63	X	0.7	=	23.88	(81)
Northwest 0.9x 0.77	X	1.55	X	28.07	X	0.63	X	0.7	=	13.3	(81)
Northwest 0.9x 0.77	X	1.55	X	14.2	X	0.63	x	0.7	=	6.73	(81)
Northwest 0.9x 0.77	X	1.55	X	9.21	x	0.63	x	0.7	=	4.36	(81)
Rooflights _{0.9x} 1	X	0.82	X	40.5	x	0.5	x	0.8	=	35.87	(82)
Rooflights _{0.9x} 1	X	0.82	X	15.92	x	0.5	x	0.8] =	9.4	(82)
Rooflights 0.9x 1	X	0.36	×	26	x	0.5	x	0.8	=	6.74	(82)

Rooflights 0.9x 1	x	0.00	l .	70.74] _x [0.5	л "г	0.0		05.04	(82)
D 6:14	╡	0.82	X	73.74]	0.5	」 × L ¬	0.8		65.31 19.19	(82)
Daafiinka	」 ×		X	32.51] [0.5	」 × L ¬		-		(82)
Deeflightee	」 ^X	0.36	l X	54	X	0.5	」 × L ¬	0.8		14	(82)
Daafiinka	X	0.82	X	111.06] [0.5	_	0.8		98.35	=
Daafiinka	X	0.82	X I	59.5	X	0.5	_	0.8		35.13	(82)
D 6: 14	X	0.36	l X	96	X	0.5	_	0.8	=	24.88	(82)
	X	0.82	X I	150.59	X	0.5	X	0.8	=	133.36	(82)
Rooflights 0.9x 1	×	0.82	X	100.03	X	0.5	_	0.8	=	59.06	(82)
Rooflights 0.9x 1	→ ×	0.36	X	150	X	0.5	_	0.8	=	38.88	(82)
Rooflights 0.9x 1	→ ×	0.82	X	177.61	X	0.5	_	8.0	=	157.29	(82)
Rooflights 0.9x 1	×	0.82	X	136.88	X [0.5	_	8.0	=	80.81	(82)
Rooflights 0.9x 1	×	0.36	Х	192	X	0.5	_ ×	0.8	_ =	49.77	(82)
Rooflights 0.9x 1	×	0.82	X	179.47	X	0.5	_ ×	0.8	=	158.94	(82)
Rooflights 0.9x 1	X	0.82	X	147.03	X	0.5	x	0.8	=	86.81	(82)
Rooflights 0.9x 1	X	0.36	X	200	X	0.5	x	0.8	=	51.84	(82)
Rooflights 0.9x 1	X	0.82	X	171.77	X	0.5	_ x _	8.0	=	152.12	(82)
Rooflights 0.9x 1	X	0.82	X	137.1	X	0.5	X	0.8	=	80.94	(82)
Rooflights 0.9x 1	X	0.36	X	189	X	0.5	X	0.8	=	48.99	(82)
Rooflights 0.9x 1	x	0.82	X	151.65	X	0.5	x	0.8	=	134.31	(82)
Rooflights 0.9x 1	X	0.82	X	107.76	X	0.5	x	0.8	=	63.62	(82)
Rooflights 0.9x 1	X	0.36	X	157	X	0.5	x	0.8	=	40.69	(82)
Rooflights 0.9x 1	X	0.82	X	125.02	X	0.5	x	0.8	=	110.72	(82)
Rooflights 0.9x 1	X	0.82	X	73.17	X	0.5	x	0.8	=	43.2	(82)
Rooflights 0.9x 1	x	0.36	x	115	X	0.5	x	0.8	=	29.81	(82)
Rooflights 0.9x 1	x	0.82	x	84.48	X	0.5	x	0.8	=	74.82	(82)
Rooflights 0.9x 1	x	0.82	x	39.91	X	0.5	x	0.8	=	23.56	(82)
Rooflights 0.9x 1	x	0.36	x	66	x	0.5	x	0.8	=	17.11	(82)
Rooflights 0.9x 1	x	0.82	x	49.44	X	0.5	x	0.8	=	43.78	(82)
Rooflights 0.9x 1	x	0.82	x	20.03	x	0.5	x	0.8	=	11.83	(82)
Rooflights 0.9x 1	x	0.36	x	33	x	0.5	_ x [0.8	=	8.55	(82)
Rooflights 0.9x 1	×	0.82	х	34.03	x	0.5	x	0.8	=	30.14	(82)
Rooflights 0.9x 1	×	0.82	x	13.01	X	0.5	×	0.8	=	7.68	(82)
Rooflights 0.9x 1	×	0.36	x	21	X	0.5	_ x [0.8	=	5.44	(82)
			•								_
Solar gains in watts, calcu	ılated	for each mon	th		(83)m	= Sum(74)m	.(82)m				
(83)m= 116.72 210.51 3°	6.34	434.94 523.18	3 5	34.37 509.02	441.	48 357.44	240.55	142	98.43		(83)
Total gains – internal and	solar	(84)m = (73)n	า + (83)m , watts							
(84)m= 460.87 552.16 6	45.5	744.36 812.6	8 8	04.54 766.94	705.	48 631.81	534.86	459.12	432.71		(84)
7. Mean internal tempera	ature (heating seaso	n)								
Temperature during hea	ting pe	eriods in the li	ving	area from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation factor for gain	s for li	ving area, h1,	m (s	ee Table 9a)							_
Jan Feb	Mar	Apr Ma	y	Jun Jul	Αι	ıg Sep	Oct	Nov	Dec		

(86)m=	1	0.99	0.98	0.95	0.87	0.73	0.58	0.64	0.86	0.97	0.99	1		(86)
Mean	internal	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				•	
(87)m=	19.13	19.35	19.7	20.18	20.59	20.87	20.96	20.94	20.73	20.19	19.59	19.13		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, T	h2 (°C)		•			
(88)m=	19.52	19.53	19.54	19.57	19.57	19.6	19.6	19.61	19.59	19.57	19.56	19.55		(88)
Litilio	tion foo	tor for a	oine for I	root of d	volling	h2 m /oc	L Tabla	00)	<u> </u>			l		
(89)m=	0.99	0.99	ains for 1	0.93	0.82	0.62	0.41	9a) 0.47	0.77	0.95	0.99	1		(89)
								l	l	<u> </u>	0.00	<u>'</u>		()
				r		Ť	r	eps 3 to	r		10.00	47.00	1	(00)
(90)m=	17.87	18.09	18.44	18.93	19.31	19.54	19.59	19.59	19.45	18.95	18.36 g area ÷ (4	17.88	0.00	(90)
										LA - LIVIII	ig alea + (4	+) -	0.38	(91)
Mean	interna	temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2	r	1	ī	ı	
(92)m=	18.35	18.56	18.92	19.4	19.79	20.04	20.11	20.1	19.93	19.42	18.83	18.35		(92)
			r					4e, whe		 			I	
(93)m=	18.35	18.56	18.92	19.4	19.79	20.04	20.11	20.1	19.93	19.42	18.83	18.35		(93)
			uirement											
				•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut			or gains			lun	lul	Aug	Con	Oct	Nov	Doo		
l Itilie	Jan stion fac	Feb tor for a	Mar ains, hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.99	0.97	0.93	0.83	0.66	0.48	0.54	0.8	0.95	0.99	0.99		(94)
			, W = (9 ²			0.00	0.40	0.04	0.0	0.00	0.00	0.00		()
(95)m=		544.57	626.07	688.89	673.07	528.16	366.39	378.36	502.95	508.79	453.37	430.33		(95)
			rnal tem	l					1		1			, ,
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	loss rate	for mea	ı an intern	ıal tempe	erature.	Lm . W =	∟ =[(39)m :	x [(93)m	<u>. </u>	<u> </u>				
(97)m=	1620.99			1168.12	895.59	588.6	379.45	398.56	636.18	976.02	1310.48	1598.21		(97)
Space	e heating	g require	ement fo	r each n	nonth, k\	Mh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	ļ		
(98)m=	865.52	687.57	588.42	345.05	165.56	0	0	0	0	347.62	617.11	868.9		
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	4485.74	(98)
Space	e heatin	a reauire	ement in	kWh/m²	/vear								67.05	(99)
·		· ·			•	:		: 6	NID)				07.00	
			ıts – Inai	ividuai n	eating sy	ystems i	nciuaing	micro-C	HP)					
•	e heating	•	nt from s	econdar	v/supple	mentary	svstem						0	(201)
			it from m			oa. y	-	(202) = 1	- (201) =					(202)
				-	` ,					(202)] =			1	=
			ng from	-				(204) = (2	02) * [1 –	(203)] –			1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1								90.3	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above))								
	865.52	687.57	588.42	345.05	165.56	0	0	0	0	347.62	617.11	868.9		
(211)m	n = {[(98)m x (20	4)] } x 1	00 ÷ (20	16)									(211)
	958.49	761.43	651.63	382.11	183.34	0	0	0	0	384.96	683.41	962.24		
								Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	=	4967.6	(211)
														_

Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)	-					ı			
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		–
			Tota	I (KWN/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating									
Output from water heater (calculated above) 187.85 164.09 170.72 151.42 146.6 1	129.12	123.71	137.91	139.43	158.77	169.48	183.44		
Efficiency of water heater								81	(216)
(217)m= 88.49 88.35 88.03 87.24 85.68	81	81	81	81	87.16	88.12	88.53		(217)
Fuel for water heating, kWh/month						ļ			
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 212.28 185.74 193.94 173.56 171.11 193.94 $	159.41	152.73	170.25	172.13	182.15	192.33	207.21		
(210)111 212.20 100.14 100.04 170.00 171.11	100.41	102.70		I = Sum(2:		102.00	207.21	2172.84	(219)
Annual totals						Wh/yeaı	r r	kWh/yea	<u> </u>
Space heating fuel used, main system 1						,		4967.6	
Water heating fuel used							Ī	2172.84	1
Electricity for pumps, fans and electric keep-hot							•		
central heating pump:									
31 1							30		(230c)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =		30	30	(230c) (231)
			sum	of (230a).	(230g) =		30	30	_ `
Total electricity for the above, kWh/year	ns inclu	ıding mi			(230g) =		30		(231)
Total electricity for the above, kWh/year Electricity for lighting	En	iding mid e rgy 'h/year				ion fac			(231)
Total electricity for the above, kWh/year Electricity for lighting	En ekW	ergy			Emiss	ion fac 2/kWh		300.98	(231)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	En ekW	e rgy h/year			Emiss kg CO	ion fac 2/kWh	tor	300.98 Emissions kg CO2/ye	(231) (232) Sear
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	En 6 kW (211	ergy h/year) ×			Emiss kg CO2	ion fac 2/kWh 16	tor = [300.98 Emissions kg CO2/ye	(231) (232) Sear (261)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Enc kW (211 (215 (219	ergy h/year) x) x			Emiss kg CO2 0.2 0.5	ion fac 2/kWh 16	tor = [Emissions kg CO2/ye	(231) (232) Sear (261) (263)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Enc kW (211 (215 (219	ergy h/year) x b) x c) x) x	cro-CHP		Emiss kg CO2 0.2 0.5	ion fac 2/kWh 16 19	tor = [300.98 Emissions kg CO2/ye 1073 0 469.33	(231) (232) (232) (232) (232) (263) (264) (264)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	End kW (211 (215 (219 (261 (231	ergy h/year) x b) x c) x) x	cro-CHP		Emiss kg CO2 0.2 0.5 0.2	ion fac 2/kWh 16 19	tor = [= [= [300.98 Emissions kg CO2/ye 1073 0 469.33 1542.34	(231) (232) (232) (232) (261) (263) (264) (265)
Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	End kW (211 (215 (219 (261 (231	ergy (h/year) x (h) x (h) x (h) x (h) x (h) x (h) x (h) x (h) x (h) x (h) x (h) x	cro-CHP	264) =	Emiss kg CO2 0.2 0.5 0.5 0.5	ion fac 2/kWh 16 19 16	tor = [= [= [300.98 Emissions kg CO2/ye 1073 0 469.33 1542.34 15.57	(231) (232) (232) (232) (261) (263) (264) (265) (267)

El rating (section 14)

(274)

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