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Planning Statement Energy Assessment 40-42 Mill Lane

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Executive Summary

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About the Scheme:

The proposed development is located in the London Borough of Camden and comprises the refurbishment and extension (rear and top) of an existing development.

Planning Policy

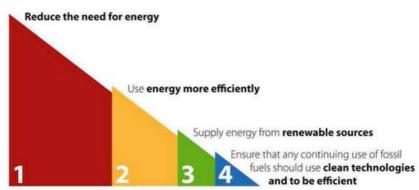
In accordance with the London Borough of Camden's Core Strategy, the scheme is required to make improvements in line with the energy hierarchy as set out in The London Plan Policy 5.2.

The scheme complies with the 2013 Building Regulations Part L and the minimum energy efficiency targets in the following documents have been followed:

- New build (Part L1A) New build elements have exceeded minimum requirements as outlined within Approved Document L.
- 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.

The Energy Hierarchy:

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



The resulting energy savings are shown below in accordance with the GLA's Energy Hierarchy:

GLA's Energy Hierarchy – Regulated Carbon Emissions					
	Baseline:	Be Lean:	Be Clean:	Be Green:	
CO ₂ emissions (Tonnes CO ₂ /yr)	14.14	9.98	-	8.54	
CO ₂ emissions saving (Tonnes CO ₂ /yr)	-	4.17	-	1.43	
Saving from each stage (%)	-	29.5	-	10.1	
Total CO ₂ emissions saving (Tonnes CO ₂ /yr) 5.60					

39.6% Total carbon emissions savings over Part L1A and 1B of the Building Regulations 2013 achieved

Executive Summary

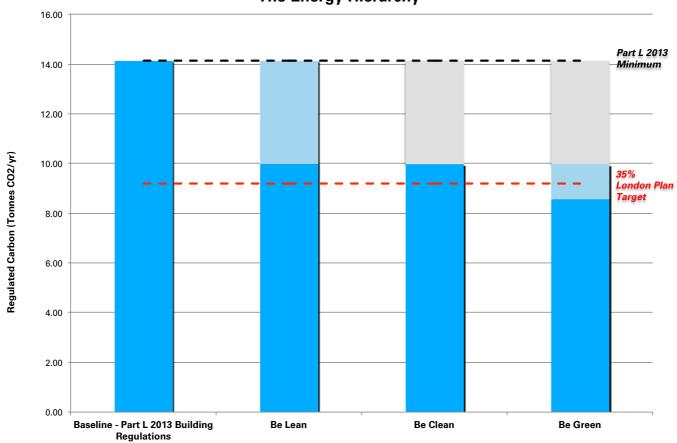
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GLA's Energy Hierarchy – Regulated Carbon Emissions:

A graphical illustration of how the scheme performs in relation to Building Regulations and the Energy Hierarchy is shown below.

Figure:

The Energy Hierarchy



Summary:

As demonstrated above the development will reduce carbon emissions by 29.5% from the fabric energy efficiency measures described in the 'Be Lean' section and will reduce total carbon emissions by 39.6% over Building Regulations with the further inclusion of low and zero carbon technologies. The inclusion of photovoltaic panels of the roof of the scheme contributes a 10.1% reduction in CO_2 emissions over the 'be lean' scenario.

A feasibility analysis of renewable technologies has been undertaken determining the suitability of each possible technology.

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Shortfall in Emissions:

As set out in Policy 5.2 of the London Plan, if the development fails to meet the 35% target, the annual shortfall is determined by subtracting the overall regulated carbon dioxide savings from the target savings. The result is then multiplied by the assumed lifetime of the development's services (e.g. 30 years) to give the cumulative shortfall. The cumulative shortfall is multiplied by the carbon dioxide off-set price to determine the required cash-in-lieu contribution, as shown below.

	(Tonnes CO ₂ /yr)	%
Savings from 'Be Lean'-After energy demand reduction	4.17	29.5%
Savings from 'Be Clean'-After CHP	0.00	0.0%
Savings from 'Be Green'-After renewable energy	1.43	10.1%
Fotal Cumulative Savings	5.60	39.6%

Total Target Savings (35% reduction as set out in London Plan policy 5.2)	4.95	35%
Annual Surplus	0.65	

Total Carbon 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.

Carbon Dioxide Emissions – Regulated and Unregulated (Tonnes CO ₂ /yr)						
	Regulated Emissions	Unregulated Emissions	Total Emissions			
Baseline: Part L 2013	14.14	6.81	20.95			
Be Lean: After demand reduction	9.98	6.81	16.78			
Be Clean: After CHP	-	-	-			
Be Green: After Renewable energy	8.54	6.81	15.35			

Introduction Energy Assessment 40-42 Mill Lane

Aim of this study:

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 development's design and evolution.

Methodology:

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 PLANNING: Greater London Authority guidance on preparing energy assessments (March 2016)"

Under the GLA's guidance and the London Borough of Camden's policy document CPG3, an energy statement should accompany planning applications. The energy statement should provide information demonstrating how the energy hierarchy has been followed i.e. 'Lean, Clean, Green', including consideration of passive design and decentralised energy options such CHP/Community CHP.

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

- BASELINE: A calculation of the Part L1A (TER) and Part L1B (DER) 2013 Building Regulations complaint CO₂ emission baseline using approved software. The baseline assumes a gas boiler would provide heating and any active cooling would be electrically powered.
- 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, 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.
- CLEAN: in accordance with Policy 5.6 of London Plan, 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.
- GREEN: in accordance with Policy 5.7 of London Plan, this report has conducted a
 feasibility assessment of renewable energy technologies. This comprised a sitespecific analysis of the technologies and if applicable how they would be integrated
 into the heating and cooling strategy for the scheme.

Please note that these findings are currently subject to a detailed analysis from a building services design engineer and qualified quantity surveyor.

Establishing Emissions: The Carbon Profile

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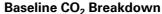
Building Regulations Part L 2013 Minimum Compliance:

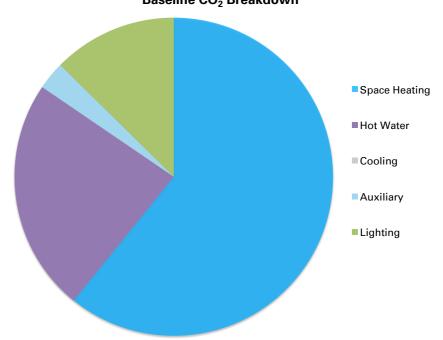
The 'baseline' carbon emissions for the development are 14.14 Tonnes $\rm CO_2/yr.$

The pie chart below provides a breakdown of the scheme's baseline carbon emissions by system over the course of one year.

Carbon	Emissions	in	Tonnes	
CO ₂ /yr				

Heating	Hot Water	Cooling	Auxiliary	Lighting
8.78	3.24	0.00	0.39	1.73





Overview:

The chart above shows that space heating is the primary source of carbon emissions, and domestic hot water is the second largest, across the scheme as a whole. Space heating accounts for approximately 60.8% of the residential scheme's total energy demand whilst domestic hot water accounts for approximately 23.7%.

'Be Lean': Demand Reduction Measures Energy Assessment 40-42 Mill Lane

Be Lean - Summary:

Demand reduction measures have reduced the scheme's carbon emissions by 29.5 % over the minimum Part L1A and 1B 2013 Building Regulations baseline.

Site Layout Passive Design measures: The existing building is orientated north/south with glazing on all exposed facades. As part of the refurbishment works, existing single glazing will be replaced with high performance low emissivity, double glazing to reduce excessive solar gains and to improve the thermal comfort within each unit. Windows will be fully openable to reduce the need for active cooling measures.

Building Fabric Passive Design measures:

U Values:

Element	Minimum Building Regulations U value	Proposed U value
	W/m²K	W/m²K
External wall (new)	0.28	0.25
External wall (existing)	0.30	0.25
Party Wall	0.20	0.00
Exposed floors	0.25	0.25
Roof (new)	0.18	0.10
Roof (existing)	0.18	0.18
Windows	1.60	1.40
Doors	1.80	1.50

Airtightness:

Refurbished flats (Flat 1 to 5) will target an air permeability of 7 m³/(hr.m²) @ 50 pa. The target air permeability for the new flats (Flat 6 and 7) has been modelled as 3 m³/(hr.m²) @ 50 pa.

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 this is caused by poor perpends in blockwork inner leafs. Structural leakage is hard to remedy retrospectively. Good detailing at the design stage is therefore essential.

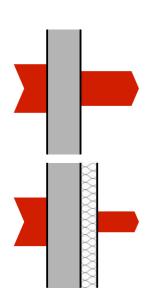
Services leakage occurs at penetrations from pipes and cables entering the building. These can be sewerage pipes, water pipes and heating pipes. As well as electricity cables there may also be telecommunication cables. Attention therefore, needs to be paid to sealing all penetrations during construction.

Thermal Bridging:

The refurbished part of the scheme has been indicatively modelled with the default thermal bridge y-values for all junction types, 0.15W/m²K. The two new flats (Flat 6 and 7) will target Accredited Construction Details (ACD) to all junctions.

Thermal Mass:

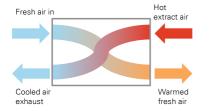
Thermal mass of the scheme has been indicatively modelled as 250 kJ/m²K (medium).



Graphic illustrations of the heat flow through a wall and how is it minimized with low uvalue (consequence of the additional insulation).

'Be Lean': Demand Reduction Measures Energy Assessment 40-42 Mill Lane

Energy Efficient Services Active Design measures:



Graphic illustration of a heat recovery unit, which exploits the extract hot air of the room to heat the cold supply air.

Heating:

Heating to the units will be provided by high efficiency combi-gas boilers, featuring time and temperature zone control by suitable arrangement of plumbing and electrical services and delayed thermostat. The heat will be distributed via radiators. The gas boiler will have a minimum efficiency of 89.5% and will provide space and domestic hot water heating.

Ventilation:

Balanced mechanical ventilation with heat recovery will be provided to the dwellings with the following specifications:

- 1 wet room: SFP of 0.53 and heat recovery of 89%
- 2 wet rooms: SFP of 0.60 and heat recovery of 88%
- 3 wet rooms: SFP of 0.71 and heat recovery of 86%

Air Conditioning:

No cooling system has been specified for the dwellings. Natural ventilation through openable windows will be used as a passive cooling measure alongside supply ventilation to living spaces.

Lighting:

High efficiency LED lighting has been specified for the development (with a lumen efficacy of more than 45lm/W).

'Be Clean': Heating Infrastructure & CHP

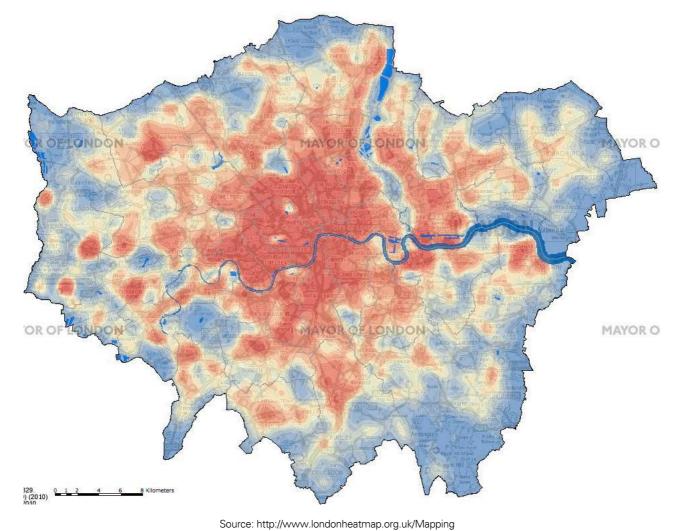
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Heating Infrastructure including CHP:

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. This has involved a systematic appraisal of the potential to connect to existing or planned heating networks and on site communal and CHP systems.

Heating Infrastructure:

The London Heat Map (shown below) has been consulted to establish the possibility of connecting to heating infrastructure.



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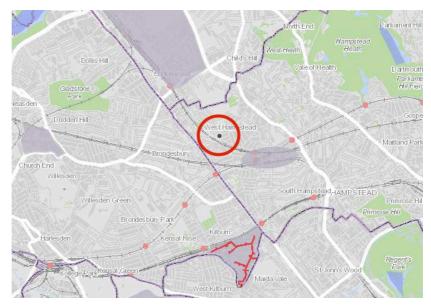
'Be Clean': Connection to Existing and Planned Networks

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Existing and Planned Networks:

Existing networks:

A review of the London Heat Map demonstrates that there are no existing networks present within connectable range of the scheme. A map of the existing and potential networks in the scheme's location is shown below.



Existing DH NetworksPotential DH Networks

There are no existing or potential networks within the vicinity of the scheme, therefore a connection is not possible. The closest potential district heating network is located in Kilburn, however this falls outside of the connectable range of the proposed scheme.

'Be Clean': Site Wide Networks and CHP Energy Assessment 40-42 Mill Lane

Site-wide Heat Networks:

In accordance with section 8.2 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 the dwellings on site will not have adequate density and 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.

Combined Heat and Power (CHP)

In accordance with section 8.3 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.

'Be Clean': Cooling Energy Assessment 40-42 Mill Lane

Policy 5.9 Overheating and Cooling:

The aim of this policy 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:

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

- 1) Minimise internal heat generation through energy efficient design
- 2) Reduce the amount of heat entering the building in summer (e.g. shading and fenestration)
- Manage the heat within the building through thermal mass, room height and green roofs
- 4) Passive ventilation
- 1
- 5) Mechanical ventilation
- 6) Active cooling systems (ensuring the lowest carbon option)

Avoiding Overheating Measures taken:

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

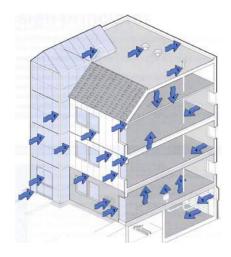
1) Minimise internal heat generation through energy efficient design

Internal heat gains have been minimised where possible. Energy Efficient appliances will help reduce internal heat gain and reduce the cooling requirement.

Energy efficient LED lighting will also be specified (>45 lumens per circuit watt).

'Be Clean': Cooling Energy Assessment 40-42 Mill Lane

Avoiding Overheating Measures taken:



Examples of possible air leakage points in a building



Examples of how the thermal mass absorbs heat during day and emits it during night.

2) Reduce the amount of heat entering the building in summer (e.g. shading and fenestration)

Direct solar gains will be controlled in the following ways:

- Solar control methods controlling solar gain to within tolerable limits
 have been considered. The location, design and type of window openings
 and new glazing have been optimised, and reduced solar gain factors
 from low emissivity windows with a g-value of 0.57 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.

Heat transfer and infiltration has been controlled in the following ways:

- Insulation levels have been maximised and the resulting u-values 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.
- A reduced air permeability rate of 3 m³/(hr.m²) @ 50 pa has been targeted for the two new flats (Flat 6 and 7) to minimise uncontrolled air infiltration. All windows will be draught stripped. This will require attention to detailing and sealing. See 'Be Lean' section of this report for details of how this will be achieved.

3) Manage the heat within the building through thermal mass, room height and green roofs.

The following measures have been specified to manage heat accumulation within the building:

 High thermal mass – Existing building fabric materials such as masonry (walls) and concrete 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.

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'Be Clean': Cooling Energy Assessment 40-42 Mill Lane

Avoiding Overheating Measures taken:

- 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 existing building has floor to ceiling heights of approximately 2.5m. As the roof will be well insulated to achieve a U-value of 0.10 W/m²K, there will be minimal penetration of heat through the roof.
- Green roofs A green roof has been considered to be unpractical by the
 design team due to site constraints. Consequently, a roof covering with a
 high albedo (reflective) surface has been specified 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.

4) Passive ventilation

Ventilation that does not use fans or mechanical systems has been specified to reduce the cooling load.

- Openable windows are specified on all exposed facades of the building.
- Night time cooling will also be utilised in the form of openable windows.
 This will work in tandem with high thermal mass materials part of the
 existing structure. 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 stricture during the
 day.



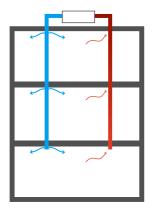
Typical building section demonstrating passive cross ventilation.

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'Be Clean': Cooling Energy Assessment

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Avoiding Overheating Measures taken:



Typical building section demonstrating a simple method of supply and extract ventilation system.

5) Mechanical ventilation

Passive ventilation will not be adequate to cool the building to the required temperature. Mechanical ventilation will be utilised in the following forms:

- A mixed mode system will be implemented. This will be complimentary
 to the passive cooling measures taken. During summer months,
 mechanical ventilation using fans will circulate and remove hot air from
 the building. The building will also adopt a zoned design to allow natural
 ventilation where possible and mechanical ventilation where there are
 increased cooling loads.
- A whole building system will be specified which will use air handling units with separate supply and extract fans. Heat recovery units will also be specified to reduce energy demand, optimal performance will be achieved by the reduced air permeability rate of 3 m³/(hr.m²) @ 50 pa.
- The mechanical systems will have the following efficiencies which are in compliance with the Domestic Building Services Compliance Guide:
 - 1 wet room: SFP of 0.53 and heat recovery of 89%
 - 2 wet rooms: SFP of 0.60 and heat recovery of 88%
 - 3 wet rooms: SFP of 0.71 and heat recovery of 86%

Overheating Risk:

The overheating risk considering all the above measures have been assessed for each dwelling and is presented in the table below:

Dwellings	Overheating risk according to SAP
Flat 1	Slight
Flat 2	Not Significant
Flat 3	Slight
Flat 4	Not Significant
Flat 5	Slight
Flat 6	Not Significant
Flat 7	Slight

According to the GLA guidance on preparing energy assessments (March 2016), 3a dynamic modelling to assess the risk of overheating should be carried out. However, due to the overheating results of SAP showing that there is no significant risk of overheating, it has been considered that a dynamic modelling is not required.

'Be Clean': Cooling Energy Assessment 40-42 Mill Lane

Efficiency Measures taken:	6) Active cooling systems (ensuring the lowest carbon option)
	Air conditioning has not been specified for the scheme, 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.

'Be Green': Renewable Energy

Energy Assessment 40-42 Mill Lane

Renewable Energy Feasibility:

In line with Policy 5.7 of the 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.

Renewable Energy Technology Comparison:

Each technology has been assessed under 5 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:

✓ ✓ ✓ ✓ ✓ = 1 scored out of a possible 5

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

- Local, site-specific impact: (Maximum score of 4)
 - Local planning criteria = ✓ ✓
 - o Land used by all components = ✓
 - o Noise impact from operation = ✓
- Suitability and design impact: (Maximum score of 4)
 - o Interaction on the current building design = **V**
 - Building orientation suitability =
 - o Buildability of installation =
- Economic viability: (Maximum score of 5)
 - o Capital cost of all components = ✔ ✔
 - o Grants and funding available = ✓
 - Payback periods (years) 3-5, 5-10, 10-15 = ✓ ✓ ✓
- Operation and maintenance: (Maximum score of 3)
 - o Servicing requirements (low or high) = ✓
 - o Maintenance costs (low or high) = ✔
 - o Resource use from future maintenance (low or high) = ✔
- CO₂ and sustainability: (Maximum score of 10)
 - o Carbon saving per year = ✓ ✓ ✓ ✓
 - o Impact of future grid decarbonisation (gas vs. electric) = 🗸 🗸
 - Local air quality/pollution =
 - o Resource use of installation = ✓ ✓

Key comments on each of the criteria and the corresponding score will be provided in a table (example below) 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.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO₂ and sustainability
	V V V V	////	VVVV	V V V	V V V V V V V V V V V V V V V V V V V

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'Be Green': Renewable Energy

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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 small 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. As there is no scope to provide CHP to the scheme, biomass boilers are likely to be unsuitable for the site. Site constraints such as limited transport/access issues, and storage of the biomass fuel also make this technology unsuitable. A detailed feasibility study will be required to investigate the suitability.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO ₂ and sustainability
Biomass Boiler	V V V V	/ / / / /	V V V V	V V V	V V V V V V V V V V V V V V V V V V V
	Local air quality impacts, increased transport usage on the restricted site, increased plant space.	Increase in plant space required, orientation fine, slightly increased buildability issues.	Increased capital costs of installation, typical payback of >15 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.

'Be Green': Renewable Energy

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Photovoltaic (PV):

Accepted



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 systems can be discreet through being designed as an integral part of the roof. An 'invisible' design using slates or shingles as opposed to an architectural statement could be preferable in a sensitive area.

Photovoltaics 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 potential useable flat roof area of approximately 115m². This would allow 10 panels to be installed to provide additional electricity generation to the 2 new apartments (Flat 6 and 7)

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO₂ and sustainability	
Photovoltaic	V V V V	/ / / /	/// ///	VVV	V V V V V	
	No local air quality impacts, use of unutilised roof space, no noise issues.	Can be added to the roof, good orientation, and slightly increased buildability issues for wiring and metering.	Increased capital costs of installation, typical payback of >10 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.	

'Be Green': Renewable Energy

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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 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 potential useable flat roof area of approximately 115m².

It is estimated that the CO_2 emissions reduction that would be produced by solar hot water as a standalone system would not be adequate to achieve the required CO_2 emissions reduction target. Therefore a solar hot water system would need to be combined with more energy efficiency strategies, a CHP or additional renewable technologies to achieve the carbon reduction target.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO₂ and sustainability	
Solar Thermal	V V V V	/// /	VVV V	VVV	<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	
	No local air quality impacts, use of unutilised roof space, conservation officer has concerns for part of the site, no noise issues.	Can be added to the roof, good orientation, and slightly increased buildability issues for piping and cylinders.	Increased capital costs of installation, typical payback of 8 years, Renewable Heat Incentive available.	Limited servicing and maintenance i.e. 1 visit every two years, 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.	

'Be Green': Renewable Energy

Energy Assessment 40-42 Mill Lane

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.

Typically a 1.5 kW turbine can provide 4,000 kWh of electrical power annually. To achieve the required CO_2 emissions reduction target of 20% approximately 2 turbines would be required as a standalone solution. The indicative cost of a smaller roof mounted turbine is £2,000/kW so achieving the required CO_2 emissions reduction would cost approximately £6,000.00.

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 small groups within the local community could also affect the viability of wind energy for the project.

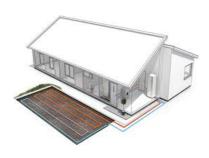
Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO ₂ and sustainability
Wind Energy	No local air quality impacts, use of unutilised roof space, conservation officer will have concerns for the site, minor noise issues.	Can be added to the roof, relatively limited wind speeds in local area, increased buildability issues for wiring and metering.	Medium capital costs of installation, typical payback < 5 years, Feed in Tariff available.	Very 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.

'Be Green': Renewable Energy

Energy Assessment 40-42 Mill Lane

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 bores, 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 bores 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 was viable.

From the bores 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 / bore 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.

Typical costs for an installation this are in the region of £80,000.00 for a smaller commercial or domestic size installation, with general installation costs at £1200 /kW of energy produced.

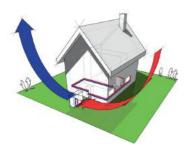
Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO₂ and sustainability
GSHP	No local air quality impacts, not visible so conservation friendly, no noise issues, however the constrained site may prohibit its installation.	Increased buildability issues for pipework and heating emitters internally.	High capital costs of installation, typical payback of 15 years where gas is displaced, Renewable Heat Incentive available.	Limited servicing and maintenance i.e. 1 visit per year, mechanical parts may require replacement over lifespan.	Limited carbon saving from gas displacement, consumes some electricity so benefits from decarbonisation, no local air impact, high embodied energy of equipment.

'Be Green': Renewable Energy

Energy Assessment 40-42 Mill Lane

Air Source Heat Pump (ASHP):

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 the 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 are only available on a relatively small scale. If applied across a larger site a number of plant zones would be required for generation of heat, leading to increased plant space requirements. Typical costs for an installation this are in the region of £30,000 for a smaller commercial or domestic size installation.

Carbon dioxide emissions savings will typically be less than that of the ground source heat pump. Air source heat pumps may be more suitable as an HVAC solution.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO₂ and sustainability	
ASHP	No local air quality impacts, use of unutilised roof space, conservation officer may have minor concerns over visual impact, no noise issues.	Can be added to the roof, good airflow on roof, increased buildability issues for pipework and heating emitters internally.	Medium- 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 parts may require replacement over lifespan.	Limited carbon saving from gas displacement, less efficient in winter, consumes electricity so benefits from decarbonisation, no local air impact, high embodied energy of equipment.	

'Be Green': Summary of Renewable Technologies

Energy Assessment 40-42 Mill Lane

Summary Comparison Matrix:

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

Renewable Technology	Local, site- specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO₂ and sustainability	Total Score
Biomass Boiler	V V V V	/ / / / /	V V V V	V V V	V V V V V	13 out of 26
Photovoltaic	<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	VV V V	VVV V	V V V	V V V V V	18 out of 26
Solar Thermal	VVV	VV V	<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	VVV	VVVV	16 out of 26
Wind Energy	V V V V	VV V	<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	VVV	V V V V V	17 out of 26
GSHP	V V V V	V V V V	V V V V V	V V V	V V V V V	14 out of 26
ASHP	V V V V	<i>\\\\\</i>	V V V V	V V V	V V V V V	15 out of 26

Renewable Technology Conclusion & Specification:

Photovoltaic panels, wind energy and solar thermal cells have scored the best. It is assumed that wind energy would be considered unsuitable for the area by conservation criteria and that the local residents would raise concerns over potential noise and turbulence.

Photovoltaic panels have been considered viable based on the available flat roof space.

'Be Green': Photovoltaic

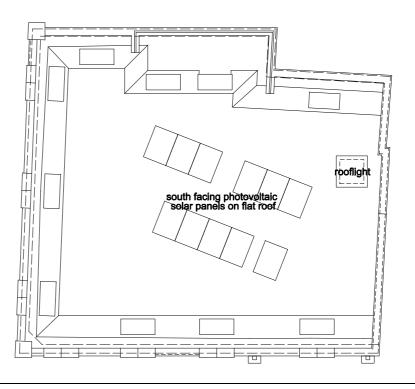
Energy Assessment 40-42 Mill Lane

Summary:

A photovoltaic panel system of 3.20 kWp (10 PV panels assuming a nominal output of 320W per PV panel) has been specified for the development and detailed summary of the lifecycle cost, revenue and payback for the photovoltaic panels is presented in this section.

Location:

The following drawing shows that there are approximately $115m^2$ of available flat roof that could be used to install photovoltaic modules. PV panels will be oriented south, covering approximately $16m^2$ of the roof.



'Be Green': Photovoltaic

Energy Assessment 40-42 Mill Lane

Lifecycle Cost:

The lifecycle of the proposed high efficiency panels is 25 years. To calculate the lifecycle cost of the panels, the maintenance of the system and replacement cost will be included.

The total costs for the proposed system's lifetime is:

- Capital Cost and maintenance = £4,600
- Maintenance = £1,500
- Operation Cost = £900 (replacement inverters etc.)
- Total Costs = £7,000.00

Revenue and Payback Parameters:

- The cost of electricity to be displaced is 14p/kWh.
- The 3.20kWp system is estimated to generate 2,764 kWh/yr. Based on the assumption that 50% of the electricity will be used on site, an offset saving of £193yr will be achieved.
- With the current Feed in Tariff, a tariff of 4.32/kWh will be received for generation, and 4.91/kWh will be received for export, which gives an additional saving of £187.

Summary Performance Calculations:

The following tables summarise the reduction in carbon emissions and the life cycle cost of the photovoltaic system.

Energy and Carbon Performance Criteria	Value
Predicted Annual Energy Saved (kWh/yr)	2,764
Annual Carbon Emissions Reductions (kg CO ₂ /year)	1,434
CO ₂ Emissions Reduction (%)	10.1

Cost Performance Criteria	Value
Total Cost Over Life Cycle (£)	7,000
Predicted Annual Savings (£)	381
Payback Period (years)	18.4

Conclusion Energy Assessment 40-42 Mill Lane

Summary

The baseline carbon emissions for the scheme are 14.14 Tonnes CO₂/yr.

As demonstrated above the development will reduce carbon emissions by 29.5% from the fabric energy efficiency measures described in the 'Be Lean' section and will reduce total carbon emissions by 39.6% over Building Regulations with the further inclusion of low and zero carbon technologies.

GLA's Energy Hierarchy – Regulated Carbon Emissions									
	Baseline:	Be Lean:	Be Clean:	Be Green:					
CO ₂ emissions (Tonnes CO ₂ /yr)	14.14	9.98	-	8.54					
CO ₂ emissions saving (Tonnes CO ₂ /yr)	-	4.17	-	1.43					
Saving from each stage (%)	-	29.5	-	10.1					
Total CO ₂ emissions saving (Tonnes CO ₂ /yr)		5.	60						

39.6% Total carbon emissions savings over Part L1A and 1B of the Building Regulations 2013 achieved

Appendix Energy Assessment 40-42 Mill Lane

Further Information:

As required by the GLA, 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 (Part L1B) – DER from the Part L1B Worksheets for Flats 1 to 5, TER from TER Worksheets for Flats 6 and 7.

Lean - DER from the Lean SAP DER Worksheets.

Green – DER from the Green SAP DER Worksheets (Flat 6 and 7).

Appendix Energy Assessment 40-42 Mill Lane

Baseline Scenario

			User D	etails:						
Assessor Name:	Chris Hockne			Strom					016363	
Software Name:	Stroma FSAF			Softwa				Versio	n: 1.0.4.10	
				Address	Unit 1-l	Part L1E	}			
Address:	Unit 1, 40-42 N	Mill Lane, Lon	don, NW	/6 1NR						
1. Overall dwelling dim	ensions:		۸۲۵	n/m²\		۸۰, ۵۰	iaht/m\		Volumo/m	3)
Ground floor			Area	72	(1a) x		ight(m) 75	(2a) =	Volume(m	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d	l)+(1e)+ (1r	n	72	(4)], ,	100	(\sage_3)
Dwelling volume		.,, (10)	·/	12)+(3c)+(3c	d)+(3e)+	.(3n) =	198	(5)
					() (, (55) (53	., ()		190	
2. Ventilation rate:	main	secondai	ry	other		total			m³ per hou	ır
Number of chimneys	heating 0	+ heating	7 + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	+ 0	╡╻┝	0	i - F	0	x	20 =	0	(6b)
Number of intermittent f	ans				,	2	x ·	10 =	20	(7a)
Number of passive vent	S				F	0	x	10 =	0	(7b)
Number of flueless gas					<u> </u>	0	x	40 =	0	(7c)
, and the second					L					`
								Air ch	nanges per h	our
Infiltration due to chimne	-					20		÷ (5) =	0.1	(8)
If a pressurisation test has		intended, procee	d to (17), (otherwise (continue fr	om (9) to	(16)			–
Number of storeys in Additional infiltration	the aweiling (ns)						[(0)	11/0 1 =	0	(9)
Structural infiltration:	0.25 for stool or tir	mbor framo or	. 0.35 fo	r macani	v constr	ruction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are					•	uction			0	(11)
deducting areas of open	nings); if equal user 0.3	35								
If suspended wooden	,	,	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e									0	(13)
Percentage of windov	vs and doors drau	ght stripped		0.25 - [0.2	(4.4) 4	001 -			0	(14)
Window infiltration				(8) + (10)	. ,	-	± (1E) =		0	(15)
Infiltration rate	aEO overegodi	in aubia matra						oroo	0	(16)
Air permeability value If based on air permeab	•		•	-	•	elle oi e	rivelope	alea	15	(17)
Air permeability value apple	-					is beina u	sed		0.85	(18)
Number of sides shelter			•	,	,	J			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor	•		(21) = (18) x (20) =				0.72	(21)
Infiltration rate modified	for monthly wind	speed								
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7	7							=	
(22)m= 5.1 5	·	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a\m = "	22\m ÷ 4	•							=	
Wind Factor (22a)m = $(22a)$ m = (1.27) 1.25	.	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
(220)1117 1.21 1.20	1.20 1.1	1.00 0.90	0.80	0.82	'	1.00	1.14	1.10	J	

Adjusted infiltra	ation rate	(allowir	ng for sh	ielter an	d wind s	peed) =	(21a) x	(22a)m					
0.92	0.9	0.89	0.8	0.78	0.69	0.69	0.67	0.72	0.78	0.81	0.85		
Calculate effect		_	ate for t	he appli	cable ca	se			-			0	(23a
If exhaust air he			ndix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , other	wise (23b) = (23a)			0	(23b
If balanced with	heat recove	ery: effici	ency in %	allowing f	or in-use f	actor (from	Table 4h) =				0	(230
a) If balance	d mechar	nical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	ı)m = (22	2b)m + (2	23b) × [1 – (23c)		
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a
b) If balance	d mechar	nical ve	ntilation	without	heat rec	overy (N	/IV) (24b)m = (22	2b)m + (2	23b)	•	•	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole he if (22b)n	ouse extra n < 0.5 × (.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)n	ventilatior n = 1, ther			•	•				0.5]		•		
(24d)m= 0.93	0.91	0.89	0.82	8.0	0.74	0.74	0.72	0.76	0.8	0.83	0.86		(24d
Effective air	change ra	ate - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.93	0.91	0.89	0.82	8.0	0.74	0.74	0.72	0.76	0.8	0.83	0.86		(25)
3. Heat losses	s and hea	at loss p	aramete	er:									
ELEMENT	Gross area (ı		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	〈)	k-value kJ/m²·l		A X k kJ/K
Doors					2	X	3	= [6				(26)
Windows Type	: 1				2.3	x1	/[1/(4.8)+	0.04] =	9.26				(27)
Windows Type	2				3.43	x1	/[1/(4.8)+	0.04] =	13.81				(27)
Floor					72	X	0.25	= [18				(28)
Walls Type1	48.2		17.23	3	30.97	×	0.3	= [9.29				(29)
Walls Type2	14.96		0		14.96	X	0.24	= [3.53				(29)
Walls Type3	9.9		2		7.9	X	0.27	= [2.1				(29)
Total area of e	lements,	m²			145.0	6							(31)
Party wall					40.96	X	0	= [0				(32)
Party ceiling					72								(32b
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
Fabric heat los	ss, W/K =	S (A x l	U)				(26) (30)	+ (32) =				108.	(33)
Heat capacity	Cm = S(A	xk)						((28)	(30) + (32	2) + (32a)	(32e) =	14109	.41 (34)
Thermal mass	paramete	er (TMP	' = Cm ÷	· TFA) ir	ı kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assess can be used instead	ad of a deta	iled calcu	ılation.			•	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridge	,	,		• .	•	(21.7	6 (36)
if details of therma Total fabric hea		re not kno	own (36) =	: 0.15 x (3	1)			(33) +	(36) =			130.)7 (37)
Ventilation hea	t loss cal	culated	monthly	/				(38)m	= 0.33 × (25)m x (5))		-
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

							1		
(38)m= 60.46 59.38 58.32 53.35 52.	42 48.1	48.1	47.3	49.76	52.42	54.31	56.27		(38)
Heat transfer coefficient, W/K					= (37) + (1			
(39)m= 190.52 189.45 188.39 183.42 182	2.49 178.16	178.16	177.36	179.83	182.49	184.37	186.34	100.10	7(20)
Heat loss parameter (HLP), W/m²K					Average = = (39)m ÷	Sum(39) ₁ (4)	12 /12=	183.42	(39)
(40)m= 2.65 2.63 2.62 2.55 2.8	53 2.47	2.47	2.46	2.5	2.53	2.56	2.59		_
Number of days in month (Table 1a)				1	Average =	Sum(40) ₁	12 /12=	2.55	(40)
	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	1 30	31	31	30	31	30	31		(41)
	Į.		l	l					
4. Water heating energy requirement:							kWh/ye	ar.	
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.0 if TFA £ 13.9, N = 1)00349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		.29		(42)
Annual average hot water usage in litres pe	er dav Vd.av	erage =	(25 x N)	+ 36		88	3.68		(43)
Reduce the annual average hot water usage by 5% if	the dwelling is	designed i			se target o				(-)
not more that 125 litres per person per day (all water u	<u> </u>	<u>, </u>					1		
Jan Feb Mar Apr M Hot water usage in litres per day for each month Vd,m	lay Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	<u> </u>	1	1	000	00.45	l 04	07.54		
(44)m= 97.54 94 90.45 86.9 83.	.35 79.81	79.81	83.35	86.9	90.45	94 m(44) _{1 12} =	97.54	1064.1	(44)
Energy content of hot water used - calculated monthly	r = 4.190 x Vd,r	m x nm x E	OTm / 3600			· /	L	1004.1	
(45)m= 144.65 126.51 130.55 113.82 109	0.21 94.24	87.33	100.21	101.41	118.18	129	140.09		
					Total = Su	m(45) _{1 12} =	•	1395.2	(45)
If instantaneous water heating at point of use (no hot	water storage),	enter 0 in	boxes (46) to (61)					
(46)m= 21.7 18.98 19.58 17.07 16. Water storage loss:	.38 14.14	13.1	15.03	15.21	17.73	19.35	21.01		(46)
Storage volume (litres) including any solar	or WWHRS	storage	within sa	ame ves	sel		0		(47)
If community heating and no tank in dwellin		_							, ,
Otherwise if no stored hot water (this include	-		. ,	ers) ente	er '0' in (47)			
Water storage loss:		<i>(</i>)					1		
a) If manufacturer's declared loss factor is	known (kvvi	n/day):					0		(48)
Temperature factor from Table 2b			(40) v (40	\ _			0		(49)
Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss	factor is not		(48) x (49	, –			0		(50)
Hot water storage loss factor from Table 2							0		(51)
If community heating see section 4.3									
Volume factor from Table 2a Temperature factor from Table 2b							0		(52)
·			/47\ v /E1	\ v (E 2) v (E2) -		0		(53)
Energy lost from water storage, kWh/year Enter (50) or (54) in (55)			(47) X (51) x (52) x (55) =	-	0		(54) (55)
Water storage loss calculated for each mor	nth		((56)m = (55) × (41)	m		~		(00)
) 0	0	0	0	0	0	0		(56)
If cylinder contains dedicated solar storage, (57)m = (50)m =			-	-				хH	. /
(57)m= 0 0 0 0 0	0	0	0	0	0	0	0		(57)
· · · · · · · · · · · · · · · · · · ·	•	•			•				

Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	(58)								
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	, , , , , , , , , , , , , , , , , , , 	1							
(59)m= 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= 49.71 43.26 46.09 42.86 42.48 39.36 40.67 42.48 42.86 46.09	46.35 49.71	(61)							
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	· (46)m + (57)m +	(59)m + (61)m							
(62)m= 194.36 169.78 176.64 156.67 151.69 133.6 128 142.69 144.26 164.27	175.36 189.8	(62)							
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)m= 0 0 0 0 0 0 0 0 0 0	0 0	(63)							
Output from water heater		•							
(64)m= 194.36 169.78 176.64 156.67 151.69 133.6 128 142.69 144.26 164.27	175.36 189.8								
Output from water heat	er (annual) _{1 12}	1927.11 (64)							
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m	n + (57)m + (59)m]							
(65)m= 60.52 52.88 54.93 48.56 46.93 41.17 39.2 43.94 44.43 50.82	54.48 59.01	(65)							
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community h	neating							
5. Internal gains (see Table 5 and 5a):	, ,	Jan							
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec								
(66)m= 114.68 114.68 114.68 114.68 114.68 114.68 114.68 114.68 114.68 114.68	+	(66)							
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	1	` ′							
(67)m= 30.6 27.18 22.1 16.73 12.51 10.56 11.41 14.83 19.91 25.28	29.5 31.45	(67)							
	20.0 01.40	(01)							
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 201.92 204.01 198.73 187.49 173.3 159.97 151.06 148.96 154.24 165.48	179.67 193.01	(68)							
	179.67 193.01	(00)							
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	T T	1 (00)							
(69)m= 34.47 34.47 34.47 34.47 34.47 34.47 34.47 34.47 34.47 34.47 34.47 34.47	34.47 34.47	(69)							
Pumps and fans gains (Table 5a)		1							
(70)m= 10 10 10 10 10 10 10 10 10 10 10	10 10	(70)							
Losses e.g. evaporation (negative values) (Table 5)		•							
(71)m= -91.75 -91.75 -91.75 -91.75 -91.75 -91.75 -91.75 -91.75 -91.75	-91.75 -91.75	(71)							
Water heating gains (Table 5)		_							
(72)m= 81.35 78.69 73.83 67.44 63.08 57.19 52.69 59.06 61.71 68.3	75.67 79.31	(72)							
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (69)m + (60)m + (60)m$	71)m + (72)m								
(73)m= 381.28 377.29 362.08 339.08 316.3 295.12 282.57 290.26 303.27 326.47	352.25 371.18	(73)							
6. Solar gains:									
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations are calculated using the following the following the flux flux flux flux flux flux flux flux	ble orientation.								
Orientation: Access Factor Area Flux g_ Table 6d m² Table 6a Table 6b	FF Fable 6c	Gains (W)							
Northeast 0.9x 0.77 x 3.43 x 11.28 x 0.85 x	0.7	15.96 (75)							
Northeast 0.9x	0.7 =	32.48 (75)							
	<u> </u>	32.10							

Northagat a a F		_			_		7				_		— ,,
Northeast _{0.9x}	0.77	X	3.4	.3	* <u> </u>	41.38	X	0.85	X	0.7	=	58.52	(75)
Northeast _{0.9x}	0.77	X	3.4	-3	×	67.96	X	0.85	X	0.7	=	96.11	(75)
Northeast _{0.9x}	0.77	X	3.4	.3	x	91.35	X	0.85	X	0.7	=	129.19	(75)
Northeast _{0.9x}	0.77	X	3.4	-3	x	97.38	X	0.85	X	0.7	=	137.73	(75)
Northeast _{0.9x}	0.77	X	3.4	-3	x	91.1	X	0.85	X	0.7	=	128.85	(75)
Northeast _{0.9x}	0.77	X	3.4	-3	x	72.63	X	0.85	X	0.7	=	102.72	(75)
Northeast 0.9x	0.77	X	3.4	-3	x	50.42	X	0.85	X	0.7	=	71.31	(75)
Northeast _{0.9x}	0.77	X	3.4	-3	X	28.07	X	0.85	X	0.7	=	39.7	(75)
Northeast _{0.9x}	0.77	X	3.4	-3	x	14.2	X	0.85	X	0.7	=	20.08	(75)
Northeast 0.9x	0.77	X	3.4	-3	x	9.21	X	0.85	X	0.7	=	13.03	(75)
Northwest 0.9x	0.77	X	2.3	3	x	11.28	X	0.85	X	0.7	=	64.2	(81)
Northwest 0.9x	0.77	X	2.3	3	x	22.97	X	0.85	X	0.7	=	130.69	(81)
Northwest 0.9x	0.77	X	2.3	3	x	41.38	x	0.85	X	0.7	=	235.45	(81)
Northwest 0.9x	0.77	x	2.3	3	x	67.96	X	0.85	x	0.7	=	386.68	(81)
Northwest 0.9x	0.77	x	2.3	3	x =	91.35	X	0.85	x	0.7	<u> </u>	519.78	(81)
Northwest 0.9x	0.77	x	2.3	3	x $\overline{\Box}$	97.38	X	0.85	x	0.7	=	554.14	(81)
Northwest 0.9x	0.77	x	2.3	3	x 🔚	91.1	X	0.85	x	0.7	=	518.39	(81)
Northwest _{0.9x}	0.77	x	2.3	3	x \square	72.63	X	0.85	x	0.7	=	413.26	(81)
Northwest 0.9x	0.77	×	2.3	3	x 🗀	50.42	X	0.85	x	0.7	-	286.9	(81)
Northwest 0.9x	0.77	x	2.3	3	x 🗀	28.07	X	0.85	x	0.7		159.71	(81)
Northwest 0.9x	0.77	x	2.3	3	x 🗀	14.2	X	0.85	x	0.7		80.78	(81)
Northwest 0.9x	0.77	x	2.3		x \vdash	9.21	X	0.85	x	0.7		52.43	(81)
_					<u> </u>		_						
Solar gains in	watts, cal	culated	for each	n month			(83)m	n = Sum(74)r	m (82)m	1			
(83)m= 80.16	163.17	293.98	482.79	648.97	691.8	647.23	515	.98 358.2	2 199.	4 100.86	65.46		(83)
Total gains – i	nternal an	id solar	(84)m =	(73)m ·	+ (83)	m , watts			-	-			
(84)m= 461.44	540.46	656.05	821.87	965.27	986.9	929.8	806	.24 661.4	8 525.8	453.11	436.64		(84)
7. Mean inter	nal tempe	erature ((heating	season)								
Temperature	during he	ating p	eriods ir	the livii	ng are	a from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisation fac	ctor for gai	ins for li	iving are	ea, h1,m	(see	Table 9a)							_
Jan	Feb	Mar	Apr	May	Ju	n Jul	Α	ug Ser	o Oc	t Nov	Dec		
(86)m= 1	0.99	0.99	0.96	0.9	0.79	0.68	0.7	75 0.91	0.98	0.99	1		(86)
Mean interna	l temperat	ture in I	iving are	ea T1 (fo	ollow	steps 3 to	7 in T	able 9c)		•		•	
(87)m= 18.21	18.42	18.85	19.51	20.14	20.6	_ i	20.		19.5	6 18.81	18.21]	(87)
	<u> </u>	!	orioda :-	root of	ducli	ing from T					!	J	
Temperature (88)m= 18.94	18.95	18.95	18.99	1 rest of	19.0	-	19.		<u> </u>	18.99	18.97	1	(88)
	<u> </u>	<u> </u>				<u> </u>		19.02	- 19	10.55	10.81	I	(50)
Utilisation fac						<u>` </u>	T	- <u> </u>	1	.	1 .	1	(00)
(89)m= 0.99	0.99	0.98	0.94	0.84	0.6	0.44	0.5	52 0.84	0.97	0.99	1		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m= 16.55	16.76	17.2	17.87	18.46	18.8	8 19.01	18.	99 18.67		ļ	16.57		(90)
									fLA = L	iving area ÷ ((4) =	0.34	(91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 17.11 17.32 17.75 18.42 19.02 19.47 19.62 19.59 19.23 18.48 17.72 17.13	
(92)11- 17.11 17.32 17.73 16.42 19.02 19.47 19.02 19.39 19.23 16.40 17.72 17.11	(92)
Apply adjustment to the mean internal temperature from Table 4a, where appropriate	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 17.11 17.32 17.75 18.42 19.02 19.47 19.62 19.59 19.23 18.48 17.72 17.13	(93)
8. Space heating requirement	(00)
	alculato
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-c the utilisation factor for gains using Table 9a	diculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	
Utilisation factor for gains, hm:	
(94)m= 0.99 0.99 0.97 0.93 0.84 0.69 0.52 0.6 0.85 0.96 0.99 0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 457.59 533.24 638.25 766.74 815.18 682.95 484.5 484.34 561.25 506.03 447.38 433.5	8 (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= 2439.8 2352.41 2120.16 1746.64 1336.46 867.2 538.1 565.86 922.76 1437.86 1958.76 2408.	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	_
(98)m= 1474.77 1222.48 1102.54 705.53 387.83 0 0 0 0 693.28 1088.19 1469.	4
Total per year (kWh/year) = Sum(98) _{15,912}	= 8143.76 (98)
Space heating requirement in kWh/m²/year	113.11 (99)
<u> </u>	, ,
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) =	
· · · · · · · · · · · · · · · · · · ·	
3	1 (204)
Efficiency of main space heating system 1	88.8 (206)
Efficiency of secondary/supplementary heating system, %	0 (208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	kWh/year
Space heating requirement (calculated above)	_
1474.77 1222.48 1102.54 705.53 387.83 0 0 0 0 693.28 1088.19 1469.	4
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	
1660.77 1376.66 1241.6 794.52 436.75 0 0 0 780.72 1225.44 1654.	14
Total (kWh/year) =Sum(211) _{15,10. 12} =	9170.9 (211)
Space heating fuel (secondary), kWh/month	
$= \{[(98)m \times (201)]\} \times 100 \div (208)$	\neg
$ = \{ [(98)m \times (201)] \} \times 100 \div (208) $ $ (215)m = $	
	0 (215)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Total (kWh/year) =Sum(215) _{15,10. 12} =	0 (215)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	0 (215)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	79.5 (216)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	79.5 (216)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	79.5 (216)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	79.5 (216)

Annual totals Space heating fuel used, main system 1				ar	kWh/year 9170.9]			
Water heating fuel used					2270.93				
Electricity for pumps, fans and electric keep-hot									
central heating pump:				120]	(230c)			
Total electricity for the above, kWh/year	sum of	f (230a)	(230g) =		120	(231)			
Electricity for lighting					540.44	(232)			
12a. CO2 emissions – Individual heating systems including micro-CHP									
	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year				
Space heating (main system 1)	(211) x		0.216	=	1980.91	(261)			
Space heating (secondary)	(215) x		0.519	=	0	(263)			
Water heating	(219) x		0.216	=	490.52	(264)			
Space and water heating	(261) + (262) + (263) + (26	64) =			2471.44	(265)			
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	62.28	(267)			
Electricity for lighting	(232) x		0.519	=	280.49	(268)			
Total CO2, kg/year		sum o	f (265) (271) =		2814.21	(272)			
Dwelling CO2 Emission Rate		(272)	÷ (4) =		39.09	(273)			

El rating (section 14)

(274)

			User D	etaile: -						
Assessor Name:	Chris Hocknell			Strom	a Num	hor:		STDC	0016363	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.10	
				Address			3			
Address :	Unit 2, 40-42 Mill L		i i							
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			3	8.56	(1a) x	2	2.75	(2a) =	106.04	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1n	1) 3	8.56	(4)			-		
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	106.04	(5)
2. Ventilation rate:										
		secondar heating	у	other		total			m³ per hou	ır
Number of chimneys		0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0		0	i = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans					2	x	10 =	20	(7a)
					Ļ			10 =		=
Number of passive vents					Ļ	0			0	(7b)
Number of flueless gas f	ires					0	X 4	40 =	0	(7c)
								Air cl	hanges per ho	our
Infiltration due to chimne	ove fluge and fanc = ((6a)+(6b)+(7	'a)+(7h)+(7c) =	Г					(8)
If a pressurisation test has					continue fr	20 rom (9) to		÷ (5) =	0.19	(0)
Number of storeys in t		ασα, μ.σσσσ	<i>z</i> (0 (17), (o (o) to	(1.0)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (0.25 for steel or timber	r frame or	0.35 for	r masonr	y constr	uction			0	(11)
	present, use the value corre	esponding to	the great	er wall are	a (after					
deducting areas of open If suspended wooden	•	alad) or 0	1 (coalc	nd) also	ontor O					7(40)
If no draught lobby, er	•	,	i (Scale	u), eise	enter o				0	(12)
Percentage of window									0	(14)
Window infiltration	o una acoro araagini (stripped		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	- 12) + (13) ·	+ (15) =		0	(16)
Air permeability value	g50, expressed in cu	ıbic metre	s per ho	our per s	guare m	etre of e	envelope	area	15	(17)
If based on air permeab	• •		•	•	•		'		0.94	(18)
Air permeability value appli	es if a pressurisation test h	as been don	e or a deg	gree air pe	rmeability	is being u	sed			
Number of sides shelter	ed								3	(19)
Shelter factor				(20) = 1 -		19)] =			0.78	(20)
Infiltration rate incorpora	_			(21) = (18) x (20) =				0.73	(21)
Infiltration rate modified	 	1		1					7	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7								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	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	1	
` '				L					J	

Adjusted infiltr	ation rat	e (allowi	na for st	nelter an	d wind s	:need) =	(21a) x	(22a)m					
0.93	0.91	0.89	0.8	0.78	0.69	0.69	0.67	0.73	0.78	0.82	0.85	1	
Calculate effe	ctive air	change i	rate for t	he appli	cable ca	se		<u> </u>					
If mechanica												0	(23a)
If exhaust air h		0		, ,	,	. ,	,, .	,) = (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 he	at recove	ery (MVI	HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c) ÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance		_				- 	ЛV) (24b)m = (22	2b)m + (23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)r		tract ven (23b), t		•	•				.5 × (23b))			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r		on or when (24d)		•	•				0.5]		•	-	
(24d)m= 0.93	0.91	0.9	0.82	0.81	0.74	0.74	0.73	0.76	0.81	0.83	0.87		(24d)
Effective air	change	rate - er	iter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)			-	_	
(25)m= 0.93	0.91	0.9	0.82	0.81	0.74	0.74	0.73	0.76	0.81	0.83	0.87		(25)
3. Heat losse	s and he	eat loss r	naramet	⊃r.								_	
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	ue	AXU		k-valu	e A	Xk
	area		m		A ,r		W/m2	!K	(W/		kJ/m²·		J/K
Doors					2	X	3	=	6				(26)
Windows					3.43	x1.	/[1/(4.8)+	0.04] =	13.81				(27)
Floor					38.56	3 x	0.25	=	9.64				(28)
Walls Type1	16.5	51	3.43		13.08	3 x	0.3	=	3.92				(29)
Walls Type2	3.9	5	2		1.95	x	0.27	<u> </u>	0.52				(29)
Total area of e	elements	, m²			59.02	2							(31)
Party wall					57.49) x	0	=	0				(32)
Party ceiling					38.56	<u></u>						-	(32b)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapi	h 3.2	
Fabric heat los	ss, W/K	= S (A x	U)				(26) (30)) + (32) =				33.89	(33)
Heat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	8050.62	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix l	<						8.85	(36)
if details of therma		are not kn	own (36) =	= 0.15 x (3	1)								_
Total fabric he								. ,	(36) =			42.75	(37)
Ventilation hea	i								= 0.33 × (1	٦	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m= 32.55	31.96	31.39	28.7	28.2	25.85	25.85	25.42	26.75	28.2	29.21	30.28		(38)
Heat transfer of		·							= (37) + (· ·		7	
(39)m= 75.29	74.71	74.14	71.45	70.94	68.6	68.6	68.17	69.5	70.94	71.96	73.03		
									Average =	Sum(39) ₁	12 /12=	71.44	(39)

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.95	1.94	1.92	1.85	1.84	1.78	1.78	1.77	1.8	1.84	1.87	1.89		
L						ı	ı	,	Average =	Sum(40) ₁	₁₂ /12=	1.85	(40)
Number of day	1	nth (Tab	le 1a)	1	ı			ı	1				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(4.4)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
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.		37		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		5.7		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 73.37	70.71	68.04	65.37	62.7	60.03	60.03	62.7	65.37	68.04	70.71	73.37		
									Total = Su	m(44) _{1 12} =		800.45	(44)
Energy content of	hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 108.81	95.17	98.21	85.62	82.15	70.89	65.69	75.38	76.28	88.9	97.04	105.38		_
If instantaneous w	vater heati	ina at noint	of use (no	n hot water	r etoraga)	enter () in	hoves (16		Total = Su	m(45) _{1 12} =	- [1049.52	(45)
			,				· · ·	, , , I	10.00	14.50	45.04		(46)
(46)m= 16.32 Water storage	14.28 loss:	14.73	12.84	12.32	10.63	9.85	11.31	11.44	13.33	14.56	15.81		(46)
Storage volum) includir	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	velling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufact				or is kno	wn (kWl	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufactHot water store			-								0		(51)
If community h	_			(- 7 /					<u> </u>		(0.7)
Volume factor	from Ta	ble 2a									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 1	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	ed solar sto	rage, (57)	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	= 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	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)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m														
Combi loss calculated for each month (61) $m = (60) \div 365 \times (41)m$ (61) $m = 37.39$ 32.54 34.67 32.24 31.95 29.61 30.59 31.95 32.24 34.67 34.87 37.39 (61)											(61)			
` ′	!		<u> </u>	<u> </u>		_!	<u> </u>			<u> </u>	<u> </u>		<u> </u>	(01)
	-i		~~				`	_		` 	ì ´	`´	(59)m + (61)m 1	(00)
(62)m= 146.		132.88	117.86	114.1	100.5		107		108.52	123.57	131.91	142.77		(62)
Solar DHW inp										r contribu	tion to wate	er heating)		
(add additio		1					i					Ι ,	1	(63)
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	J	(03)
Output from			147.00		100 5	1 00 00	1.0-		100 50	100.57	1 404 04	140.77	1	
(64)m= 146.	2 127.71	132.88	117.86	114.1	100.5	96.28	107		108.52	123.57	131.91	142.77	1110.01	(64)
						_					er (annual) ₁		1449.64	J ⁽⁰⁴⁾
Heat gains							`			- 	- ` 	``	1] 1	(05)
(65)m= 45.5	-	41.32	36.53	35.3	30.97	<u> </u>	33.		33.42	38.23	40.98	44.39		(65)
include (5	7)m in cal	culation (of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):										
Metab <u>olic g</u>	ains (Table	5), Wat	ts			_								
Ja	n Feb	Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m= 68.4	3 68.43	68.43	68.43	68.43	68.43	68.43	68.	43	68.43	68.43	68.43	68.43		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5					
(67)m= 20.6	4 18.33	14.91	11.28	8.44	7.12	7.69	10	0	13.42	17.05	19.89	21.21]	(67)
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a),	also	see Ta	ble 5		-	-	
(68)m= 117.	93 119.15	116.07	109.5	101.22	93.43	88.23	8	7	90.09	96.65	104.94	112.73]	(68)
Cooking ga	ns (calcula	ated in A	ppendix	L, equat	ion L1	5 or L15a), als	o se	e Table	5	•	•	•	
(69)m= 29.8	4 29.84	29.84	29.84	29.84	29.84	29.84	29.	84	29.84	29.84	29.84	29.84]	(69)
Pumps and	fans gains	(Table 5	5a)			•					•	•	•	
(70)m= 10	$\overline{}$	10	10	10	10	10	10	0	10	10	10	10	1	(70)
Losses e.g.	evaporation	n (nega	tive valu	es) (Tab	le 5)		!				<u>.</u>			
(71)m= -54.7		-54.74	-54.74	-54.74	-54.74	-54.74	-54	.74	-54.74	-54.74	-54.74	-54.74]	(71)
Water heati	ng gains (1	rable 5)	ļ	<u> </u>						<u> </u>			J	
(72)m= 61.1	-,	55.54	50.73	47.45	43.02	39.64	44.	43	46.42	51.38	56.92	59.66]	(72)
Total interr						6)m + (67)n	<u> </u>				l	l)m	J	
(73)m= 253.	`	240.04	225.05	210.63	197.1		194	_	203.46	218.61	235.28	247.12	1	(73)
6. Solar ga														
Solar gains a		using sola	r flux from	Table 6a	and asso	ociated equa	ations	to co	nvert to th	e applica	ble orientat	tion.		
Orientation:	Orientation: Access Factor Area Flux g_ FF Gains													
Table 6d m ² Table 6a Table 6b Table 6c (W)														
Northeast 0.9	0.77	x	3.4	13	х	11.28	x		0.85	x [0.7		15.96	(75)
Northeast 0.9			3.4	13	x	22.97	X		0.85	x	0.7	=	32.48	(75)
Northeast 0.9			3.4		x	41.38) x		0.85	= x	0.7	= =	58.52	(75)
Northeast 0.9			3.4		x	67.96]] x		0.85	x	0.7		96.11] (75)
Northeast 0.9		_			x	91.35]] x		0.85	_ x [0.7	= =	129.19	(75)
310	0.77					250	1		0.00		<u> </u>		120.70	J ` -/

Northeast _{0.9x}	0.77	X	3.4	3	X	97.38] x [0.85	X	0.7	=	137.73	(75)
Northeast _{0.9x}	0.77	x	3.4	3	x	91.1] x [0.85	x	0.7	=	128.85	(75)
Northeast _{0.9x}	0.77	X	3.4	13	x	72.63] x [0.85	x	0.7	=	102.72	(75)
Northeast _{0.9x}	0.77	X	3.4	13	X .	50.42] x [0.85	x	0.7	=	71.31	(75)
Northeast _{0.9x}	0.77	Х	3.4	3	x	28.07	x	0.85	х	0.7	=	39.7	(75)
Northeast _{0.9x}	0.77	X	3.4	3	x	14.2	x	0.85	x	0.7	=	20.08	(75)
Northeast 0.9x	0.77	х	3.4	13	x	9.21	i x i	0.85	x [0.7	=	13.03	(75)
Solar gains in	watts, ca	alculated	for eacl	h month			(83)m	= Sum(74)m	(82)m				
(83)m= 15.96	32.48	58.52	96.11	129.19	137.73	128.85	102.	72 71.31	39.7	20.08	13.03		(83)
Total gains –	internal a	nd solar	(84)m =	(73)m	+ (83)m	, watts						•	
(84)m= 269.25	282.69	298.57	321.16	339.82	334.83	317.93	297.0	67 274.77	258.3	255.36	260.16		(84)
7. Mean inte	rnal temp	erature	(heating	season)								
Temperature	during h	eating p	eriods ir	n the livii	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see Ta	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.99	0.98	0.95	0.87	0.76	0.8	0.94	0.98	0.99	1		(86)
Mean interna	al temper	ature in	living ar	22 T1 (fc	llow etc	ne 3 to 3	7 in T:	ahla Oc)					
(87)m= 18.9	19.04	19.34	19.81	20.27	20.68	20.87	20.8		19.95	19.39	18.92		(87)
	ļ				<u> </u>			<u>l</u>					, ,
Temperature	19.38	19.39	eriods ir		19.48	1	1		T 10 11	19.42	19.41	Ī	(88)
(88)m= 19.37	19.36	19.39	19.43	19.44	19.40	19.48	19.4	9 19.47	19.44	19.42	19.41		(00)
Utilisation fa	T				h2,m (s	ee Table	9a)			T	1	Ī	
(89)m= 0.99	0.99	0.99	0.97	0.92	0.78	0.57	0.63	0.88	0.97	0.99	0.99		(89)
Mean interna	al temper	ature in	the rest	of dwelli	ng T2 (1	follow ste	eps 3	to 7 in Tal	ole 9c)	_			
(90)m= 17.52	17.67	17.97	18.48	18.93	19.33	19.45	19.4	4 19.18	18.63	18.06	17.58		(90)
									fLA = Livi	ng area ÷ (4) =	0.69	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) = 1	LA × T1	+ (1 -	- fLA) × T2	2				
(92)m= 18.47	18.61	18.91	19.4	19.85	20.26	20.43	20.4		19.54	18.98	18.51		(92)
Apply adjust	ment to the	he mear	internal	temper	ature fro	m Table	4e, v	vhere app	ropriate	•	•		
(93)m= 18.47	18.61	18.91	19.4	19.85	20.26	20.43	20.4	20.1	19.54	18.98	18.51		(93)
8. Space hea	ating requ	uirement											
Set Ti to the					ned at st	ep 11 of	Table	9b, so th	at Ti,m=	(76)m an	d re-calc	culate	
the utilisation	1				l .	·	Ι.		Τ	1		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
Utilisation fa	0.99	0.99	0.97	0.93	0.84	0.7	0.75	5 0.91	0.97	0.99	0.99		(94)
Useful gains					0.04	0.7	0.73	0.91	0.91	0.99	0.99		(04)
(95)m= 267.3	280.07	294.18	311.51	316.08	280.11	223.41	222.	75 249.95	251.69	252.68	258.53		(95)
Monthly ave						1		1 - 10100	1 -000	1 ===:==			, ,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	1 14.1	10.6	7.1	4.2		(96)
Heat loss rat						=[(39)m			1]	1	I	I	
	1024.38	920.26	750.11	578.5	388.21	262.65	272.9		-	854.68	1044.7		(97)
Space heating	ng require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (9	5)m] x (4	1)m			
(98)m= 594.94	500.17	465.8	315.79	195.24	0	0	0	0	284.69	433.44	584.91		
												-	

			Tota	per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3375	(98)
Space heating requirement in kWh/m²/year								87.53	(99)
9a. Energy requirements – Individual heating sys	tems in	ncluding	micro-C	HP)					
Space heating:									_
Fraction of space heat from secondary/supplement	entary	-	(000)	(004)				0	(201)
Fraction of space heat from main system(s)			(202) = 1 -	, ,	(000)1			1	(202)
Fraction of total heating from main system 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1		0.4						88.8	(206)
Efficiency of secondary/supplementary heating s	system,					ī	ı	0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above) 594.94 500.17 465.8 315.79 195.24	0	0	0	0	284.69	433.44	584.91		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$					204.00	100.11	004.01		(211)
669.98 563.26 524.55 355.62 219.86	0	0	0	0	320.6	488.11	658.69		(211)
			Tota	l (kWh/yea	ar) =Sum(2	211) _{15,10. 12}	<u> </u>	3800.67	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)								<u>.</u>	
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		_
			Tota	l (kWh/yea	ar) =Sum(2	215) _{15,10. 12}	=	0	(215)
Water heating									
Output from water heater (calculated above) 146.2 127.71 132.88 117.86 114.1	100.5	96.28	107.33	108.52	123.57	131.91	142.77		
Efficiency of water heater							l	79.5	(216)
(217)m= 86.8 86.74 86.55 86.06 85.13	79.5	79.5	79.5	79.5	85.76	86.44	86.81		(217)
Fuel for water heating, kWh/month	•	•				•	•	•	
(219) m = (64) m x $100 \div (217)$ m (219)m= 168.44 147.24 153.52 136.94 134.04 1	126.41	121.11	135.01	136.5	144.08	152.6	164.47]	
(219)111- 100.44 147.24 133.32 130.94 134.04 1	120.41	121.11		I = Sum(2		132.0	104.47	1720.38	(219)
Annual totals				`		Wh/yeaı	•	kWh/yeaı	」 ` ′
Space heating fuel used, main system 1						, , ,		3800.67	
Water heating fuel used								1720.38	Ī
Electricity for pumps, fans and electric keep-hot									
central heating pump:							120		(230c)
Total electricity for the above, kWh/year			sum	of (230a)	(230g) =			120	(231)
Electricity for lighting								364.43	(232)
12a. CO2 emissions – Individual heating system	ns inclu	ding mid	cro-CHP						
		ergy h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211)) x			0.2	16	=	820.95	(261)
Space heating (secondary)	(215)) x			0.5		=	0	(263)
, ,									

Water heating	(219) x	0.216	371.6	(264)
Space and water heating	(261) + (262) + (263) + (264) =		1192.55	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	62.28	(267)
Electricity for lighting	(232) x	0.519	189.14	(268)
Total CO2, kg/year	sum	of (265) (271) =	1443.96	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =	37.45	(273)
El rating (section 14)			77	(274)

			User D	etails: -						
Assessor Name:	Chris Hocknell			Strom	a Num	hor:		STDC	0016363	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.10	
				Address			3			
Address :	Unit 3, 40-42 Mill L		i i							
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			6	6.43	(1a) x	2	.75	(2a) =	182.68	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1n	1) 6	6.43	(4)			_		<u> </u>
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	182.68	(5)
2. Ventilation rate:										
		secondar heating	у	other		total			m³ per hou	r
Number of chimneys		0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0		0] = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans					2	x	10 =	20	(7a)
					Ļ			10 =		=
Number of passive vents					Ļ	0			0	(7b)
Number of flueless gas f	ires					0	X 4	40 =	0	(7c)
								Air cl	hanges per ho	our
Infiltration due to chimne	ove fluge and fanc = ((6a)+(6b)+(7	'a)+(7h)+(7c) =	Г					(8)
If a pressurisation test has					ontinue fr	20 rom (9) to		÷ (5) =	0.11	(0)
Number of storeys in t		ασα, μ.σσσσ	<i>z</i> (0 (17), (o (o) to	(1.0)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (0.25 for steel or timber	r frame or	0.35 for	masonr	y constr	uction			0	(11)
	present, use the value corre	esponding to	the great	er wall are	a (after					_
deducting areas of open If suspended wooden	•	aled) or 0	1 (coalc	ud) alsa	antar N					7(12)
If no draught lobby, er	,	,	i (Scale	iu), eise	CIIICI U				0	(12)
Percentage of window									0	(14)
Window infiltration	o and acord araagine	ou ippou		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, expressed in cu	ıbic metre	s per ho	our per so	guare m	etre of e	envelope	area	15	(17)
If based on air permeab	lity value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)		•		0.86	(18)
Air permeability value appli	es if a pressurisation test h	as been don	e or a deg	gree air pe	meability	is being u	sed			_
Number of sides shelter	ed								2	(19)
Shelter factor				(20) = 1 -	· ·	19)] =			0.85	(20)
Infiltration rate incorpora	•			(21) = (18)	x (20) =				0.73	(21)
Infiltration rate modified	 	1							7	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7								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	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	1	
` '									_	

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.93 0.91 0.89 0.8 0.79 0.69 0.69 0.68 0.73 0.79 0.82 0.86	
Calculate effective air change rate for the applicable case	
If mechanical ventilation:	0 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (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) \times [1 - (23c) - (24a)m = 0 $	÷ 100] (24a)
	(240)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)	(24b)
(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24b)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)	
(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0	(24c)
d) If natural ventilation or whole house positive input ventilation from loft	
if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$	
(24d)m= 0.93 0.92 0.9 0.82 0.81 0.74 0.74 0.73 0.77 0.81 0.84 0.87	(24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	
(25)m= 0.93 0.92 0.9 0.82 0.81 0.74 0.74 0.73 0.77 0.81 0.84 0.87	(25)
3. Heat losses and heat loss parameter:	
ELEMENT Gross Openings Net Area U-value A X U k-value area (m²) m² A ,m² W/m2K (W/K) kJ/m²·K	A X k kJ/K
Doors 2 x 3 = 6	(26)
Windows Type 1 $3.43 \times 1/[1/(4.8) + 0.04] = 13.81$	(27)
Windows Type 2 $2.38 \times 1/[1/(4.8) + 0.04] = 9.58$	(27)
Windows Type 3 $5 \times 1/[1/(4.8) + 0.04] = 20.13$	(27)
Windows Type 4	(27)
Windows Type 5	(27)
Floor 66.43 x 0.25 = 16.6075	(28)
Walls Type1 48.84 12.16 36.68 x 0.3 = 11	(29)
Walls Type2 20.68 1.26 19.42 x 0.28 = 5.44	(29)
	(20)
Walls Lyne3 46.06 2 44.06 y 0.27 - 2.05	
Walls Type3 16.86 2 14.86 x 0.27 = 3.95	(29)
Roof 23.24 0 23.24 × 0.18 = 4.18	(30)
Roof 23.24 0 23.24 x 0.18 = 4.18 Total area of elements, m ² 176.05	(30)
Roof 23.24 0 23.24 × 0.18 = 4.18 Total area of elements, m ² 176.05 Party wall 37.33 × 0 = 0	(30) (31) (32)
Roof 23.24 0 23.24 x 0.18 = 4.18 Total area of elements, m² 176.05 Party wall 37.33 x 0 = 0 Party ceiling 43.2 — — —	(30) (31) (32) (32b)
Roof 23.24 0 23.24 x 0.18 = 4.18 Total area of elements, m² 176.05 Party wall 37.33 x 0 = 0 Party ceiling 43.2	(30) (31) (32) (32b)
Roof 23.24 0 23.24 × 0.18 = 4.18 Total area of elements, m² 176.05 Party wall 37.33 × 0 = 0 Party ceiling * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3** include the areas on both sides of internal walls and partitions	(30) (31) (32) (32b) 3.2
Roof 23.24 0 23.24 × 0.18 = 4.18 Total area of elements, m² 176.05 Party wall 37.33 × 0 = 0 Party ceiling 43.2 * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) =	(30) (31) (32) (32b) 3.2 (32b)
Roof 23.24 0 23.24 × 0.18 = 4.18 Total area of elements, m² 176.05 Party wall 37.33 × 0 = 0 Party ceiling 43.2 * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3** include the areas on both sides of internal walls and partitions	(30) (31) (32) (32b) 3.2

can ha i	used insta	ad of a do	tailed calc	ulation										
can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K													26.41	(36)
	•	•	are not kn		• •	•	•						20.41	(00)
	abric hea			, ,	,	,			(33) +	(36) =			124.67	(37)
Ventila	ition hea	it 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=	56.29	55.28	54.28	49.61	48.73	44.66	44.66	43.91	46.23	48.73	50.5	52.35]	(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	180.97	179.95	178.95	174.28	173.4	169.33	169.33	168.58	170.9	173.4	175.17	177.02		
Heat lo	oss para	meter (F	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) ₁ (4)	12 /12=	174.27	(39)
(40)m=	2.72	2.71	2.69	2.62	2.61	2.55	2.55	2.54	2.57	2.61	2.64	2.66		
Numbe	er of day	s in mor	nth (Tab	le 1a)						Average =	Sum(40) ₁	12 /12=	2.62	(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	ing ener	rgy requi	rement:								kWh/y	ear:	
	ied occu A > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		16]	(42)
Annua		e hot wa						(25 x N)				5.42	1	(43)
		_	hot water person per			_	_	to achieve	a water us	se target o	f		_	
		Feb	Mar		<u> </u>	Jun	Jul	1 1	Con	Oct	Nov	Dec	1	
Hot wate	Jan er usage ir		day for ea	Apr ach month	May Vd,m = fa			Aug (43)	Sep	Oct	INOV	Dec	J	
(44)m=	93.96	90.54	87.12	83.71	80.29	76.87	76.87	80.29	83.71	87.12	90.54	93.96	1	
,			<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u>I</u> Total = Su	<u>l</u> m(44) _{1 12} =	! =	1024.98	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600						
(45)m=	139.34	121.86	125.75	109.63	105.2	90.78	84.12	96.53	97.68	113.84	124.26	134.94		
lf inatan	tanaaa	atar baatin	na at naint	of was (no	bat watar	r otorogol	antar O in	haves (46		Total = Su	m(45) _{1 12} =	=	1343.92	(45)
								boxes (46)		17.00	1004		7	(40)
(46)m= Water	20.9 storage	18.28 loss:	18.86	16.45	15.78	13.62	12.62	14.48	14.65	17.08	18.64	20.24]	(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)					-	
Otherv	vise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage			64	!	(1.) \ / /	- /-l · · \ ·						1	
,			eclared l		or is kno	wn (kvvr	n/day):					0]	(48)
•			m Table					(40) (40)				0]	(49)
			storage eclared o	-		or is not	known:	(48) x (49)) =			0]	(50)
Hot wa	ater stora	age loss	factor fr	om Tabl								0]	(51)
	e factor	_	ee section ble 2a	JII 4 .3								0	1	(52)
			m Table	2b							-	0	†	(53)
													-	

Energy lost from Enter (50) or (50)		_	, kWh/ye	ear			(47) x (51) x (52) x (53) =		0		(54) (55)
Water storage	, ,	,	or each	month			((56)m = ((55) × (41)r	m		O .		(55)
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	dedicated	d solar stor	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 circuit	loss (an	nual) fro	m Table	e 3							0		(58)
Primary circuit	loss cal	culated f	or each	month (59)m = ((58) ÷ 36	65 × (41))m					
(modified by	factor fr	om Tabl	e 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 cal	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m= 47.88	41.67	44.4	41.28	40.92	37.91	39.17	40.92	41.28	44.4	44.65	47.88		(61)
Total heat requ	ired 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= 187.21	163.54	170.15	150.91	146.11	128.69	123.29	137.44	138.96	158.23	168.91	182.82		(62)
Solar DHW input c	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additional	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 wa	ater heat	ter											
(64)m= 187.21	163.54	170.15	150.91	146.11	128.69	123.29	137.44	138.96	158.23	168.91	182.82		_
							Outp	out from wa	ater heate	r (annual)₁	12	1856.27	(64)
Heat gains from	n 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= 58.3	50.94	52.91	46.77	45.21	39.66	37.76	40.00						
			40.77	40.21	39.00	37.76	42.32	42.8	48.95	52.48	56.84		(65)
include (57)n	m in calc						<u> </u>			ļ		eating	(65)
include (57)r 5. Internal ga		culation o	of (65)m	only if c			<u> </u>			ļ		eating	(65)
5. Internal ga	ins (see	culation of Table 5	of (65)m and 5a	only if c			<u> </u>			ļ		eating	(65)
, ,	ins (see	culation of Table 5	of (65)m and 5a	only if c			<u> </u>			ļ		eating	(65)
5. Internal ga	ins (see	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. Internal ga Metabolic gains	ins (see s (Table Feb 107.82	tulation of Table 5 5), Watt	of (65)m and 5a ts Apr 107.82	only if c): May 107.82	ylinder i: Jun 107.82	Jul	Aug 107.82	or hot w	ater is fr	om com	munity h	eating	
5. Internal ga Metabolic gains Jan (66)m= 107.82	ins (see s (Table Feb 107.82	tulation of Table 5 5), Watt	of (65)m and 5a ts Apr 107.82	only if c): May 107.82	ylinder i: Jun 107.82	Jul	Aug 107.82	or hot w	ater is fr	om com	munity h	eating	
5. Internal games Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61	s (Table Feb 107.82 (calculat	Table 5 5), Watt Mar 107.82 ted in Ap	of (65)m and 5a ts Apr 107.82 opendix 15.65	only if c May 107.82 L, equati	Jun 107.82 ion L9 o	Jul 107.82 r L9a), a	Aug 107.82 Iso see	Sep 107.82 Table 5	Oct 107.82	Nov	Dec	eating	(66)
5. Internal games Metabolic gains Jan (66)m= 107.82 Lighting gains	s (Table Feb 107.82 (calculat	Table 5 5), Watt Mar 107.82 ted in Ap	of (65)m and 5a ts Apr 107.82 opendix 15.65	only if c May 107.82 L, equati	Jun 107.82 ion L9 o	Jul 107.82 r L9a), a	Aug 107.82 Iso see	Sep 107.82 Table 5	Oct 107.82	Nov	Dec	eating	(66)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83	s (Table Feb 107.82 (calculat 25.41 ns (calculat 190.79	ted in Ap 20.67 ulated in 185.85	and 5a ts Apr 107.82 opendix 15.65 Appendix 175.34	only if c): May 107.82 L, equati 11.7 dix L, equati 162.07	Jun 107.82 ion L9 o 9.87 uation L	Jul 107.82 r L9a), a 10.67 13 or L1	Aug 107.82 Iso see 13.87 3a), also	Sep 107.82 Table 5 18.62 See Tal	Oct 107.82 23.64 ble 5 154.75	Nov 107.82 27.59	Dec 107.82	eating	(66) (67)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83 Cooking gains	s (Table Feb 107.82 (calculat 25.41 ns (calculat 190.79	ted in Ap 20.67 ulated in 185.85	and 5a ts Apr 107.82 opendix 15.65 Appendix 175.34	only if c): May 107.82 L, equati 11.7 dix L, equati 162.07	Jun 107.82 ion L9 o 9.87 uation L	Jul 107.82 r L9a), a 10.67 13 or L1	Aug 107.82 Iso see 13.87 3a), also	Sep 107.82 Table 5 18.62 See Tal	Oct 107.82 23.64 ble 5 154.75	Nov 107.82 27.59	Dec 107.82	eating	(66) (67)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83 Cooking gains (69)m= 33.78	s (Table Feb 107.82 (calculat 25.41 ns (calculat 190.79 (calculat 33.78	ted in Apulated in	and 5a ts Apr 107.82 opendix 15.65 Append 175.34 opendix 33.78	only if c May 107.82 L, equati 11.7 dix L, equ 162.07 L, equat	Jun 107.82 ion L9 of 9.87 uation L 149.6 ion L15	Jul 107.82 r L9a), a 10.67 13 or L1 141.26 or L15a	Aug 107.82 Iso see 13.87 3a), also 139.3	Sep 107.82 Table 5 18.62 See Tal 144.24 ee Table	Oct 107.82 23.64 ble 5 154.75 5	Nov 107.82 27.59	Dec 107.82 29.41 180.49	eating	(66) (67) (68)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83 Cooking gains (69)m= 33.78 Pumps and fan	s (Table Feb 107.82 (calculat 25.41 ns (calculat 190.79 (calcula 33.78 ns gains	ted in Apulated in	and 5a ts Apr 107.82 opendix 15.65 Appendix 175.34 opendix 33.78	only if c): May 107.82 L, equati 11.7 dix L, equati 162.07 L, equati 33.78	Jun 107.82 ion L9 o 9.87 uation L 149.6 ion L15 33.78	Jul 107.82 r L9a), a 10.67 13 or L1 141.26 or L15a;	Aug 107.82 Iso see 13.87 3a), also 139.3), also se 33.78	Sep 107.82 Table 5 18.62 See Tal 144.24 ee Table 33.78	Oct 107.82 23.64 ble 5 154.75 5 33.78	Nov 107.82 27.59 168.02	Dec 107.82 29.41 180.49 33.78	eating	(66) (67) (68) (69)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83 Cooking gains (69)m= 33.78 Pumps and fan (70)m= 10	s (Table Feb 107.82 (calculat 25.41 ns (calculat 190.79 (calcula 33.78 ns gains	ted in Ap 185.85 ted in Ap 185.85 ted in Ap 185.85 ted in Ap 185.85	and 5a ts Apr 107.82 ppendix 15.65 Append 175.34 ppendix 33.78 ia)	only if c): May 107.82 L, equati 11.7 dix L, equ 162.07 L, equat 33.78	Jun 107.82 ion L9 of 9.87 uation L 149.6 ion L15 33.78	Jul 107.82 r L9a), a 10.67 13 or L1 141.26 or L15a	Aug 107.82 Iso see 13.87 3a), also 139.3	Sep 107.82 Table 5 18.62 See Tal 144.24 ee Table	Oct 107.82 23.64 ble 5 154.75 5	Nov 107.82 27.59	Dec 107.82 29.41 180.49	eating	(66) (67) (68)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83 Cooking gains (69)m= 33.78 Pumps and fan (70)m= 10 Losses e.g. eva	s (Table Feb 107.82 (calculat 25.41 ns (calculat 190.79 (calculat 33.78 ns gains 10 aporatio	ted in Ap 20.67 ulated in Ap 33.78 (Table 5	and 5a an	only if c): May 107.82 L, equati 11.7 dix L, equ 162.07 L, equati 33.78	Jun 107.82 ion L9 of 9.87 uation L 149.6 ion L15 33.78	Jul 107.82 r L9a), a 10.67 13 or L1 141.26 or L15a; 33.78	Aug 107.82 Iso see 13.87 3a), also 139.3), also se 33.78	Sep 107.82 Table 5 18.62 See Tal 144.24 ee Table 33.78	23.64 ble 5 154.75 5 33.78	Nov 107.82 27.59 168.02 33.78	Dec 107.82 29.41 180.49 33.78	eating	(66) (67) (68) (69) (70)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83 Cooking gains (69)m= 33.78 Pumps and fan (70)m= 10 Losses e.g. eva (71)m= -86.26	s (Table Feb 107.82 (calculat 25.41 ns (calculat 190.79 (calcula 33.78 ns gains 10 aporatio -86.26	ted in Ap 20.67 ulated in 185.85 ted in Ap 33.78 (Table 5 10 n (negat -86.26)	and 5a ts Apr 107.82 ppendix 15.65 Append 175.34 ppendix 33.78 ia)	only if c): May 107.82 L, equati 11.7 dix L, equ 162.07 L, equat 33.78	Jun 107.82 ion L9 of 9.87 uation L 149.6 ion L15 33.78	Jul 107.82 r L9a), a 10.67 13 or L1 141.26 or L15a;	Aug 107.82 Iso see 13.87 3a), also 139.3), also se 33.78	Sep 107.82 Table 5 18.62 See Tal 144.24 ee Table 33.78	Oct 107.82 23.64 ble 5 154.75 5 33.78	Nov 107.82 27.59 168.02	Dec 107.82 29.41 180.49 33.78	eating	(66) (67) (68) (69)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83 Cooking gains (69)m= 33.78 Pumps and fan (70)m= 10 Losses e.g. eva (71)m= -86.26 Water heating	s (Table Feb 107.82 (calculat 25.41 ns (calculat 190.79 (calculat 33.78 ns gains 10 aporatio -86.26 gains (T	ted in Ap 33.78 (Table 5 10 n (negat -86.26 fable 5)	and 5a ts Apr 107.82 pendix 15.65 Append 175.34 pendix 33.78 (a) 10 ive valu -86.26	only if c May 107.82 L, equati 11.7 dix L, equati 162.07 L, equati 33.78 10 es) (Tab	Jun 107.82 ion L9 of 9.87 uation L 149.6 ion L15 33.78 10 le 5) -86.26	Jul 107.82 r L9a), a 10.67 13 or L1 141.26 or L15a) 33.78	Aug 107.82 Iso see 13.87 3a), also 139.3), also se 33.78	Sep 107.82 Table 5 18.62 See Tal 144.24 ee Table 33.78	23.64 ble 5 154.75 5 33.78	Nov 107.82 27.59 168.02 33.78	Dec 107.82 29.41 180.49 33.78	eating	(66) (67) (68) (69) (70) (71)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83 Cooking gains (69)m= 33.78 Pumps and fan (70)m= 10 Losses e.g. evo (71)m= -86.26 Water heating (72)m= 78.36	s (Table Feb 107.82 (calculat 25.41 ns (calculat 190.79 (calculat 33.78 ns gains 10 aporatio -86.26 gains (T 75.8	ted in Ap 20.67 ulated in 185.85 ted in Ap 33.78 (Table 5 10 n (negat -86.26 fable 5) 71.12	and 5a an	only if c): May 107.82 L, equati 11.7 dix L, equ 162.07 L, equati 33.78	Jun 107.82 ion L9 of 9.87 uation L 149.6 ion L15 33.78 10 le 5) -86.26	Jul 107.82 r L9a), a 10.67 13 or L1 141.26 or L15a 33.78	Aug 107.82 Iso see 13.87 3a), also 139.3), also se 33.78	Sep 107.82 Table 5 18.62 See Tal 144.24 ee Table 33.78	23.64 ble 5 154.75 5 33.78 10 -86.26	Nov 107.82 27.59 168.02 33.78 10	Dec 107.82 29.41 180.49 33.78 10 -86.26	eating	(66) (67) (68) (69) (70)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83 Cooking gains (69)m= 33.78 Pumps and fan (70)m= 10 Losses e.g. eva (71)m= -86.26 Water heating (72)m= 78.36 Total internal	ins (see s (Table Feb 107.82 (calculat 25.41 ns (calculat 190.79 (calculat 33.78 ns gains 10 aporatio -86.26 gains (T 75.8 gains =	ted in Ap 20.67 ulated in Ap 33.78 (Table 5 10 n (negat -86.26 able 5) 71.12	and 5a ts Apr 107.82 pendix 15.65 Append 175.34 pendix 33.78 ioa) 10 ive valu -86.26	only if c May 107.82 L, equati 11.7 dix L, equ 162.07 L, equati 33.78 10 es) (Tab -86.26	Jun 107.82 ion L9 of 9.87 uation L 149.6 ion L15 33.78 10 le 5) -86.26	Jul 107.82 r L9a), a 10.67 13 or L1 141.26 or L15a; 33.78 10 -86.26 50.76	Aug 107.82 Iso see 13.87 3a), also 139.3), also se 33.78	Sep 107.82 Table 5 18.62 See Tal 144.24 ee Table 33.78 10 -86.26	23.64 ble 5 154.75 5 33.78 10 -86.26 65.79 (70)m + (7	Nov 107.82 27.59 168.02 33.78 10 -86.26 72.89 1)m + (72)	Dec 107.82 29.41 180.49 33.78 10 -86.26 76.39	eating	(66) (67) (68) (69) (70) (71)
Metabolic gains Jan (66)m= 107.82 Lighting gains (67)m= 28.61 Appliances gain (68)m= 188.83 Cooking gains (69)m= 33.78 Pumps and fan (70)m= 10 Losses e.g. evo (71)m= -86.26 Water heating (72)m= 78.36	ins (see s (Table Feb 107.82) (calculat 25.41) (calculat 190.79) (calcula 33.78) (calcula 33.7	ted in Ap 20.67 ulated in 185.85 ted in Ap 33.78 (Table 5 10 n (negat -86.26 fable 5) 71.12	and 5a ts Apr 107.82 pendix 15.65 Append 175.34 pendix 33.78 (a) 10 ive valu -86.26	only if c May 107.82 L, equati 11.7 dix L, equati 162.07 L, equati 33.78 10 es) (Tab	Jun 107.82 ion L9 of 9.87 uation L 149.6 ion L15 33.78 10 le 5) -86.26	Jul 107.82 r L9a), a 10.67 13 or L1 141.26 or L15a 33.78	Aug 107.82 Iso see 13.87 3a), also 139.3), also se 33.78	Sep 107.82 Table 5 18.62 See Tal 144.24 ee Table 33.78	23.64 ble 5 154.75 5 33.78 10 -86.26	Nov 107.82 27.59 168.02 33.78 10	Dec 107.82 29.41 180.49 33.78 10 -86.26	eating	(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.

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	3.43	x	11.28	x	0.85	х	0.7	=	15.96	(75)
Northeast 0.9x	0.77	x	1.35	x	11.28	x	0.85	x	0.7	=	6.28	(75)
Northeast 0.9x	0.77	x	3.43	x	22.97	x	0.85	x	0.7	=	32.48	(75)
Northeast 0.9x	0.77	x	1.35	x	22.97	x	0.85	x	0.7	=	12.78	(75)
Northeast 0.9x	0.77	x	3.43	x	41.38	x	0.85	x	0.7	=	58.52	(75)
Northeast 0.9x	0.77	x	1.35	x	41.38	x	0.85	x	0.7	=	23.03	(75)
Northeast 0.9x	0.77	x	3.43	x	67.96	x	0.85	x	0.7] =	96.11	(75)
Northeast 0.9x	0.77	x	1.35	x	67.96	x	0.85	x	0.7	=	37.83	(75)
Northeast 0.9x	0.77	x	3.43	x	91.35	x	0.85	x	0.7	=	129.19	(75)
Northeast 0.9x	0.77	x	1.35	x	91.35	x	0.85	x	0.7	=	50.85	(75)
Northeast 0.9x	0.77	x	3.43	x	97.38	x	0.85	x	0.7	=	137.73	(75)
Northeast 0.9x	0.77	x	1.35	x	97.38	x	0.85	x	0.7	=	54.21	(75)
Northeast 0.9x	0.77	x	3.43	x	91.1	x	0.85	x	0.7	=	128.85	(75)
Northeast 0.9x	0.77	x	1.35	x	91.1	x	0.85	x	0.7	=	50.71	(75)
Northeast 0.9x	0.77	X	3.43	x	72.63	x	0.85	х	0.7	=	102.72	(75)
Northeast 0.9x	0.77	X	1.35	x	72.63	X	0.85	х	0.7	=	40.43	(75)
Northeast 0.9x	0.77	X	3.43	x	50.42	x	0.85	х	0.7	=	71.31	(75)
Northeast 0.9x	0.77	X	1.35	x	50.42	x	0.85	х	0.7	=	28.07	(75)
Northeast 0.9x	0.77	X	3.43	x	28.07	x	0.85	х	0.7	=	39.7	(75)
Northeast 0.9x	0.77	X	1.35	x	28.07	x	0.85	х	0.7	=	15.62	(75)
Northeast 0.9x	0.77	X	3.43	x	14.2	x	0.85	х	0.7	=	20.08	(75)
Northeast 0.9x	0.77	X	1.35	x	14.2	X	0.85	х	0.7	=	7.9	(75)
Northeast 0.9x	0.77	x	3.43	x	9.21	x	0.85	х	0.7	=	13.03	(75)
Northeast 0.9x	0.77	x	1.35	x	9.21	x	0.85	х	0.7	=	5.13	(75)
Southeast 0.9x	0.77	X	2.38	x	36.79	X	0.85	х	0.7	=	36.11	(77)
Southeast 0.9x	0.77	x	5	x	36.79	x	0.85	x	0.7	=	75.86	(77)
Southeast 0.9x	0.77	X	2.38	x	62.67	X	0.85	х	0.7	=	61.51	(77)
Southeast 0.9x	0.77	x	5	x	62.67	X	0.85	x	0.7	=	129.21	(77)
Southeast 0.9x	0.77	x	2.38	x	85.75	x	0.85	х	0.7	=	84.15	(77)
Southeast 0.9x	0.77	x	5	x	85.75	x	0.85	x	0.7	=	176.79	(77)
Southeast 0.9x	0.77	x	2.38	x	106.25	X	0.85	x	0.7	=	104.27	(77)
Southeast 0.9x	0.77	x	5	x	106.25	x	0.85	x	0.7] =	219.06	(77)
Southeast 0.9x	0.77	X	2.38	x	119.01	X	0.85	х	0.7	=	116.79	(77)
Southeast 0.9x	0.77	X	5	x	119.01	X	0.85	х	0.7	=	245.36	(77)
Southeast 0.9x	0.77	X	2.38	x	118.15	x	0.85	х	0.7	=	115.95	(77)
Southeast 0.9x	0.77	X	5	x	118.15	x	0.85	x	0.7] =	243.59	(77)
Southeast 0.9x	0.77	X	2.38	x	113.91	x	0.85	х	0.7] =	111.79	(77)
Southeast 0.9x	0.77	X	5	x	113.91	×	0.85	x	0.7] =	234.84	(77)
Southeast 0.9x	0.77	X	2.38	x	104.39	x	0.85	x	0.7] =	102.44	(77)
				-		•		•		-		_

_								_						
Southeast _{0.9x}	0.77	X	5		X	104.39		x	0.85	X	0.7	=	215.22	(77)
Southeast _{0.9x}	0.77	X	2.3	8	X	92.85		x [0.85	X	0.7	=	91.12	(77)
Southeast _{0.9x}	0.77	X	5		X	92.85		x	0.85	x	0.7	=	191.43	(77)
Southeast _{0.9x}	0.77	X	2.3	8	X	69.27		x	0.85	x	0.7	=	67.98	(77)
Southeast _{0.9x}	0.77	X	5		X	69.27		x [0.85	x	0.7	=	142.81	(77)
Southeast _{0.9x}	0.77	X	2.3	8	X	44.07		x	0.85	x	0.7	=	43.25	(77)
Southeast 0.9x	0.77	x	5		X	44.07		x	0.85	x	0.7	-	90.86	(77)
Southeast _{0.9x}	0.77	x	2.3	8	X	31.49		x	0.85	x	0.7	=	30.9	(77)
Southeast _{0.9x}	0.77	x	5		X	31.49		x	0.85	x	0.7	=	64.92	(77)
Southwest _{0.9x}	0.77	x	1.2	6	X	36.79			0.63	x	0.7	=	14.17	(79)
Southwest _{0.9x}	0.77	x	1.2	6	x	62.67	\exists	Ī	0.63	x	0.7	=	24.13	(79)
Southwest _{0.9x}	0.77	×	1.2	6	X	85.75		Ī	0.63	x	0.7		33.02	(79)
Southwest _{0.9x}	0.77	x	1.2	6	X	106.25		Ī	0.63	x	0.7		40.91	(79)
Southwest _{0.9x}	0.77	x	1.2	6	X	119.01	╗	Ī	0.63	×	0.7		45.83	(79)
Southwest _{0.9x}	0.77	×	1.2	6	X	118.15	ī	Ī	0.63	x	0.7	=	45.5	(79)
Southwest _{0.9x}	0.77	×	1.2	6	X	113.91	Ħ	Ī	0.63	×	0.7	-	43.86	(79)
Southwest _{0.9x}	0.77	×	1.2	6	X	104.39	Ħ	Ī	0.63	×	0.7	╡ =	40.2	(79)
Southwest _{0.9x}	0.77	x	1.2	6	X	92.85	Ħ	Ī	0.63	x	0.7	<u> </u>	35.75	(79)
Southwest _{0.9x}	0.77	×	1.2	6	X	69.27	Ħ	Ī	0.63	Īx	0.7	╡ =	26.67	(79)
Southwest _{0.9x}	0.77	×	1.2	6	X	44.07	Ħ	Ī	0.63	×	0.7	╡ =	16.97	(79)
Southwest _{0.9x}	0.77	×	1.2	6	X	31.49	Ħ	Ī	0.63	×	0.7	=	12.13	(79)
_								_		_ '				_
Solar gains in	watts calci	ulated	for each	n mont	h		(83	3)m :	= Sum(74)m	(82)m				
(83)m= 148.37	<u> </u>	75.52	498.18	588.02	$\overline{}$	96.97 570.0	Ť	501.0		292.78	3 179.06	126.1]	(83)
Total gains – i	nternal and	solar	 (84)m =	: (73)m	+ (B3)m , watts	 }		<u> </u>		_!		ı	
(84)m= 509.52	617.46 7°	18.51	819.47	887.89	8	76.87 838.09	9 7	776.4	11 705.33	602.31	512.9	477.75]	(84)
7. Mean inter	nal temper	ature (heating	seaso	n)									
Temperature						area from T	able	9	Th1 (°C)				21	(85)
Utilisation fac	•	•			_			, 0,	(0)				21	
Jan		Mar	Apr	May	Ť	Jun Jul	<u>, </u>	Au	g Sep	Oct	Nov	Dec]	
(86)m= 0.99		0.98	0.95	0.9	+	0.81 0.69	\top	0.74	* 	0.97	0.99	0.99		(86)
Mean interna	<u> </u>	!	iving or	00 T1 /	follo	w otopo 2 to	 . 7 ir	n Ta	hlo Oo)		-!		I	
(87)m= 18.24		8.91	19.52	20.1	$\overline{}$	0.58 20.82	$\overline{}$	20.7	 	19.64	18.86	18.23	1	(87)
` ′	<u> </u>	!				ļ .			_		1			()
Temperature (88)m= 18.89		ting po	18.95	18.96	$\overline{}$	8.99 18.99	$\overline{}$	19	 	18.96	18.94	18.93	1	(88)
(88)m= 18.89	10.9	0.91	10.90	10.90	'	0.99 10.99	<u> </u>	19	10.90	10.90	10.94	10.93		(00)
Utilisation fac					$\overline{}$	`_	\neg		<u> </u>				1	(22)
(89)m= 0.99	0.98	0.97	0.93	0.85		0.67 0.45		0.51	0.79	0.95	0.98	0.99		(89)
Mean interna	I temperatu	ıre in t	he rest	of dwe	ling	T2 (follow s	steps	s 3 1	to 7 in Table	e 9c)			1	
(90)m= 16.55	16.8 1	7.23	17.85	18.39	1	8.82 18.96	3	18.9		17.98		16.56		(90)
									fL	A = Liv	ing area ÷ (4	4) =	0.34	(91)
Moon interne	Ltonoporoti	/fo.	مارين مطاء	مام طب	منالم	~\ - fl	- ₄ ,	/1	fl A \ v TO					

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

(92)m= 17.12	17.37	17.8	18.42	18.97	19.42	19.59	19.57	19.26	18.54	17.76	17.13		(92)
Apply adjustn	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	priate	ļ.		l	
(93)m= 17.12	17.37	17.8	18.42	18.97	19.42	19.59	19.57	19.26	18.54	17.76	17.13		(93)
8. Space hea	ting requ	uirement											
Set Ti to the i					ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	i —						1	•	1	1	1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		1					T						(0.4)
(94)m= 0.99	0.98	0.96	0.92	0.85	0.71	0.54	0.59	0.81	0.94	0.98	0.99		(94)
Useful gains,		<u> </u>			000.0	450.00	150.40	F70.44	500.50	F00.00	470.55	1	(OE)
(95)m= 502.86	603.79	690.12	756.03	752.69	623.6	450.06	458.49	573.11	566.56	502.26	472.55		(95)
Monthly average (96)m= 4.3	age exte	ernai tem	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
` '	L				<u> </u>	<u> </u>			l	7.1	4.2		(90)
Heat loss rate (97)m= 2320.83				1261.5	816.63	507.1	535.03	881.26	1377.58	1868.04	2289.64		(97)
						<u> </u>			L		2209.04		(37)
Space heatin (98)m= 1352.57	1102.58	991.58	650.29	378.55	0	0.02	0	0 0	603.4	983.37	1351.91		
(30)111- 1332.37	1102.30	991.50	030.29	370.55								7414.25	(98)
							1018	ıl per year	(KVVII/yeai) = Sum(9	O)15,912 =		╡```
Space heatin	g require	ement in	kWh/m ²	/year								111.61	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heatir	•										,		_
Fraction of sp	ace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of to	tal heati	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of I	main spa	ace heat	ing syste	em 1								88.8	(206)
Efficiency of	seconda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
Jan	Feb	Mar		May		Jul	Δυσ	Sep	Oct	Nov	Dec	kWh/ye	⊒ or
Space heatin						Jui	Aug	l Seb	Oct	INOV	Dec	K VVIII y C	aı
	1102.58	991.58	650.29	378.55	0	0	0	0	603.4	983.37	1351.91		
)e)									(211)
(211)m = {[(98		1116.64		426.3	0	0	0	0	679.5	1107 30	1522.43		(211)
1020.17	1241.00	1110.04	702.01	420.0				l (kWh/yea				8349.38	(211)
Conner bootin	a fuel (e		\\ \/\b./					(,	715,10. 12	2	0349.30	(211)
Space heatin $= \{[(98)m \times (200)]\}$	•		• •	montn									
$= \{[(90) 11 \times (20)] \}$	0	00 + (20	0	0	0	0	0	0	0	0	0		
(= : 0)			, ,	, ,				l (kWh/yea			_	0	(215)
Water beating	-							(,	- · · /15,10. 12	2		(210)
Water heating Output from w		ter (calc	ulated al	hove)									
187.21	163.54	170.15	150.91	146.11	128.69	123.29	137.44	138.96	158.23	168.91	182.82		
Efficiency of w	ater hea				<u> </u>	l				l		79.5	(216)
(217)m= 87.55	87.48	87.3	86.89	86	79.5	79.5	79.5	79.5	86.69	87.3	87.58		(217)
Fuel for water	<u> </u>	<u> </u>			L	L	L	L	L	L	I		` '
(219)m = (64)	•												
(219)m= 213.83	186.95	194.89	173.69	169.9	161.87	155.08	172.88	174.79	182.52	193.48	208.75		
							Tota	ıl = Sum(2	19a) ₁₁₂ =			2188.63	(219)
													_

Annual totals			kWh/yea	ar	kWh/yea	<u>r_</u>
Space heating fuel used, main system 1					8349.38	
Water heating fuel used					2188.63	
Electricity for pumps, fans and electric keep-hot						
central heating pump:				120		(230c)
Total electricity for the above, kWh/year	:	sum of (230a)	(230g) =		120	(231)
Electricity for lighting					505.33	(232)
12a. CO2 emissions – Individual heating system	s including micro-C	CHP				
	Energy kWh/year		Emission fa		Emissions kg CO2/ye	
Space heating (main system 1)	(211) x		0.216	=	1803.47	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	472.74	(264)
Space and water heating	(261) + (262) + (263	s) + (264) =			2276.21	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	62.28	(267)
Electricity for lighting	(232) x		0.519	=	262.27	(268)
Total CO2, kg/year		sum o	of (265) (271) =		2600.76	(272)
Dwelling CO2 Emission Rate		(070)	÷ (4) =			(273)

El rating (section 14)

			User D	etails:						
Assessor Name:	Chris Hockne			Strom					016363	
Software Name:	Stroma FSAP			Softwa				Versic	n: 1.0.4.10	
				Address	Unit 4-l	Part L1E	3			
Address :	Unit 4, 40-42 M	lill Lane, Lon	don, NW	/6 1NR						
Overall dwelling dime	ensions:		Δ	- (2\		Av. IIa	: a.la.l/.a.s\		Valuma/m²	21
Ground floor				a(m²) 3.27	(1a) x		ight(m) 2.6	(2a) =	Volume(m ³	(3a)
Total floor area TFA = (1	a)+(1h)+(1c)+(1d)	\+(1e\+ (1r	,		(4)](==)	100.0	(==)
Dwelling volume	(10) (10)	, ((()) (())	')/	3.21)+(3c)+(3c	d)+(3e)+	(3n) =	400.5	¬(E)
					(00) (00)	<i>1</i>) · (00) ·	.(011)	190.5	(5)
2. Ventilation rate:	main	secondai	ry	other		total			m³ per hou	ır
Number of chimneys	heating 0	+ heating	7 + [0	1 = [0	x	40 =	0	(6a)
Number of open flues	0	+ 0	╡ᆠ┝	0]	0	x	20 =	0	(6b)
Number of intermittent fa					J L			10 =	_	╡``
	_				Ļ	3		10 =	30	(7a)
Number of passive vents					Ļ	0			0	(7b)
Number of flueless gas f	ires				L	0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	evs flues and fans	= (6a) + (6b) + (7a)	⁷ a)+(7b)+(7c) =	Г	30		÷ (5) =	0.16	(8)
If a pressurisation test has	-				continue fr			. (3) –	0.10	(0)
Number of storeys in t									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or tin	nber frame or	0.35 fo	r masonr	y constr	ruction			0	(11)
if both types of wall are p deducting areas of open			the great	er wall are	a (after					
If suspended wooden			.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	•	•	`	,,					0	(13)
Percentage of window	s and doors draug	ght 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, expressed in	n cubic metre	s per ho	our per s	quare m	etre of e	envelope	area	15	(17)
If based on air permeabi	lity value, then (18	$= [(17) \div 20] + ($	8), otherw	ise (18) = (16)				0.91	(18)
Air permeability value appli		est has been dor	ne or a deg	gree air pe	rmeability	is being u	sed			_
Number of sides shelter Shelter factor	ed			(20) = 1 -	in n75 x (1	19)1 =			2	(19)
Infiltration rate incorpora	ting shelter factor			(21) = (18	`	· • /]			0.85	(20)
Infiltration rate modified	-	need		(21) (10	/ X (20)				0.77	(21)
Jan Feb		May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind s				1 7.09	СОР		1		l	
(22)m= 5.1 5		1.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
	I		I	<u>I</u>	<u> </u>	I	1	I .	J	
Wind Factor (22a)m = (2	·								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 infiltrat	ion rate (allow	ina for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
0.98	0.96 0.94	0.85	0.83	0.73	0.73	0.71	0.77	0.83	0.87	0.91]		
Calculate effecti	_	rate for t	he appli	cable ca	se	!	!	<u> </u>	!	!	J		_
If mechanical		o a caralla e NI - (O	10l-) (00 -		ti /b	\) (00-)				0	(23a)
If exhaust air hea) = (23a)				0	(23b)
If balanced with h	-	-	_									0	(23c)
a) If balanced	1	1			, 	- 	í `	 		```) ÷ 100] 1		(240)
(24a)m= 0	0 0	0	0	0	0	0 (0.41)	0	0	0	0]		(24a)
b) If balanced	mechanicai v	entilation 0	without	neat red	covery (i	VIV) (24k 0	$\int_{0}^{\infty} \int_{0}^{\infty} dt = (22)$	2b)m + (0		0	1		(24b)
()		ļ	<u> </u>			<u> </u>	<u> </u>		0]		(240)
c) If whole hou	use extract ve < 0.5 × (23b),		•	•				5 × (23h	n)				
(24c)m= 0	0 0	0	0	0	0	0 (22.	0	0	0	0	1		(24c)
d) If natural ve	entilation or wi	nole hous	Lse positiv	/e input	ventilatio	on from	loft		<u> </u>	<u> </u>	J		
,	= 1, then (24d		•	•				0.5]					
(24d)m= 0.98	0.96 0.95	0.86	0.84	0.77	0.77	0.75	0.8	0.84	0.88	0.91			(24d)
Effective air cl	hange rate - e	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)	-	-	-	_		
(25)m= 0.98	0.96 0.95	0.86	0.84	0.77	0.77	0.75	0.8	0.84	0.88	0.91			(25)
3. Heat losses	and heat loss	paramete	er:										
ELEMENT	Gross area (m²)	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·		A X kJ/ł	
Doors	, ,							`	,				
D0010				2	X	3	=	6					(26)
Windows Type 1	1			1.35	= ,	3 /[1/(4.8)+	!	6 5.44					(26) (27)
					x1.		0.04] =						` ,
Windows Type 1	2	6.75	; <u> </u>	1.35	x1.	/[1/(4.8)+ /[1/(4.8)+	0.04] =	5.44			— [(27)
Windows Type 2 Windows Type 2 Walls Type1	45.57	6.75	<u> </u>	1.35 1.35 38.82	x1.	/[1/(4.8)+ /[1/(4.8)+ 	0.04] =	5.44 5.44 11.65					(27) (27) (29)
Windows Type 2 Windows Type 2 Walls Type1 Walls Type2	2 45.57 11.73	2		1.35 1.35 38.82 9.73	x1. x1. 2 x	/[1/(4.8)+ /[1/(4.8)+ 	0.04] =	5.44 5.44 11.65 2.61					(27) (27) (29) (29)
Windows Type 2 Windows Type 2 Walls Type1 Walls Type2 Walls Type3	45.57 11.73 12.88	0	5	1.35 1.35 38.82 9.73 12.88	x1. x1. 2 x x x x x	/[1/(4.8)+ /[1/(4.8)+ 0.3 0.27	0.04] =	5.44 5.44 11.65 2.61 3.04					(27) (27) (29) (29) (29)
Windows Type 2 Windows Type 2 Walls Type1 Walls Type2 Walls Type3 Roof	45.57 11.73 12.88 15.07	2		1.35 1.35 38.82 9.73 12.88 15.07	x1. x1. x2. x x x x x x x x x	/[1/(4.8)+ /[1/(4.8)+ 	0.04] =	5.44 5.44 11.65 2.61					(27) (27) (29) (29) (29) (29) (30)
Windows Type 2 Walls Type1 [Walls Type2 [Walls Type3 [Roof [Total area of ele	45.57 11.73 12.88 15.07	0		1.35 1.35 38.82 9.73 12.88 15.07	x1. x1. x1. x2. x x x x x x x x x x x x x x x x x	/[1/(4.8)+ /[1/(4.8)+	0.04] = 0.04] =	5.44 5.44 11.65 2.61 3.04 2.71					(27) (27) (29) (29) (29) (29) (30) (31)
Windows Type 2 Windows Type 2 Walls Type1 Walls Type2 Walls Type3 Roof Total area of ele Party wall	45.57 11.73 12.88 15.07	0		1.35 1.35 38.82 9.73 12.88 15.07 85.25	x1. x1. x2. x x x x x x x x x x x x x x x x x	/[1/(4.8)+ /[1/(4.8)+ 0.3 0.27	0.04] =	5.44 5.44 11.65 2.61 3.04					(27) (27) (29) (29) (29) (29) (30) (31) (32)
Windows Type 2 Windows Type 2 Walls Type1 Walls Type2 Walls Type3 Roof Total area of ele Party wall Party floor	45.57 11.73 12.88 15.07	0		1.35 1.35 38.82 9.73 12.88 15.07 85.25 37.7	x1. x1. x2. x x x x x x x x x x x x x x x x x	/[1/(4.8)+ /[1/(4.8)+	0.04] = 0.04] =	5.44 5.44 11.65 2.61 3.04 2.71					(27) (27) (29) (29) (29) (30) (31) (32) (32a)
Windows Type 2 Windows Type 2 Walls Type 1 Walls Type 2 Walls Type 3 Roof Total area of ele Party wall Party floor Party ceiling	45.57 11.73 12.88 15.07 ements, m ²	0 0		1.35 1.35 38.82 9.73 12.88 15.07 85.25 37.7 73.27	x1. x1. x2. x x x x x x x x x x x x x x x x x	/[1/(4.8)+ /[1/(4.8)+	0.04] = 0.04] = 0.04] = = = =	5.44 5.44 11.65 2.61 3.04 2.71		naragraph			(27) (27) (29) (29) (29) (29) (30) (31) (32)
Windows Type 2 Windows Type 2 Walls Type1 Walls Type2 Walls Type3 Roof Total area of ele Party wall Party floor	45.57 11.73 12.88 15.07 ements, m ²	2 0 0	indow U-ve	1.35 1.35 38.82 9.73 12.88 15.07 85.25 37.7 73.27 58.2	x1. x1. x2. x x x x x x x x x x x x x x x x x	/[1/(4.8)+ /[1/(4.8)+	0.04] = 0.04] = 0.04] = = = =	5.44 5.44 11.65 2.61 3.04 2.71	as given in	paragrapl			(27) (27) (29) (29) (29) (30) (31) (32) (32a)
Windows Type 2 Windows Type 2 Walls Type 1 Walls Type 2 Walls Type 3 Roof Total area of ele Party wall Party floor Party ceiling * for windows and room.	45.57 11.73 12.88 15.07 ements, m² oof windows, use on both sides of a	2 0 0	indow U-ve	1.35 1.35 38.82 9.73 12.88 15.07 85.25 37.7 73.27 58.2	x1. x1. x2. x x x x x x x x x x x x x x x x x	0.3 0.27 0.24 0.18	0.04] = 0.04] = 0.04] = = = =	5.44 5.44 11.65 2.61 3.04 2.71	as given in	paragrapl		5.19	(27) (27) (29) (29) (29) (30) (31) (32) (32a)
Windows Type 2 Windows Type 2 Walls Type 1 Walls Type 2 Walls Type 3 Roof Total area of ele Party wall Party floor Party ceiling * for windows and ro ** include the areas	45.57 11.73 12.88 15.07 ements, m² of windows, use on both sides of the sides	2 0 0	indow U-ve	1.35 1.35 38.82 9.73 12.88 15.07 85.25 37.7 73.27 58.2	x1. x1. x2. x x x x x x x x x x x x x x x x x	0.3 0.27 0.24 0.18	= 0.04] = 0.04] = = 0.04] = = = =	5.44 5.44 11.65 2.61 3.04 2.71 0	as given in (2) + (32a)		53	5.19	(27) (27) (29) (29) (29) (30) (31) (32) (32a) (32b)
Windows Type 2 Windows Type 2 Walls Type 1 Walls Type 2 Walls Type 3 Roof Total area of ele Party wall Party floor Party ceiling * for windows and ro ** include the areas Fabric heat loss	45.57 11.73 12.88 15.07 ements, m² of windows, use on both sides of the sides	effective wi	indow U-va	1.35 1.35 38.82 9.73 12.88 15.07 85.25 37.7 73.27 58.2 alue calculatitions	x1.	0.3 0.27 0.24 0.18	= 0.04] = 0.04] = = 0.04] = = = = = = = =	5.44 5.44 11.65 2.61 3.04 2.71 0	2) + (32a)		53 1332		(27) (27) (29) (29) (29) (30) (31) (32) (32a) (32b)
Windows Type 2 Windows Type 2 Walls Type 1 Walls Type 2 Walls Type 3 Roof Total area of ele Party wall Party floor Party ceiling * for windows and ro ** include the areas Fabric heat loss Heat capacity C	45.57 11.73 12.88 15.07 ements, m² of windows, use on both sides of the control of the cont	effective winternal walk (U) P = Cm ÷	indow U-valls and part	1.35 1.35 38.82 9.73 12.88 15.07 85.29 37.7 73.27 58.2 salue calculatitions	x1.	0.3 0.27 0.24 0.18 0 (26) (30	= 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = (1/U-value) + (32) = ((28))	5.44 5.44 11.65 2.61 3.04 2.71 0 (30) + (33) tive Value	2) + (32a) : Medium	(32e) =	53 1332	27.59	(27) (27) (29) (29) (29) (30) (31) (32a) (32a) (32b)
Windows Type 2 Walls Type1 Walls Type2 Walls Type3 Roof Total area of ele Party wall Party floor Party ceiling * for windows and ro ** include the areas Fabric heat loss Heat capacity C Thermal mass p For design assessm	45.57 11.73 12.88 15.07 ements, m² of windows, use on both sides of the sides	effective winternal walk (U) P = Cm = etails of the culation.	Transfer Tra	1.35 1.35 38.82 9.73 12.88 15.07 85.25 37.7 73.27 58.2 alue calculatitions	x1.	0.3 0.27 0.24 0.18 0 (26) (30	= 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = = 0.04] = (1/U-value) + (32) = ((28))	5.44 5.44 11.65 2.61 3.04 2.71 0 (30) + (33) tive Value	2) + (32a) : Medium	(32e) =	53 1332 2	27.59	(27) (27) (29) (29) (29) (30) (31) (32a) (32a) (32b)
Windows Type 2 Walls Type1 Walls Type2 Walls Type3 Roof Total area of ele Party wall Party floor Party ceiling * for windows and ro ** include the areas Fabric heat loss Heat capacity C Thermal mass p For design assessment	45.57 11.73 12.88 15.07 ements, m² of windows, use on both sides of the sides	effective winternal walk (U) P = Cm = etails of the culation.	indow U-vals and part	1.35 1.35 38.82 9.73 12.88 15.07 85.28 37.7 73.27 58.2 alue calculations n kJ/m²K ion are not	x1.	0.3 0.27 0.24 0.18 0 (26) (30	= 0.04] = 0.04] = = 0.04] = = = = = = = = = =	5.44 5.44 11.65 2.61 3.04 2.71 0 (30) + (33) tive Value	2) + (32a) : Medium	(32e) =	53 1332 2	27.59 50	(27) (27) (29) (29) (29) (30) (31) (32a) (32a) (32b) (33) (34)

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=	61.84	60.66	59.5	54.06	53.05	48.31	48.31	47.43	50.14	53.05	55.1	57.25		(38)
Heat tr	ansfer o	coefficie	nt, W/K	•	•	•	•	•	(39)m	= (37) + (37)	38)m	•		
(39)m=	127.81	126.63	125.47	120.04	119.02	114.29	114.29	113.41	116.11	119.02	121.08	123.23		
Heat Id	oss para	meter (ł	HLP), W	m²K				•		Average = = (39)m ÷		12 /12=	120.03	(39)
(40)m=	1.74	1.73	1.71	1.64	1.62	1.56	1.56	1.55	1.58	1.62	1.65	1.68		
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	ar.	
1. ***	101 1104	ing ono	igy roqui	nomont.								ikvviii yk	our.	
if TF			N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.		32		(42)
Annua	l averag	e hot wa	ater usaç									.37		(43)
		-	hot water person per			-	-	to achieve	a water us	se target o	/			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres pei	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	98.3	94.73	91.15	87.58	84.01	80.43	80.43	84.01	87.58	91.15	94.73	98.3		
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	т х пт х <i>[</i>	OTm / 3600		Total = Su oth (see Ta			1072.41	(44)
(45)m=	145.78	127.5	131.57	114.71	110.06	94.98	88.01	100.99	102.2	119.1	130.01	141.18		
If instant	taneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) _{1 12} =		1406.09	(45)
(46)m=	21.87	19.13	19.74	17.21	16.51	14.25	13.2	15.15	15.33	17.87	19.5	21.18		(46)
	storage										,			
•		` ') includir				•		ame ves	sel		0		(47)
Otherw	-	stored	ind no ta hot wate		•			, ,	ers) ente	er '0' in (47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	m water	· storage	, kWh/ye	ear			(48) x (49) =			0		(50)
,			eclared	•										
		_	factor free section		e 2 (kW	h/litre/da	ay)					0		(51)
	-	from Ta		011 4.5								0		(52)
			m Table	2b								0		(53)
•			· storage		ear			(47) x (51) x (52) x (53) =		0		(54)
		(54) in (5	_	,,,,,,,,					/ \	•		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)
•		l	ı	I	I	L	I	<u> </u>	L	I	<u> </u>	I		

If cylinder conta	ains dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circ	uit loss (ar	nual) fro	m Table	3							0		(58)
Primary circ	uit loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				'	
(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= 50.0	9 43.6	46.45	43.19	42.81	39.66	40.99	42.81	43.19	46.45	46.72	50.09		(61)
Total heat re	equired 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= 195.8	38 171.1	178.02	157.9	152.87	134.64	129	143.8	145.39	165.55	176.73	191.28		(62)
Solar DHW inp	ut calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal 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	water hea	ter											
(64)m= 195.8	38 171.1	178.02	157.9	152.87	134.64	129	143.8	145.39	165.55	176.73	191.28		_
							Outp	out from wa	ater heate	r (annual)₁	12	1942.15	(64)
Heat gains f	rom 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= 61	53.29	55.36	48.94	47.3	41.5	39.51	44.28	44.78	51.21	54.91	59.47		(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ains (Table	e 5), Wat	ts										
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 116.1	116.14	116.14	116.14	116.14	116.14	116.14	116.14	116.14	116.14	116.14	116.14		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 35.5	7 31.59	25.69	19.45	14.54	12.28	13.26	17.24	23.14	29.38	34.3	36.56		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5	-	-	•	
(68)m= 204.8	31 206.93	201.58	190.17	175.78	162.26	153.22	151.09	156.45	167.85	182.24	195.77		(68)
Cooking gai	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)), also se	ee Table	5			•	
(69)m= 34.6	1 34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61		(69)
Pumps and	fans gains	(Table 5	5a)				•			•	•	•	
(70)m= 10	10	10	10	10	10	10	10	10	10	10	10		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•	•					•	
(71)m= -92.9	1 -92.91	-92.91	-92.91	-92.91	-92.91	-92.91	-92.91	-92.91	-92.91	-92.91	-92.91		(71)
Water heati	ng gains (1	rable 5)								!	!	•	
(72)m= 81.9	8 79.31	74.41	67.97	63.57	57.63	53.1	59.52	62.19	68.84	76.26	79.93		(72)
Total intern	al gains =				(66)	m + (67)m	1 + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m	•	
(73)m= 390.	2 385.68	369.52	345.44	321.74	300.01	287.43	295.7	309.63	333.91	360.64	380.1		(73)
6. Solar ga	ins:												
Solar gains a	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	e applicat	ole orientat	ion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	x ole 6a	Т	g_ able 6b	T	FF able 6c		Gains (W)	

Northeast 0.9x	0.77	x	1.3	25	x		1.28] x		85	7 x l	0.7			6.28	(75)
Northeast 0.9x		$=$ $\stackrel{\wedge}{}$ x	1.3		X	_	2.97	」 ^] x		85	」^!]	0.7	╡ .		12.78	(75)
Northeast 0.9x		= ^	1.3		X		1.38	」 ^] x		85	」^!] x [0.7	╡.	-	23.03	(75)
Northeast 0.9x		= x	1.3		X	_	7.96]		85	」^!] x [0.7	╡.		37.83	(75)
Northeast 0.9x		$=$ $\stackrel{\wedge}{}$ x	1.3		X	_	1.35	」 ^] x		85	」^!] x [0.7	╡ .		50.85	(75)
Northeast 0.9x		= ^	1.3		X		7.38	」 ^] x		85	」^!] x [0.7	╡.	-	54.21	(75)
Northeast 0.9x		☐ x	1.3		X		91.1	」 ^] x		85	」^!] x [0.7	╡.		50.71	(75)
Northeast 0.9x		$=$ \hat{x}	1.3		X	_	2.63	」^] _×		85	」^!]	0.7	╡ :		40.43	(75) (75)
Northeast 0.9x		$=$ \hat{x}			X	_		」^]			」^!] x [╡ :	-		(75)
Northeast 0.9x		$=$ \hat{x}	1.3		X		0.42	」^] _×		85	」^!] x !	0.7	╡ :		28.07	(75) (75)
Northeast 0.9x			1.3				8.07	1		85	╡╏		╡ :		15.62	(75)
Northeast 0.9x		x	1.3		X		14.2] X] ,		85]	0.7	=	-	7.9	= ' '
Northwest 0.9x		x	1.3		X		9.21] X]		85]	0.7	=		5.13	(75)
Northwest 0.9x		x	1.3		X		1.28] X]		85] X]	0.7	_		25.12	(81)
Northwest 0.9x		X	1.3		X	_	2.97] X		85	_ X	0.7	_ = -		51.14	(81)
Northwest 0.9x		X	1.3		X	_	1.38] X]		85	_ X 	0.7	╡ ╸		92.13	(81)
		×	1.3		X		7.96	」 X ¬		85	_ X	0.7	╡ -	-	151.31	(81)
Northwest 0.9x		X	1.3		X		1.35	」 X ¬		85	_ X	0.7	_ -		203.39	(81)
Northwest 0.9x		X	1.3		X	_	7.38	」 X ¬		85	_ X	0.7	┩ ⁵		216.84	(81)
Northwest 0.9x		X	1.3		X		91.1	X	0.	85	_ X	0.7	_ "		202.85	(81)
Northwest 0.9x		X	1.3	35	X	7	2.63	X	0.	85	_ X	0.7	_	·	161.71	(81)
Northwest 0.9x		X	1.3	35	X	5	0.42	X	0.	85	X	0.7	_ •	·	112.27	(81)
Northwest 0.9x		X	1.3	35	X	2	8.07	X	0.	85	X	0.7	=	· <u> </u>	62.49	(81)
Northwest 0.9x		X	1.3	35	X	<i>_</i>	14.2	X	0.	85	X	0.7	=	· <u>L</u>	31.61	(81)
Northwest 0.9x	0.77	X	1.3	35	X		9.21	X	0.	85	X	0.7	=		20.52	(81)
Solar gains in									n = Sum((82)m	1		_		(00)
	63.92							202	2.14 14	40.33	78.12	39.51	25.65			(83)
Total gains –		484.69	<u> </u>	575.98	 			1 407	. 04 4	40 00 T	440.00	100.45	405.75			(84)
(84)m= 421.61	449.6	484.69	534.58	575.98	3 5	71.05	540.99	497	.84 44	49.96	412.03	400.15	405.78	<u> </u>		(04)
7. Mean inte																_
Temperatur	e during h	eating p	eriods i	n the liv	ving	area f	from Tal	ble 9	, Th1 ('	°C)					21	(85)
Utilisation fa	ctor for ga	ains for	living ar	ea, h1,	m (s	ee Ta	ble 9a)					_		_		
Jan	Feb	Mar	Apr	May	4	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	<u>:</u>		
(86)m= 1	1	0.99	0.99	0.96		0.88	0.77	9.0	32 ().95	0.99	1	1			(86)
Mean intern	al tempera	ature in	living ar	ea T1 (follo	w ste	ps 3 to 7	7 in T	able 9	c)						
(87)m= 19.02	19.16	19.45	19.91	20.35	2	20.73	20.9	20.	86 2	0.56	20.02	19.49	19.05			(87)
Temperatur	e durina h	eating r	eriods i	n rest d	of dw	/ellina	from Ta	able 9	9. Th2	(°C)				_		
(88)m= 19.51	19.52	19.53	19.59	19.6	_	19.64	19.64	19.		9.62	19.6	19.58	19.55	\neg		(88)
Utilisation fa	etor for a	aine for	ract of d	welling	h2	m (sc	A Table	(02)	I	!_		1	<u> </u>			
(89)m= 1	1	0.99	0.98	0.94	$\overline{}$	0.8	0.6	0.6	67 C	0.91	0.98	1	1	\neg		(89)
			<u> </u>	<u> </u>								1 '	<u>'</u>			()
Mean intern	al tempera	ature in	the rest	ot dwe	lling	12 (fo	ollow ste	eps 3	to 7 in	ı I able	9c)					

(90)m= 17.75													
(90)111-	17.89	18.19	18.69	19.12	19.5	19.61	19.61	19.35	18.81	18.27	17.82		(90) –
								f	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m= 18.18	18.33	18.62	19.11	19.54	19.92	20.05	20.04	19.76	19.23	18.69	18.24		(92)
Apply adjustr	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	re appro	priate				
(93)m= 18.18	18.33	18.62	19.11	19.54	19.92	20.05	20.04	19.76	19.23	18.69	18.24		(93)
8. Space hea	iting requ	uirement											
Set Ti to the the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	•	<u> </u>	<u> </u>	<u> </u>		•		<u> </u>	<u> </u>		
(94)m= 1	0.99	0.99	0.98	0.93	0.82	0.66	0.72	0.92	0.98	0.99	1		(94)
Useful gains	hmGm	, W = (94	4)m x (84	4)m									
(95)m= 419.92	447.11	479.88	521.74	537.94	470.08	356.13	357.74	412.01	404.61	397.72	404.4		(95)
Monthly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m= 1774.45	1700.19	1520.84	1225.62	933.41	608.4	394.76	412.64	657.61	1026.7	1403.16	1730.25		(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= 1007.77	842.07	774.47	506.79	294.23	0	0	0	0	462.84	723.92	986.43		_
							Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	5598.52	(98)
Space heating	a require	ement in	k\\/h/m²	2/voor							Ī		= (00)
	grogani	CITICITE III	KVVII/III	/yeai								76.41	(99)
·	• .				vstems i	ncluding	micro-C	HP)				76.41	<u> </u>
9a. Energy re	quiremer				ystems i	ncluding	micro-C	HP)				76.41	(aa)
·	quiremer	nts – Indi	vidual h	eating s				CHP)				76.41	
9a. Energy red Space heati	quiremer ng: pace hea	nts – Indi at from se	vidual h	eating s		system		, in the second					(201
9a. Energy red Space heati Fraction of space fra	quiremerng: pace head	nts – Indi at from se at from m	vidual h econdary	eating sy y/supple em(s)		system		- (201) =	(203)] =			0	(201
9a. Energy rec Space heati Fraction of space of space of space of the fraction of to	quirements ng: pace head pace head tal heati	nts – Indi at from se at from m ng from i	ividual h econdary nain syst main sys	eating sy/supple em(s) stem 1		system	(202) = 1 -	- (201) =	(203)] =			0 1 1	(201)
9a. Energy rec Space heati Fraction of s Fraction of s Fraction of to Efficiency of	quirement ng: pace hea pace hea patal heati main spa	nts – Indi at from se at from m ng from i ace heati	vidual hecondary nain systemain syst	eating syysupple em(s) stem 1	mentary	system	(202) = 1 -	- (201) =	(203)] =			0 1 1 88.8	(201 (202 (204 (206
9a. Energy rec Space heati Fraction of space fraction of to Efficiency of	quirement ng: pace hea pace hea pace hea stal heati main spa seconda	nts – Indi	econdary nain systemain systemain systemain systematory	eating syysupple em(s) stem 1 em 1	mentary	system	(202) = 1 - (204) = (2	- (201) = 02) × [1 –				0 1 1 88.8 0	(201 (202 (204 (206 (208
9a. Energy rec Space heati Fraction of sp Fraction of to Efficiency of Efficiency of Jan	quirement ng: pace hea pace hea stal heati main spa seconda	at from set from ming from inace heating/supplement	vidual h econdary nain syst main sys ing syste ementar Apr	eating sy/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 -	- (201) =	(203)] =	Nov	Dec	0 1 1 88.8	(201 (202 (204 (206 (208
9a. Energy recomplete Space heating Fraction of space fraction of to Efficiency of Efficiency of Space heating Spa	quirement ng: pace heat pace heat stal heati main spa seconda Feb	nts – Indi at from se at from m ng from i ace heati ry/supple Mar ement (c	econdary nain systemain systemain systementar Apr alculate	eating syysupple em(s) stem 1 em 1 y heating May d above	mentary g system Jun	system 1, % Jul	(202) = 1 - (204) = (2	- (201) = 02) × [1 –	Oct			0 1 1 88.8 0	(201 (202 (204 (206 (208
9a. Energy rec Space heati Fraction of sp Fraction of to Efficiency of Efficiency of Jan Space heatir 1007.77	quirement ng: pace heat pace heat tal heati main spates secondar reb	at from set at from many from the ace heating many/supplement (controller)	econdary nain systemain systementar Apr alculated	eating syysupple em(s) stem 1 em 1 y heating May d above 294.23	mentary g system Jun	system	(202) = 1 - (204) = (2	- (201) = 02) × [1 –		Nov 723.92	Dec 986.43	0 1 1 88.8 0	(201 (202 (204 (206 (208
9a. Energy rec Space heati Fraction of sp Fraction of to Efficiency of Efficiency of Jan Space heatir 1007.77	puirement pace head pace h	at from set from many from it ace heating ry/supplement (compared to 1774.47	econdary nain systemain systementar Apr alculated	eating syysupple em(s) stem 1 em 1 y heating May d above 294.23	mentary g system Jun	system 1, % Jul	(202) = 1 - (204) = (2	- (201) = 02) × [1 –	Oct	723.92		0 1 1 88.8 0	(201 (202 (204 (206 (208 ar
9a. Energy rec Space heati Fraction of sp Fraction of to Efficiency of Efficiency of Jan Space heatir 1007.77	puirement pace hea pace hea pace hea patal heati main spa seconda Feb g require 842.07	at from set at from many from the ace heating many/supplement (controller)	econdary nain systemain systementar Apr alculated	eating syysupple em(s) stem 1 em 1 y heating May d above 294.23	mentary g system Jun	system 1, % Jul	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - Sep 0	Oct 462.84 521.22	723.92 815.22	986.43	0 1 1 88.8 0	(201) (202) (204) (206) (208) ar
9a. Energy recompany space heating fraction of space fraction of the efficiency of t	puirement pace hea pace hea pace hea patal heati main spa seconda Feb g require 842.07	at from set from many from it ace heating ry/supplement (compared to 1774.47	econdary nain systemain systementar Apr alculated 506.79	eating sy/supplemem(s) stem 1 em 1 y heating May d above 294.23	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - Sep 0	Oct 462.84 521.22	723.92	986.43	0 1 1 88.8 0	(201) (202) (204) (206) (208) ar
9a. Energy recomplete Space heating Fraction of space fraction of the Efficiency of Efficiency of Space heating 1007.77	puirement page head pace head pace head pace head patal heati main spa seconda Feb g require 842.07 8)m x (20 948.27	at from set from many from the ace heating many supplement (control of the front from the front from the front front from the front	econdary nain systemain systementar Apr alculatee 506.79 00 ÷ (20 570.71	eating sy/supple em(s) stem 1 em 1 y heating May d above 294.23	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - Sep 0	Oct 462.84 521.22	723.92 815.22	986.43	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) ar
9a. Energy recomplete Space heating Fraction of space fraction of the Efficiency of Efficiency of Space heating 1007.77 (211)m = {[(98) m x (20) m m m m m m m m m m m m m m m m m m m	puirement of the property of t	at from set from many from in the set of the	econdary nain systemain systematar Apr alculatee 506.79 00 ÷ (20 570.71	eating sy/supple em(s) stem 1 em 1 y heating May d above 294.23 06) 331.34	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - Sep 0	Oct 462.84 521.22 ar) =Sum(2	723.92 815.22 211) _{15,10. 12}	986.43	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) ar
9a. Energy recomplete Space heating Fraction of space fraction of the Efficiency of Efficiency of Space heating 1007.77 (211)m = {[(98) m x (20) m m m m m m m m m m m m m m m m m m m	puirement of the property of t	at from set at from many from in the secondary set of the secondary secondary set of the secondary	econdary nain systemain systematrar Apr alculated 506.79 00 ÷ (20 570.71	eating sy/supple em(s) stem 1 em 1 y heating May d above 294.23	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 02) × [1 - 02] 0 0 0 (kWh/yea	Oct 462.84 521.22 ar) =Sum(2	723.92 815.22 211) _{15,10. 12}	986.43	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) ar (211)
9a. Energy recomplete Space heating Fraction of space fraction of the Efficiency of Efficiency of Space heating 1007.77 (211)m = {[(98) m x (20) m m m m m m m m m m m m m m m m m m m	puirement pace head pace h	at from set from many from in the set of the	econdary nain systemain systematar Apr alculatee 506.79 00 ÷ (20 570.71	eating sy/supple em(s) stem 1 em 1 y heating May d above 294.23 06) 331.34	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - Sep 0 I (kWh/yea	Oct 462.84 521.22 ar) =Sum(2	723.92 815.22 211) _{15,10. 12}	986.43	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) ar
9a. Energy recomplete Space heating Fraction of space heating Fraction of to Efficiency of Efficiency of Incomplete Space heating Incomplete Space	puirement pace head pace h	at from set at from many from in the set of	econdary nain systemain systemain systementar Apr alculated 506.79 00 ÷ (20 570.71 y), kWh/8) 0	eating sy/supple em(s) stem 1 em 1 y heating dabove 294.23 06) 331.34 month	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - Sep 0 I (kWh/yea	Oct 462.84 521.22 ar) =Sum(2	723.92 815.22 211) _{15,10. 12}	986.43	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) ar (211)
9a. Energy recompanies Space heating Fraction of space fraction of to the Efficiency of Efficiency	puirement page pace head p	at from set from ming from in ace heating ry/supplement (c 774.47 47)] } x 1 872.15 econdary 00 ÷ (20 0	econdary nain systemain systematic Apr alculated 506.79 00 ÷ (20 570.71 y), kWh/ 8) 0	eating sy/supple em(s) stem 1 em 1 y heating May d above 294.23 06) 331.34 emonth 0	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - Sep 0 I (kWh/yea	Oct 462.84 521.22 ar) =Sum(2	723.92 815.22 211) _{15,10. 12} 0	986.43	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208) ar
9a. Energy recomplete Space heating Fraction of space heating Fraction of to Efficiency of Efficiency of Incomplete Space heating Incomplete Space	puirement ng: Dace head Da	at from set at from many f	econdary nain systemain systemain systementar Apr alculated 506.79 00 ÷ (20 570.71 y), kWh/8) 0	eating sy/supple em(s) stem 1 em 1 y heating dabove 294.23 06) 331.34 month	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - Sep 0 I (kWh/yea	Oct 462.84 521.22 ar) =Sum(2	723.92 815.22 211) _{15,10. 12}	986.43	0 1 1 88.8 0 kWh/ye	(201) (202) (204) (206) (208)

			1	1	1		•	
(217)m= 87.14 87.08 86.9 86.4 85.38 7	79.5 79.5	79.5	79.5	86.15	86.81	87.14		(217)
Fuel for water heating, kWh/month								
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 224.78 196.49 204.86 182.75 179.04 10	69.36 162.26	180.88	182.88	192.18	203.58	219.49		
	<u> </u>	Tota	I = Sum(2	19a) ₁₁₂ =	ļ	l	2298.55	(219)
Annual totals				k\	Wh/yeaı	r	kWh/year	J`
Space heating fuel used, main system 1					•		6304.64]
Water heating fuel used							2298.55	Ī
Electricity for pumps, fans and electric keep-hot								_
central heating pump:						120		(230c)
		eum	of (230a)	(230g) =		120	400	
Total electricity for the above, kWh/year		Suili	01 (230a)	(230g) –			120	(231)
Electricity for lighting							628.21	(232)
12a. CO2 emissions – Individual heating systems	s including mi	cro-CHF						
	Energy			Emiss	ion fac	tor	Emissions	
	kWh/year			kg CO	2/kWh		kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	1361.8	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	496.49	(264)
Space and water heating	(261) + (262)	+ (263) + ((264) =				1858.29	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	62.28	(267)
Electricity for lighting	(232) x			0.5	19	=	326.04	(268)
Total CO2, kg/year			sum o	of (265) (2	271) =		2246.61	(272)
Dwelling CO2 Emission Rate			(272)	÷ (4) =			30.66	(273)
El rating (section 14)							75	(274)

			User D	etails:						
Assessor Name:	Chris Hockne	-		Strom					016363	
Software Name:	Stroma FSAF			Softwa				Versic	on: 1.0.4.10	
	Ll.: 5 40 40 h			Address	Unit 5-	Part L1	3			
Address: 1. Overall dwelling dim	Unit 5, 40-42 N	VIII Lane, Lon	don, NV	/6 1NR						
1. Overall dwelling diff	iensions.		Δre	a(m²)		Δν Ηρ	ight(m)		Volume(m ³	2)
Ground floor					(1a) x		2.6	(2a) =	213.75	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1c	d)+(1e)+(1r	n)	32.21	(4)			_		
Dwelling volume	, , , , , ,	, , , , ,	·)+(3c)+(3c	l)+(3e)+	.(3n) =	213.75	(5)
2. Ventilation rate:										
2. 70/11/10/10/17/10/0	main heating	secondar heating	Y	other		total			m³ per hou	r
Number of chimneys	0	+ 0	7 + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	Ī + Ē	0	Ī - Ē	0	x2	20 =	0	(6b)
Number of intermittent t	ans					3	x -	10 =	30	(7a)
Number of passive vent	s				Ē	0	x '	10 =	0	(7b)
Number of flueless gas	fires				Ē	0	X 4	40 =	0	(7c)
					_					
					_				nanges per ho	_
Infiltration due to chimn	=					30		÷ (5) =	0.14	(8)
If a pressurisation test has Number of storeys in		intenaea, procee	a to (17), (otnerwise (continue tr	om (9) to	(16)			(9)
Additional infiltration	the dwelling (113)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or tir	mber frame or	0.35 fo	r masoni	v constr	uction	[(0)		0	(11)
if both types of wall are					•					()
deducting areas of open										_
If suspended wooder	•	•	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e									0	(13)
Percentage of window Window infiltration	ws and doors drau	ignt stripped		0.25 - [0.2	v (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)	. ,	-	+ (15) =		0	(15)
Air permeability value	a a50 everessed	in cuhic metre						area	0	(16)
If based on air permeat	•		•	-	•	Curc or c	rivelope	arca	0.89	(17)
Air permeability value appl	=					is being u	sed		0.00	(.0)
Number of sides shelter	red								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor	r		(21) = (18) x (20) =				0.76	(21)
Infiltration rate modified	for monthly wind	speed							_	
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7	7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (
(22a)m= 1.27 1.25	 	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	1	
1.27		55 0.00	L 5.55	1 3.02		L '	_ ''_	L ''	J	

1.06	Adjusted infiltr	ation rate (a	allowii	ng for sh	ielter an	d wind s	peed) =	(21a) x	(22a)m					
	0.96	0.95 0	0.93	0.83	0.81	0.72	0.72	0.7	0.76	0.81	0.85	0.89		
If exhaust air heat pump using Appendix N, (28b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)			_	ate for t	he appli	cable ca	se	•		•		•		
It balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =				endix N (2	3h) = (23a	a) x Fmv (e	equation (I	N5)) othe	nwise (23h) = (23a)				===
a) If balanced mechanical ventiliation 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 0 0 0 0 0 0										(200)				
24a)m			-	-	_					2h\m + (23h) x [[,]	1 _ (23c)		(230)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)	· ·			1			- ` ` 	- 	ŕ	<u> </u>		```]	(24a)
C4b m=	` '	l l	cal ve	ntilation	without	heat rec	covery (N	ЛV) (24h	l = (2)	2b)m + (;	23h)		J	, ,
Fig (22b)	· ·							- 	``	r `		0		(24b)
Fig (22b)		ouse extrac	ct ven	tilation c	r positiv	/e input v	ventilatio	on from o	utside			<u> </u>	l	
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] (24d)m = 0.97	,				•	•				.5 × (23b)			
Fig (22b) m = 1, then (24d) m = (22b) m otherwise (24d) m = 0.5 + [(22b) m² x 0.5] Cadd m = 0.97	(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
C24d)m=	,				•	•				_				
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)ms 0.97 0.95 0.93 0.85 0.83 0.76 0.76 0.75 0.79 0.83 0.86 0.9 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	<u>``</u>		Ť	<u> </u>		· `				-			1	(0.4.1)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings area (m²)	` ′	<u> </u>						<u> </u>		0.83	0.86	0.9		(24d)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings area (m²) Net Area (W/m2k (W/K) kJ/m²-K (kJ/k² (W/K) kJ/m²-K (W/K) kJ/m²-K (W/K) kJ/m²-K (W/K) (W/K) (W/K) (W/K) (W/K) (W/K) (W/K) (W/K) (W/K) (W/		~~~		`	, ,	´`	´`	- 	`				1	
ELEMENT Gross area (m²) Openings area (m²) Net Area A , m² U-value W/m2K A X U (W/K) k-value kJ/m²-K A X k kJ/lK Doors 2	(25)m= 0.97	0.95 0	0.93	0.85	0.83	0.76	0.76	0.75	0.79	0.83	0.86	0.9		(25)
A m A m	3. Heat losse	s and heat	loss p	aramete	er:									
Windows Type 1 1.35	ELEMENT		²)								〈)			
Windows Type 2 1.35 x1/[1/(4.8) + 0.04] = 5.44 (27) Windows Type 3 1.35 x1/[1/(4.8) + 0.04] = 5.44 (27) Windows Type 4 2.66 x1/[1/(4.8) + 0.04] = 10.71 (27) Windows Type 5 0.72 x1/[1/(4.8) + 0.04] = 1.21 (27) Windows Type 6 1.35 x1/[1/(1.8) + 0.04] = 1.21 (27) Windows Type 6 1.35 x1/[1/(1.8) + 0.04] = 2.27 (27) Walls Type 1 52.72 8.06 44.66 x 0.3 = 13.4 (29) Walls Type 2 19.71 2.07 17.64 x 0.28 = 4.94 (29) Walls Type 3 18.72 2 16.72 x 0.27 = 4.48 (29) Walls Type 3 18.72 2 16.72 x 0.27 = 4.48 (29) Walls Type 3 18.72 2 16.72 x 0.27 = 4.48 (30) Total area of elements, m² 116.55 (31) Party wall 30.66 x 0 = 0 (32) Party floor 82.21 Party ceiling *for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 **include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = (32) (32) (32) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm + TFA) in kJ/m²K	Doors					2	х	3	=	6				(26)
Windows Type 3 1.35	Windows Type	e 1				1.35	x1	/[1/(4.8)+	0.04] =	5.44				(27)
Windows Type 4 2.66	Windows Type	e 2				1.35	x1	/[1/(4.8)+	0.04] =	5.44	=			(27)
Windows Type 5 Windows Type 6 1.35 x1/[1/(1.8) + 0.04] = 1.21 (27) Walls Type 1 52.72 8.06 44.66 x 0.3 = 13.4 (29) Walls Type 2 19.71 2.07 17.64 x 0.28 = 4.94 (29) Walls Type 3 18.72 2 16.72 x 0.27 = 4.48 (29) Walls Type 3 18.72 2 16.72 x 0.27 = 4.48 (29) Walls Type 3 18.72 2 16.72 x 0.27 = 4.48 (30) Total area of elements, m² 116.55 (31) Party wall 30.66 x 0 = 0 (32) Party ceiling * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = (69.32 (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) 14861.9 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)	Windows Type	e 3				1.35	x1	/[1/(4.8)+	0.04] =	5.44				(27)
Windows Type 6 1.35 x1/[1/(1.8) + 0.04] = 2.27 (27)	Windows Type	e 4				2.66	x1	/[1/(4.8)+	0.04] =	10.71				(27)
Windows Type 6 1.35 x1/[1/(1.8) + 0.04] = 2.27 (27)	Windows Type	e 5				0.72	x1	/[1/(1.8)+	0.04] =	1.21				(27)
Walls Type1 52.72 8.06 44.66 x 0.3 = 13.4 (29) Walls Type2 19.71 2.07 17.64 x 0.28 = 4.94 (29) Walls Type3 18.72 2 16.72 x 0.27 = 4.48 (29) Roof 25.4 0 25.4 x 0.18 = 4.57 (30) Total area of elements, m² (116.55) (31) Party wall 30.66 x 0 = 0 (32) Party floor 82.21 (32a) Party ceiling 56.82 (32b) * for windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 *** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 69.32 (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm + TFA) in kJ/m²K Indicative Value: Medium 250 (35)	Windows Type	e 6				1.35	x1	/[1/(1.8)+	0.04] =	2.27				(27)
Walls Type2	Walls Type1	52.72		8.06		44.66	3 x	0.3	─	13.4				(29)
Walls Type3 18.72 2 16.72 x 0.27 = 4.48 (29) Roof 25.4 0 25.4 x 0.18 = 4.57 (30) Total area of elements, m² 116.55 (31) Party wall 30.66 x 0 = 0 (32) Party floor 82.21 (32a) Party ceiling 56.82 (32b) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 *** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = (69.32) (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm + TFA) in kJ/m²K Indicative Value: Medium 250 (35)	Walls Type2	19.71	Ħ	2.07		17.64	x	0.28	=	4.94	=			(29)
Roof	Walls Type3	18.72	Ħ	2		16.72	<u>x</u>	0.27	=	4.48	=			(29)
Total area of elements, m²	Roof	25.4	Ħ	0		25.4	×	0.18	_ :	4.57	=		= =	
Party wall $30.66 \times 0 = 0 \qquad (32)$ Party floor $82.21 \qquad (32a)$ Party ceiling $56.82 \qquad (32b)$ * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 *** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) $(26) (30) + (32) = 69.32 (33)$ Heat capacity Cm = S(A x k) $((28) (30) + (32) + (32a) (32e) = 14861.9 (34)$ Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium $250 (35)$	Total area of e		 ²			116.5	5							
Party floor 82.21 (32a) Party ceiling 56.82 (32b) * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 *** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 69.32 (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)	Party wall					30.66	x	0		0				
Party ceiling 56.82 [32b) * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 *** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 69.32 (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)	•						_						7 F	
* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 69.32 (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)	•												7 F	
Fabric heat loss, W/K = S (A x U) (26) $(30) + (32) =$ 69.32 (33) Heat capacity Cm = S(A x k) ((28) $(30) + (32) + (32a)$ (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)	* for windows and					alue calcul		g formula 1	/[(1/U-valu	ıe)+0.04] a	L s given in	paragraph		()
Heat capacity Cm = S(A x k) $ ((28) (30) + (32) + (32a) (32e) = 14861.9 $ Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 (35)					o anu pan			(26) (30)) + (32) =				60 33	(33)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m^2K Indicative Value: Medium 250 (35)			•	-,						(30) + (32	2) + (32a)	(32e) =		
		•	•) = Cm ÷	· TFA) ir	n kJ/m²K				, , ,	, , ,	/		
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f		•	•		,			ecisely the				able 1f		(00)

can be used instead Thermal bridge				ısina Δn	nendiy l	<i>(</i>						47.40	(36)
if details of therma	,	,			•	`						17.48	(30)
Total fabric he		are not no	om (00) -	- 0.70 X (0	• /			(33) +	(36) =			86.8	(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= 68.11	66.83	65.58	59.71	58.61	53.5	53.5	52.55	55.47	58.61	60.83	63.16		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m	•	•	
(39)m= 154.91	153.63	152.38	146.51	145.41	140.3	140.3	139.35	142.27	145.41	147.64	149.96		
Heat loss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	` '	12 /12=	146.51	(39)
(40)m= 1.88	1.87	1.85	1.78	1.77	1.71	1.71	1.7	1.73	1.77	1.8	1.82		
Number of day	e in mo	oth (Tab	lo 1a)					,	Average =	Sum(40) ₁	₁₂ /12=	1.78	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
, ,		<u> </u>							<u> </u>			J	
4. Water heat	ting ener	rav regui	irement:								kWh/y	ear:	
	Ţ.											1	(40)
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		2.5	l	(42)
Annual averag	•	ater usaç	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		93	3.66]	(43)
Reduce the annua not more that 125	_				_	_	to achieve	a water us	se target o	f		4	
					<u> </u>	·	A	Con	Oat	Nov	Dag	1	
Jan Hot water usage ii	Feb n litres per	Mar day for ea	Apr ach month	May Vd,m = fa	Jun ctor from 7	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec	J	
(44)m= 103.02	99.28	95.53	91.78	88.04	84.29	84.29	88.04	91.78	95.53	99.28	103.02]	
` /	<u> </u>	<u> </u>	ļ		<u> </u>	<u> </u>	ļ	-	I Total = Su	<u>l</u> m(44) _{1 12} =		1123.89	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 152.78	133.62	137.89	120.21	115.35	99.54	92.23	105.84	107.1	124.82	136.25	147.96		_
If instantaneous w	vater heatii	na at noint	of use (no	hot water	r storage)	enter () in	hoves (46		Total = Su	m(45) _{1 12} =	=	1473.59	(45)
(46)m= 22.92	20.04	20.68	18.03	17.3	14.93	13.84	15.88	16.07	18.72	20.44	22.19	1	(46)
Water storage	l	20.00	10.03	17.3	14.93	13.04	13.00	10.07	10.72	20.44	22.19		(40)
Storage volum	e (litres)) includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0]	(47)
If community h	eating a	ınd no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
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	nee facti	or is kno	wn (k\//h	n/day).					0	1	(48)
Temperature f) 13 KHO	vvii (icvvi	irday).					0]]	
Energy lost fro				ear			(48) x (49)) =			0]]	(49) (50)
b) If manufact		_	-		or is not	known:	(10) X (+0)	•			U	J	(50)
Hot water stora	-			e 2 (kW	h/litre/da	ıy)					0]	(51)
If community he Volume factor	_		on 4.3									1	(EQ)
Temperature factor			2b							-	0		(52) (53)
			-									J	(55)

Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (Water storage	. , .	•	or each	month			((56)m = ((55) × (41)r	m		0		(55)
	0	0	0	0	0	0	0	0	0	0	0		(56)
(56)m= 0 If cylinder contains		_				_		-				ix H	(30)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
		<u> </u>							Ů		ļ		` '
Primary circuit	•	,			E0\m = /	(EQ) + 26	E ~ (44)				0		(58)
Primary circuit (modified by				•	,	` '	` '		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					l	
(61)m= 50.96	45.69	48.68	45.26	44.86	41.57	42.95	44.86	45.26	48.68	48.96	50.96		(61)
Total heat regi	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= 203.74		186.57	165.48	160.21	141.1	135.19	150.7	152.37	173.5	185.21	198.92		(62)
Solar DHW input	calculated [,]	using Appr	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	on to wate	r heating)	l	
(add additiona													
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter						!				'	
(64)m= 203.74	179.32	186.57	165.48	160.21	141.1	135.19	150.7	152.37	173.5	185.21	198.92		
						ı	Outp	out from wa	ater heater	r (annual)₁	12	2032.3	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	า] + 0.8 x	(46)m	+ (57)m	+ (59)m	1	
(65)m= 63.54	55.85	58.02	51.29	49.57	43.49	41.41	46.41	46.93	53.67	57.54	61.94	_	(65)
include (57)	m in calc	culation c	of (65)m	only if c	ylinder i	s in the o	dwellina	or bot w	-1:- £-		·	40	
5. Internal ga	ains (see	Table F		=				OI HOLW	ater is tr	om com	munity n	eating	
Metabolic gain		l able o	and 5a):				OI HOLW	ater is ir	om com	munity n	eating	
Jan	s (Table):				OI HOLW	ater is tr	om com	munity n	leating	
(00)	s (Table Feb): May	Jun	Jul	Aug	Sep	Oct	om com	Dec	eating	
(66)m= 125.17	Feb	5), Watt	ts	I	Jun 125.17						,	eating	(66)
(66)m= 125.17 Lighting gains	Feb 125.17	5), Watt Mar 125.17	ts Apr 125.17	May 125.17	125.17	Jul 125.17	Aug 125.17	Sep 125.17	Oct	Nov	Dec	eating	(66)
` ′	Feb 125.17	5), Watt Mar 125.17	ts Apr 125.17	May 125.17	125.17	Jul 125.17	Aug 125.17	Sep 125.17	Oct	Nov	Dec	eating	(66) (67)
Lighting gains (67)m= 36.68	Feb 125.17 (calculat 32.58	e 5), Watt Mar 125.17 ted in Ap	Apr 125.17 ppendix 20.06	May 125.17 L, equati	125.17 on L9 o	Jul 125.17 r L9a), a 13.68	Aug 125.17 Iso see	Sep 125.17 Table 5 23.86	Oct 125.17	Nov 125.17	Dec 125.17	eating	
Lighting gains	Feb 125.17 (calculat 32.58	e 5), Watt Mar 125.17 ted in Ap	Apr 125.17 ppendix 20.06	May 125.17 L, equati	125.17 on L9 o	Jul 125.17 r L9a), a 13.68	Aug 125.17 Iso see	Sep 125.17 Table 5 23.86	Oct 125.17	Nov 125.17	Dec 125.17	eating	
Lighting gains (67)m= 36.68 Appliances ga (68)m= 224	Feb 125.17 (calculat 32.58 ins (calculat 226.32	125.17 ted in Ap 26.5 ulated in	Apr 125.17 ppendix 20.06 Append 207.99	May 125.17 L, equati 14.99 dix L, eq 192.25	125.17 fon L9 of 12.66 uation L	Jul 125.17 r L9a), a 13.68 13 or L1	Aug 125.17 Iso see 17.78 3a), also	Sep 125.17 Table 5 23.86 See Tal 171.11	Oct 125.17 30.3 ble 5 183.58	Nov 125.17 35.37	Dec 125.17	eating	(67)
Lighting gains (67)m= 36.68 Appliances ga	Feb 125.17 (calculat 32.58 ins (calculat 226.32	125.17 ted in Ap 26.5 ulated in	Apr 125.17 ppendix 20.06 Append 207.99	May 125.17 L, equati 14.99 dix L, eq 192.25	125.17 fon L9 of 12.66 uation L	Jul 125.17 r L9a), a 13.68 13 or L1	Aug 125.17 Iso see 17.78 3a), also	Sep 125.17 Table 5 23.86 See Tal 171.11	Oct 125.17 30.3 ble 5 183.58	Nov 125.17 35.37	Dec 125.17	eating	(67)
Lighting gains (67)m= 36.68 Appliances ga (68)m= 224 Cooking gains (69)m= 35.52	Feb 125.17 (calculat 32.58 ins (calculat 226.32 (calculat 35.52	26.5 Watted in Ap 26.5 wlated in Ap 220.46 tted in Ap 35.52	Apr 125.17 opendix 20.06 Append 207.99 opendix 35.52	May 125.17 L, equati 14.99 dix L, equati 192.25 L, equat	125.17 on L9 of 12.66 uation L 177.46 ion L15	Jul 125.17 r L9a), a 13.68 13 or L1 167.58 or L15a	Aug 125.17 Iso see 17.78 3a), also 165.25	Sep 125.17 Table 5 23.86 2 see Tal 171.11	Oct 125.17 30.3 ole 5 183.58 5	Nov 125.17 35.37	Dec 125.17 37.7 214.11	eating	(67) (68)
Lighting gains (67)m= 36.68 Appliances ga (68)m= 224 Cooking gains	Feb 125.17 (calculat 32.58 ins (calculat 226.32 (calculat 35.52	26.5 Watted in Ap 26.5 wlated in Ap 220.46 tted in Ap 35.52	Apr 125.17 opendix 20.06 Append 207.99 opendix 35.52	May 125.17 L, equati 14.99 dix L, equati 192.25 L, equat	125.17 on L9 of 12.66 uation L 177.46 ion L15	Jul 125.17 r L9a), a 13.68 13 or L1 167.58 or L15a	Aug 125.17 Iso see 17.78 3a), also 165.25	Sep 125.17 Table 5 23.86 2 see Tal 171.11	Oct 125.17 30.3 ole 5 183.58 5	Nov 125.17 35.37	Dec 125.17 37.7 214.11	eating	(67) (68)
Lighting gains (67)m= 36.68 Appliances ga (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fail (70)m= 10	Feb 125.17 (calculat 32.58 ins (calculat 226.32 (calculat 35.52 ns gains 10	ted in Ap 26.5 ulated in Ap 25.46 tted in Ap 35.52 (Table 5	Apr 125.17 opendix 20.06 Append 207.99 opendix 35.52 5a)	May 125.17 L, equati 14.99 dix L, equ 192.25 L, equat 35.52	125.17 fon L9 of 12.66 uation L 177.46 ion L15 35.52	Jul 125.17 r L9a), a 13.68 13 or L1 167.58 or L15a) 35.52	Aug 125.17 Iso see 17.78 3a), also 165.25), also se 35.52	Sep 125.17 Table 5 23.86 See Tal 171.11 ee Table 35.52	Oct 125.17 30.3 ble 5 183.58 5 35.52	Nov 125.17 35.37 199.32	Dec 125.17 37.7 214.11	eating	(67) (68) (69)
Lighting gains (67)m= 36.68 Appliances ga (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fall	Feb 125.17 (calculat 32.58 ins (calculat 226.32 (calculat 35.52 ns gains 10 vaporatio	125.17 ted in Ap 26.5 ulated in 220.46 ted in Ap 35.52 (Table 5	Apr 125.17 opendix 20.06 Append 207.99 opendix 35.52 5a)	May 125.17 L, equati 14.99 dix L, equ 192.25 L, equat 35.52	125.17 fon L9 of 12.66 uation L 177.46 ion L15 35.52	Jul 125.17 r L9a), a 13.68 13 or L1 167.58 or L15a) 35.52	Aug 125.17 Iso see 17.78 3a), also 165.25), also se 35.52	Sep 125.17 Table 5 23.86 See Tal 171.11 ee Table 35.52	Oct 125.17 30.3 ble 5 183.58 5 35.52	Nov 125.17 35.37 199.32	Dec 125.17 37.7 214.11	eating	(67) (68) (69)
Lighting gains (67)m= 36.68 Appliances ga (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fai (70)m= 10 Losses e.g. ev (71)m= -100.14	Feb 125.17 (calculat 32.58 ins (calculat 226.32 (calculat 35.52 ns gains 10 raporatio -100.14	125.17 ted in Ap 26.5 ulated in Ap 35.52 (Table 5 10 on (negat -100.14	Apr 125.17 ppendix 20.06 Append 207.99 ppendix 35.52 5a) 10	May 125.17 L, equati 14.99 dix L, equati 192.25 L, equati 35.52 10 es) (Tab	125.17 on L9 of 12.66 uation L 177.46 ion L15 35.52 10 le 5)	Jul 125.17 r L9a), a 13.68 13 or L1 167.58 or L15a) 35.52	Aug 125.17 Iso see 17.78 3a), also 165.25), also se 35.52	Sep 125.17 Table 5 23.86 See Tal 171.11 ee Table 35.52	Oct 125.17 30.3 cole 5 183.58 5 35.52	Nov 125.17 35.37 199.32 35.52	Dec 125.17 37.7 214.11 35.52	eating	(67) (68) (69) (70)
Lighting gains (67)m= 36.68 Appliances ga (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fail (70)m= 10 Losses e.g. ev (71)m= -100.14 Water heating	Feb 125.17 (calculat 32.58 ins (calculat 226.32 (calculat 35.52 ns gains 10 raporatio -100.14 gains (T	125.17 ted in Ap 26.5 ulated in Ap 35.52 (Table 5 10 on (negat -100.14	Apr 125.17 ppendix 20.06 Append 207.99 ppendix 35.52 5a) 10	May 125.17 L, equati 14.99 dix L, equati 192.25 L, equati 35.52 10 es) (Tab	125.17 on L9 of 12.66 uation L 177.46 ion L15 35.52 10 le 5)	Jul 125.17 r L9a), a 13.68 13 or L1 167.58 or L15a) 35.52	Aug 125.17 Iso see 17.78 3a), also 165.25), also se 35.52	Sep 125.17 Table 5 23.86 See Tal 171.11 ee Table 35.52	Oct 125.17 30.3 cole 5 183.58 5 35.52	Nov 125.17 35.37 199.32 35.52	Dec 125.17 37.7 214.11 35.52	eating	(67) (68) (69) (70)
Lighting gains (67)m= 36.68 Appliances ga (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fai (70)m= 10 Losses e.g. ev (71)m= -100.14 Water heating (72)m= 85.4	Feb 125.17 (calculat 32.58 ins (calculat 226.32 (calculat 35.52 ns gains 10 raporatio -100.14 gains (T 83.11	125.17 ted in Ap 26.5 ulated in Ap 35.52 (Table 5 10 in (negat -100.14 able 5) 77.98	Apr 125.17 opendix 20.06 Append 207.99 opendix 35.52 oa) 10 tive valu	May 125.17 L, equati 14.99 dix L, equ 192.25 L, equat 35.52 10 es) (Tab	125.17 on L9 of 12.66 uation L 177.46 ion L15 35.52 10 le 5) -100.14	Jul 125.17 r L9a), a 13.68 13 or L1 167.58 or L15a) 35.52	Aug 125.17 Iso see 17.78 3a), also 165.25), also se 35.52	Sep 125.17 Table 5 23.86 See Tal 171.11 ee Table 35.52 10	Oct 125.17 30.3 ole 5 183.58 5 35.52 10 -100.14	Nov 125.17 35.37 199.32 35.52 10 -100.14	Dec 125.17 37.7 214.11 35.52 10 -100.14 83.25	eating	(67) (68) (69) (70) (71)
Lighting gains (67)m= 36.68 Appliances ga (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fait (70)m= 10 Losses e.g. ev (71)m= -100.14 Water heating (72)m= 85.4 Total internal	Feb 125.17 (calculat 32.58 ins (calculat 226.32 (calculat 35.52 ns gains 10 vaporatio -100.14 gains (T 83.11 gains =	125.17 ted in Ap 26.5 ulated in 220.46 ted in Ap 35.52 (Table 5 10 on (negat -100.14 Table 5) 77.98	Apr 125.17 opendix 20.06 Append 207.99 opendix 35.52 oa) 10 tive valu	May 125.17 L, equati 14.99 dix L, equ 192.25 L, equat 35.52 10 es) (Tab	125.17 on L9 of 12.66 uation L 177.46 ion L15 35.52 10 le 5) -100.14	Jul 125.17 r L9a), a 13.68 13 or L1 167.58 or L15a) 35.52 10 -100.14	Aug 125.17 Iso see 17.78 3a), also 165.25), also se 35.52 10 -100.14	Sep 125.17 Table 5 23.86 See Tal 171.11 ee Table 35.52 10 -100.14 65.18 + (69)m + (Oct 125.17 30.3 ble 5 183.58 5 35.52 10 -100.14 72.14 70)m + (7	Nov 125.17 35.37 199.32 35.52 10 -100.14 79.92 1)m + (72)	Dec 125.17 37.7 214.11 35.52 10 -100.14 83.25 m	eating	(67) (68) (69) (70) (71) (72)
Lighting gains (67)m= 36.68 Appliances ga (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fai (70)m= 10 Losses e.g. ev (71)m= -100.14 Water heating (72)m= 85.4 Total internal	Feb 125.17 (calculat 32.58 ins (calculat 226.32 (calculat 35.52 ns gains 10 raporatio -100.14 gains (T 83.11 gains =	125.17 ted in Ap 26.5 ulated in Ap 35.52 (Table 5 10 in (negat -100.14 able 5) 77.98	Apr 125.17 ppendix 20.06 Appendix 207.99 opendix 35.52 5a) 10 tive valu -100.14	May 125.17 L, equati 14.99 dix L, equati 192.25 L, equati 35.52 10 es) (Tab -100.14	125.17 fon L9 of 12.66 uation L 177.46 ion L15 35.52 10 le 5) -100.14 60.4 (66)	Jul 125.17 r L9a), a 13.68 13 or L1 167.58 or L15a) 35.52	Aug 125.17 Iso see 17.78 3a), also 165.25), also se 35.52	Sep 125.17 Table 5 23.86 See Tal 171.11 ee Table 35.52 10	Oct 125.17 30.3 ole 5 183.58 5 35.52 10 -100.14	Nov 125.17 35.37 199.32 35.52 10 -100.14	Dec 125.17 37.7 214.11 35.52 10 -100.14 83.25	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 Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.35	x	11.28	x	0.85	x	0.7	=	6.28	(75)
Northeast 0.9x	0.77	x	1.35	x	22.97	x	0.85	x	0.7	=	12.78	(75)
Northeast 0.9x	0.77	x	1.35	x	41.38	x	0.85	x	0.7	=	23.03	(75)
Northeast 0.9x	0.77	x	1.35	x	67.96	x	0.85	x	0.7	=	37.83	(75)
Northeast 0.9x	0.77	x	1.35	x	91.35	X	0.85	x	0.7	=	50.85	(75)
Northeast 0.9x	0.77	x	1.35	x	97.38	x	0.85	x	0.7	=	54.21	(75)
Northeast 0.9x	0.77	x	1.35	x	91.1	x	0.85	x	0.7	=	50.71	(75)
Northeast 0.9x	0.77	x	1.35	x	72.63	x	0.85	x	0.7	=	40.43	(75)
Northeast 0.9x	0.77	x	1.35	x	50.42	x	0.85	x	0.7	=	28.07	(75)
Northeast 0.9x	0.77	x	1.35	x	28.07	x	0.85	x	0.7	=	15.62	(75)
Northeast 0.9x	0.77	X	1.35	x	14.2	X	0.85	X	0.7	=	7.9	(75)
Northeast 0.9x	0.77	x	1.35	x	9.21	x	0.85	x	0.7	=	5.13	(75)
Southeast 0.9x	0.77	x	1.35	x	36.79	x	0.85	x	0.7	=	20.48	(77)
Southeast 0.9x	0.77	x	1.35	x	36.79	x	0.85	x	0.7	=	40.96	(77)
Southeast 0.9x	0.77	X	2.66	x	36.79	x	0.85	x	0.7	=	40.36	(77)
Southeast 0.9x	0.77	X	0.72	x	36.79	x	0.63	X	0.7	=	8.1	(77)
Southeast 0.9x	0.77	X	1.35	x	36.79	x	0.63	x	0.7	=	15.18	(77)
Southeast 0.9x	0.77	x	1.35	x	62.67	x	0.85	x	0.7	=	34.89	(77)
Southeast 0.9x	0.77	X	1.35	x	62.67	x	0.85	X	0.7	=	69.77	(77)
Southeast 0.9x	0.77	X	2.66	x	62.67	x	0.85	x	0.7	=	68.74	(77)
Southeast 0.9x	0.77	X	0.72	x	62.67	x	0.63	x	0.7	=	13.79	(77)
Southeast 0.9x	0.77	x	1.35	x	62.67	x	0.63	x	0.7	=	25.86	(77)
Southeast 0.9x	0.77	x	1.35	x	85.75	x	0.85	x	0.7	=	47.73	(77)
Southeast 0.9x	0.77	x	1.35	x	85.75	x	0.85	x	0.7	=	95.47	(77)
Southeast 0.9x	0.77	x	2.66	x	85.75	x	0.85	X	0.7	=	94.05	(77)
Southeast 0.9x	0.77	x	0.72	x	85.75	x	0.63	x	0.7	=	18.87	(77)
Southeast 0.9x	0.77	x	1.35	x	85.75	x	0.63	x	0.7	=	35.38	(77)
Southeast 0.9x	0.77	X	1.35	x	106.25	x	0.85	x	0.7	=	59.15	(77)
Southeast 0.9x	0.77	X	1.35	x	106.25	x	0.85	x	0.7	=	118.29	(77)
Southeast 0.9x	0.77	X	2.66	x	106.25	x	0.85	x	0.7	=	116.54	(77)
Southeast 0.9x	0.77	x	0.72	x	106.25	X	0.63	x	0.7	=	23.38	(77)
Southeast 0.9x	0.77	x	1.35	x	106.25	x	0.63	x	0.7	=	43.84	(77)
Southeast 0.9x	0.77	x	1.35	x	119.01	x	0.85	x	0.7	=	66.25	(77)
Southeast 0.9x	0.77	x	1.35	x	119.01	x	0.85	x	0.7	=	132.5	(77)
Southeast 0.9x	0.77	X	2.66	x	119.01	x	0.85	x	0.7] =	130.53	(77)
Southeast 0.9x	0.77	X	0.72	x	119.01	x	0.63	x	0.7] =	26.19	(77)
Southeast 0.9x	0.77	X	1.35	x	119.01	x	0.63	x	0.7] =	49.1	(77)
Southeast 0.9x	0.77	X	1.35	x	118.15	x	0.85	x	0.7] =	65.77	(77)
Southeast 0.9x	0.77	X	1.35	x	118.15	x	0.85	x	0.7] =	131.54	(77)
				-		-		•		-		_

Southeast 0.9x		٦		-		ا ا	0.0-	ЭГ			100.70	— (77)
Southeast 0.9x	0.77	X	2.66	X	118.15	X	0.85	X	0.7	=	129.59	(77)
<u> </u>	0.77	X	0.72	×	118.15	X	0.63	_	0.7	_ =	26	(77)
Southeast 0.9x	0.77	X	1.35	→ ×	118.15	X	0.63	_ ×	0.7	=	48.75	(77)
Southeast 0.9x	0.77	X	1.35	→ ×	113.91	_ X	0.85	۱× ۲	0.7	=	63.41	(77)
Southeast 0.9x	0.77	×	1.35	X	113.91	X	0.85	۱× ۲	0.7	=	126.82	(77)
Southeast 0.9x	0.77	×	2.66	X	113.91	X	0.85	x	0.7	=	124.94	(77)
Southeast 0.9x	0.77	×	0.72	×	113.91	X	0.63	x	0.7	=	25.06	(77)
Southeast 0.9x	0.77	X	1.35	X	113.91	X	0.63	x	0.7	=	47	(77)
Southeast _{0.9x}	0.77	X	1.35	X	104.39	X	0.85	x	0.7	=	58.11	(77)
Southeast 0.9x	0.77	X	1.35	X	104.39	X	0.85	X	0.7	=	116.22	(77)
Southeast _{0.9x}	0.77	X	2.66	X	104.39	X	0.85	x	0.7	=	114.5	(77)
Southeast _{0.9x}	0.77	X	0.72	X	104.39	X	0.63	x	0.7	=	22.97	(77)
Southeast 0.9x	0.77	×	1.35	X	104.39	X	0.63	x [0.7	=	43.07	(77)
Southeast 0.9x	0.77	X	1.35	X	92.85	X	0.85	x [0.7	=	51.69	(77)
Southeast 0.9x	0.77	X	1.35	x	92.85	X	0.85	x	0.7	=	103.37	(77)
Southeast 0.9x	0.77	×	2.66	x	92.85	x	0.85	x	0.7	=	101.84	(77)
Southeast _{0.9x}	0.77	×	0.72	x	92.85	X	0.63	_ x [0.7	=	20.43	(77)
Southeast 0.9x	0.77	×	1.35	×	92.85	x	0.63	_ x [0.7	-	38.31	(77)
Southeast 0.9x	0.77	×	1.35	×	69.27	X	0.85	- x	0.7	=	38.56	(77)
Southeast 0.9x	0.77	×	1.35	×	69.27	X	0.85	x	0.7	=	77.12	(77)
Southeast _{0.9x}	0.77	×	2.66	×	69.27	X	0.85	x	0.7	=	75.97	(77)
Southeast 0.9x	0.77	X	0.72	×	69.27	X	0.63	- x	0.7	<u> </u>	15.24	(77)
Southeast 0.9x	0.77	×	1.35	×	69.27	X	0.63	- x	0.7	=	28.58	(77)
Southeast 0.9x	0.77	×	1.35	×	44.07	X	0.85	x	0.7	=	24.53	(77)
Southeast 0.9x	0.77	i x	1.35	= x	44.07	X	0.85	i x i	0.7	=	49.06	(77)
Southeast 0.9x	0.77	X	2.66	×	44.07	X	0.85	x	0.7	=	48.34	(77)
Southeast 0.9x	0.77	X	0.72	×	44.07	X	0.63	x	0.7	=	9.7	(77)
Southeast 0.9x	0.77	X	1.35	X	44.07	X	0.63	- x	0.7	<u> </u>	18.18	(77)
Southeast 0.9x	0.77	= x	1.35	×	31.49	X	0.85	x	0.7	-	17.53	(77)
Southeast 0.9x	0.77	×	1.35	×	31.49	X	0.85	- x	0.7	-	35.06	(77)
Southeast _{0.9x}	0.77	ا x	2.66	= x	31.49	X	0.85	╡ҳ╞	0.7	_ =	34.54	(77)
Southeast 0.9x	0.77	X	0.72	= x	31.49	X	0.63	╡╺╞	0.7	=	6.93	(77)
Southeast 0.9x	0.77	d x	1.35	x	31.49] x	0.63	╡╺┞	0.7	-	12.99	(77)
	0.11	_	1.00		01.10		0.00		<u> </u>		12.00	` ′
Solar gains in	watts. calcu	lated	for each mo	nth		(83)m	= Sum(74)m	(82)m				
(83)m= 131.36		4.54	399.02 455		55.85 437.93	395		251.09	157.72	112.17		(83)
Total gains – ir	nternal and	solar	(84)m = (73)m + (83)m , watts		!				l	
(84)m= 547.99	638.41 71	0.03	768.86 799	.84 7	76.92 745.39	711	.25 674.41	607.66	542.87	517.78		(84)
7. Mean inter	nal tempera	iture (heating sea	son)		,						
Temperature	•	•		· •	area from Tal	ble 9.	Th1 (°C)				21	(85)
Utilisation fac	•	•		_		•	` '					
Jan		Mar		ay	Jun Jul	A	ug Sep	Oct	Nov	Dec		
		1	·I	- 1		•			•		ı	

(86)m=	1 0.99	0.99	0.97	0.93	0.84	0.71	0.75	0.9	0.98	0.99	1		(86)
Mean inte	ernal tempe	rature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
	.94 19.14	19.47	19.95	20.38	20.75	20.91	20.89	20.62	20.06	19.45	18.96		(87)
Tempera	ture during	heating p	eriods ir	rest of	dwelling	from Ta	able 9, Ti	–––– h2 (°C)				•	
· —	.41 19.42	19.43	19.48	19.49	19.54	19.54	19.54	19.52	19.49	19.47	19.45		(88)
Utilisation	n factor for	gains for	rest of d	welling, I	h2,m (se	ee Table	9a)	•				•	
	99 0.99	0.98	0.96	0.9	0.74	0.52	0.57	0.84	0.96	0.99	1		(89)
Mean inte	ernal tempe	rature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)	•	•		
	7.6 17.81	18.14	18.65	19.06	19.41	19.51	19.51	19.3	18.77	18.16	17.65		(90)
	•	•	!				!	f	LA = Livin	g area ÷ (4	4) =	0.39	(91)
Mean inte	ernal tempe	rature (fo	or the wh	ole dwel	llina) = fl	LA × T1	+ (1 – fL	A) × T2			'		
	.13 18.33	18.66	19.16	19.58	19.93	20.06	20.05	19.82	19.27	18.66	18.16		(92)
Apply adj	ustment to	the mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m= 18	.13 18.33	18.66	19.16	19.58	19.93	20.06	20.05	19.82	19.27	18.66	18.16		(93)
8. Space	heating rec	uirement	t e										
	the mean in		•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
	ation factor to an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	n factor for	-	<u> </u>	iviay	Juli	Jui	L	Seb	Oct	INOV	Dec		
	99 0.99	0.98	0.95	0.9	0.77	0.6	0.64	0.85	0.96	0.99	0.99		(94)
	ins, hmGm	, W = (9	4)m x (84	1)m									
(95)m= 544	4.32 630.9	694.55	733.54	718.52	600.43	445.49	456.34	575.2	584.4	536.7	515		(95)
Monthly a	average ext	ernal 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)
	rate for me	1				- ` 		<u> </u>	ī —			İ	
` '	1.71 2063.03		1502.66	1145.41	748.4	485.1	508.4	813.29	1260.75	1707.01	2093.79		(97)
. —	eating requires	1			Wh/mont	h = 0.02	24 x [(97])m – (95 l	í - ·	' 	4474.00	1	
(98)m= 118	88.46 962.39	862.09	553.77	317.61	U	U			503.2	842.62	1174.62	0404.70	(98)
							rota	ll per year	(kwn/year	r) = Sum(9	8)15,912 =	6404.76	Ⅎ
-	ating requi			-								77.91	(99)
Ŭ.	/ requireme	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space he	_	at from a	ooondor	/ounnio	montory	ovotom					İ		7(201)
	of space he				пепату	•	(202) = 1 -	(201) -				0	(201)
	of space he		•	` ,			,	, ,	(000)			1	(202)
	of total heat	_	-				(204) = (2	02) × [1 –	(203)] =			1	(204)
•	of main sp		•									88.8	(206)
Efficiency	of second	ary/suppl	ementar	y heating	g system	າ, %						0	(208)
J	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
	ating requi											I	
118	8.46 962.39	862.09	553.77	317.61	0	0	0	0	503.2	842.62	1174.62		
· · · —	[(98)m x (2	,	`			ı			i	ı		I	(211)
133	8.36 1083.78	970.82	623.61	357.66	0	0	0 T-1-	0	566.67	948.9	1322.77		_
							lota	ıl (kWh/yea	ar) =Sum(2	۲۱۱) _{15,10. 12}	2	7212.57	(211)

Space heating fuel (secondary), kWh/month								
= {[(98)m x (201)] } x 100 ÷ (208)			•	T	ı	•	1	
(215)m= 0 0 0 0 0	0 0		0	0	0	0		_
		Tota	al (kWh/ye	ar) =Sum(2	215) _{15,10. 1}	2	0	(215)
Water heating								
Output from water heater (calculated above) 203.74 179.32 186.57 165.48 160.21	141.1 135	.19 150.7	152.37	173.5	185.21	198.92	1	
Efficiency of water heater	11111 100	100.7	102.01	170.0	100.21	100.02	79.5	(216)
	79.5 79	5 79.5	79.5	86.21	86.97	87.32		(217)
Fuel for water heating, kWh/month			<u>ļ</u>	<u> </u>	ļ	ļ.	ı	
(219) m = (64) m x $100 \div (217)$ m			1			1	1	
(219)m= 233.36 205.64 214.47 191.36 187.49 1	177.49 170		191.66	201.24	212.96	227.8		–
		lota	al = Sum(2	-			2403.1	(219)
Annual totals Space heating fuel used, main system 1				K	Wh/yea	r	kWh/year 7212.57	
Water heating fuel used							2403.1	=
•							2403.1	
Electricity for pumps, fans and electric keep-hot							1	
central heating pump:						120		(230c) —
Total electricity for the above, kWh/year		sum	of (230a)	(230g) =			120	(231)
Electricity for lighting							647.83	(232)
12a. CO2 emissions – Individual heating system	ns including	micro-CHF)					
	Energy	,		Fmice	ion fac	tor	Emissions	
	kWh/ye			kg CO			kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	1557.91	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	519.07	(264)
Space and water heating	(261) + (2	62) + (263) +	(264) =				2076.98	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	62.28	(267)
Electricity for lighting	(232) x			0.5	19	=	336.22	(268)
Total CO2, kg/year			sum o	of (265) (2	271) =		2475.49	(272)
Dwelling CO2 Emission Rate			(272)	÷ (4) =			30.11	(273)

El rating (section 14)

			User D	etails: —						
Assessor Name:	Chris Hocknell			Strom	a Muum	bou.		STD(0016363	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.10	
Contware Hame.	500 ma 1 57 ti 25			Address			d-Lean	VOION	011. 1.0.1.10	
Address :	Unit 6, 40-42 Mill L		i i							
1. Overall dwelling dime	·	·	·							
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	·)
Ground floor			6	4.04	(1a) x	2	2.17	(2a) =	138.97	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1n	1) 6	4.04	(4)			_		
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	138.97	(5)
2. Ventilation rate:										
		secondar heating	У	other		total			m³ per hou	r
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	ī - Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ans				,	2	x ·	10 =	20	(7a)
Number of passive vents	3				_ 	0	x	10 =	0	(7b)
Number of flueless gas t					L	0	x	40 =	0	(7c)
Number of fluciess gas i	1103				L	0			0	(70)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7	a)+(7b)+(7c) =	Γ	20		÷ (5) =	0.14	(8)
If a pressurisation test has	been carried out or is intend	ded, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (•	ruction			0	(11)
if both types of wall are p deducting areas of open	oresent, use the value corre ings); if equal user 0.35	sponaing to	tne great	er waii are	а (апег					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0.	1 (seale	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 s	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value	• •		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•								0.39	(18)
Air permeability value application Number of sides sheltered		as been don	e or a deg	gree air pei	meability	is being u	sed			(19)
Shelter factor	cu			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.33	(21)
Infiltration rate modified	for monthly wind spee	ed								
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		
NAME of Eq. (1991)	100)			•		•	-	•	_	
Wind Factor (22a)m = $(2^{22a})^{m}$	'	1 005 1	0.05	0.00	4	1 4 00	1 4 40	4 40	7	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	

0.43	ation rate (allo	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.38	0.39	1		
	ctive air chang		l			1 0.01	1 0.00	0.00		1 0.00			_
	al ventilation:											0	(2
	eat pump using Ap							o) = (23a)				0	(2
	heat recovery: et	-	_									0	(2
· —	d mechanical	1	i	1		- 	ŕ	r Ó Ì	· -	' ') ÷ 100] ¬		
4a)m= 0	0 0	0	0	0	0	0	0	0	0	0			(2
· —	d mechanical	1	ı	1		- 	ŕ	 		1 .	1		,,
4b)m= 0	0 0	0	0	0	0	0	0	0	0	0	_		(2
•	ouse extract v n < 0.5 × (23b)							5 x (23h	`				
4c)m= 0	0 0	0	0	0	0	0	0	0	0	0	1		(2
	ventilation or v	vhole hous	e nositiv	ve innut v	ventilatio	on from I	l				_		Ì
,	n = 1, then (24		•	•				0.5]					
4d)m= 0.59	0.59 0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58			(2
Effective air	change rate -	enter (24a) or (24l	o) or (24	c) or (24	d) in box	x (25)	-		-			
5)m= 0.59	0.59 0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58			(:
B Heat losses	s and heat los	s paramet	er.										
LEMENT	Gross	Openin	gs	Net Ar		U-valı		AXU		k-valu		АХ	k
	araa (m²)	m	14	Λη	n ²	\///m2) [2	/\///	~ \	k 1/m².	V	V 1/12	•
nors	area (m²)	m	1 *	A ,n	_	W/m2	_	(W/k	ς) 	kJ/m²·	K	kJ/K	
	, ,	m	l '	2	x	1	=	2	() 	kJ/m²·	K	kJ/K	(
indows Type	: 1	m	14	0.99	x x1	<u>1</u> /[1/(1.4)+	0.04] =	2 1.31	() 	kJ/m²·	K	kJ/K	()
/indows Type /indows Type	2			0.99	x x1 x1	1 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] =	2 1.31 1.31	() 	kJ/m²·	к — г	kJ/K	(;
/indows Type /indows Type /alls Type1	26.8	3.96		0.99 0.99 22.84	x1 x1 x1 x1	1 /[1/(1.4)+ /[1/(1.4)+ 0.18	0.04] = 0.04] = 0.04] =	2 1.31 1.31 4.11	() 	kJ/m²·	K] [kJ/K	
/indows Type /indows Type /alls Type1 /alls Type2	26.8	3.96		2 0.99 0.99 22.84 2.78	x x1 x1	1 /[1/(1.4)+ /[1/(1.4)+ 0.18	0.04] = 0.04] =	2 1.31 1.31 4.11 0.5	() 	kJ/m²·	к] [kJ/K	
/indows Type /indows Type /alls Type1 /alls Type2 /alls Type3	26.8 26.8 4.78 3.08	3.96		2 0.99 0.99 22.84 2.78 3.08	x x1 x1 x1 x x x x x	1 /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18	= 0.04] = 0.04] = = = = = = = =	2 1.31 1.31 4.11 0.5 0.55		kJ/m²·	к] [] [kJ/K	
/indows Type /indows Type /alls Type1 /alls Type2 /alls Type3 /alls Type4	26.8 4.78 3.08 19.58	3.96		2 0.99 0.99 22.84 2.78	x x1 x1 x1 x x x x x	1 /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18	0.04] = 0.04] = 0.04] =	2 1.31 1.31 4.11 0.5 0.55 3.52		kJ/m²·	к 	kJ/K	
/indows Type /indows Type /alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5	26.8 26.8 4.78 3.08	3.96		2 0.99 0.99 22.84 2.78 3.08	x x1 x1 x1 x x x x x x	1 /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18	= 0.04] = 0.04] = = = = = = = =	2 1.31 1.31 4.11 0.5 0.55		kJ/m²-	к 	kJ/K	
/indows Type /indows Type /alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5 oof Type1	26.8 4.78 3.08 19.58	3.96 2 0		2 0.99 0.99 22.84 2.78 3.08	x x1 x1 x1 x x x x x x x x x	1 /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18	= 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	2 1.31 1.31 4.11 0.5 0.55 3.52		kJ/m²·	к [[[kJ/K	
/indows Type /indows Type /alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5 oof Type1	26.8 4.78 3.08 19.58 11.14 54.83 2.06	3.96 2 0 0		2 0.99 0.99 22.84 2.78 3.08 19.58	x x1 x1 x1 x x x x x x x x x	1 /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 0.18	= 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	2 1.31 1.31 4.11 0.5 0.55 3.52 2.01		kJ/m²-	к 	kJ/K	
/indows Type /indows Type /alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5 oof Type1 oof Type2	26.8 4.78 3.08 19.58 11.14 54.83 2.06	3.96 2 0 0		2 0.99 0.99 22.84 2.78 3.08 19.58 11.14 54.83	x x1 x1 x x x x x x x x x x x x x x x x	1 /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 0.18 0.18	= 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	2 1.31 1.31 4.11 0.5 0.55 3.52 2.01 7.13		kJ/m²-	K [kJ/K	
oors /indows Type /indows Type /alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5 coof Type1 oof Type2 otal area of e arty wall	26.8 4.78 3.08 19.58 11.14 54.83 2.06	3.96 2 0 0		2 0.99 0.99 22.84 2.78 3.08 19.58 11.14 54.83	x x1 x1 x x x x x x x x x x x x x x x x	1 /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 0.18 0.18	= 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	2 1.31 1.31 4.11 0.5 0.55 3.52 2.01 7.13		kJ/m²-	K [kJ/K	
/indows Type /indows Type /alls Type1 /alls Type2 /alls Type3 /alls Type4 /alls Type5 oof Type1 oof Type2 otal area of e arty wall arty floor	26.8 4.78 3.08 19.58 11.14 54.83 2.06 lements, m ²	3.96 2 0 0 0		2 0.99 0.99 22.84 2.78 3.08 19.58 11.14 54.83 2.06 122.2 23.75 64.04	x x1 x1 x1 x x x x x x x x x x x x x x	1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	2 1.31 1.31 4.11 0.5 0.55 3.52 2.01 7.13 0.27				kJ/K	
findows Type findows Type falls Type1 falls Type2 falls Type3 falls Type4 falls Type5 pof Type1 pof Type2 potal area of earty wall party floor for windows and	26.8 4.78 3.08 19.58 11.14 54.83 2.06 lements, m ²	3.96 2 0 0 0 0	indow U-va	2 0.99 0.99 22.84 2.78 3.08 19.58 11.14 54.83 2.06 122.2 23.75 64.04 alue calculations	x x1 x1 x1 x x x x x x x x x x x x x x	1 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	2 1.31 1.31 4.11 0.5 0.55 3.52 2.01 7.13 0.27				kJ/K	
findows Type findows Type falls Type1 falls Type2 falls Type3 falls Type4 falls Type5 foof Type1 foof Type2 fotal area of earty wall farty floor for windows and include the area	26.8 4.78 3.08 19.58 11.14 54.83 2.06 Ilements, m²	3.96 2 0 0 0 0 0	indow U-va	2 0.99 0.99 22.84 2.78 3.08 19.58 11.14 54.83 2.06 122.2 23.75 64.04 alue calculations	x x1 x1 x1 x x x x x x x x x x x x x x	1 /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	2 1.31 1.31 4.11 0.5 0.55 3.52 2.01 7.13 0.27					
findows Type findows Type falls Type1 falls Type2 falls Type3 falls Type4 falls Type5 foof Type1 foof Type2 fotal area of earty wall farty floor for windows and finclude the area fabric heat los	26.8 4.78 3.08 19.58 11.14 54.83 2.06 Ilements, m²	3.96 2 0 0 0 0 0 c effective wif internal walk	indow U-va	2 0.99 0.99 22.84 2.78 3.08 19.58 11.14 54.83 2.06 122.2 23.75 64.04 alue calculations	x x1 x1 x1 x x x x x x x x x x x x x x	1 /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	2 1.31 4.11 0.5 0.55 3.52 2.01 7.13 0.27	s given in	ı paragrapı		5.34	
findows Type findows Type falls Type1 falls Type2 falls Type3 falls Type4 falls Type5 foof Type1 foof Type2 fotal area of earty wall farty floor for windows and finclude the area fabric heat lose feat capacity for	26.8 4.78 3.08 19.58 11.14 54.83 2.06 Ilements, m²	3.96 2 0 0 0 0 0 te effective with internal wall x U)	indow U-va	2 0.99 0.99 22.84 2.78 3.08 19.58 11.14 54.83 2.06 122.22 23.75 64.04 alue calculatitions	x x1 x1 x1 x x x x x x x x x x x x x x	1 /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] = = = = = = = = = = = = = ((28)	2 1.31 1.31 4.11 0.5 0.55 3.52 2.01 7.13 0.27	s given in	ı paragrapı	[

f details of therm Fotal fabric he	0 0	are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) =		Г	40.04	(37)
√entilation he		alculated	l monthly	ı				` '	, ,	25)m x (5)	L	43.34	(37)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 27.11	26.95	26.79	26.04	25.9	25.25	25.25	25.13	25.5	25.9	26.18	26.48		(38)
Heat transfer	coefficier	nt \/\/k							= (37) + (37)	38)m	ļ		
39)m= 70.45	70.29	70.13	69.38	69.24	68.59	68.59	68.47	68.84	69.24	69.52	69.82		
			33.33		33.33	33.33				Sum(39) ₁		69.38	(39)
Heat loss para	ameter (H	HLP), W/	m²K						= (39)m ÷	. ,			
40)m= 1.1	1.1	1.1	1.08	1.08	1.07	1.07	1.07	1.07	1.08	1.09	1.09		
						-	-		Average =	Sum(40) ₁	12 /12=	1.08	(40)
Number of da		· · ·	· .							l			
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	iting ener	gy requi	irement:								kWh/ye	ar:	
Assumed occ	upancy I	V								2	.09		(42)
if TFA > 13.			[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0	0013 x (TFA -13.		.09		(42)
if TFA £ 13.	,												
Annual averao Reduce the annu									se target o		3.91		(43)
not more that 125	_				_	_	o acriieve	a water us	se largel o	1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								ОСР	000	1404	Dec		
44)m= 92.31	88.95	85.59	82.24	78.88	75.52	75.52	78.88	82.24	85.59	88.95	92.31		
02.01	1 00.00	00.00	V=	. 0.00			. 0.00			m(44) _{1 12} =		1006.98	(44)
Energy content o	f hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C)Tm / 3600			. ,	L		`
45)m= 136.89	119.72	123.54	107.71	103.35	89.18	82.64	94.83	95.96	111.84	122.08	132.57		
	1		!			!			rotal = Su	m(45) _{1 12} =	=	1320.31	(45)
f instantaneous ı	vater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)			-		
46)m= 20.53	17.96	18.53	16.16	15.5	13.38	12.4	14.22	14.39	16.78	18.31	19.89		(46)
Nater storage													
Storage volun	, ,					•		ame ves	sel		0		(47)
f community	_			-				\	(01: /				
Otherwise if n Water storage		not wate	er (this in	iciuaes i	nstantar	ieous co	mbi boli	ers) ente	er o in (47)			
a) If manufac		eclared le	oss facto	or is kno	wn (kWł	n/day):					0		(48
•), 10 mil	("day).					0		(49)
l emnerature :				aar			(48) x (49)	۱ =					
•		Sidiage	-		or is not		(40) X (49)	, –			0		(50)
Temperature = Energy lost fronts b) If manufact		eclared o	wiii idei i										(51)
•	turer's de		-			ıy)					0		(51)
Energy lost from the state of t	turer's de age loss	factor fr	om Tabl			ıy)					0		(51
Energy lost from the state of t	turer's de age loss neating s from Tal	factor fr ee section ble 2a	om Tabl			ıy)					0		
Energy lost from the bound of t	turer's de age loss neating s from Tal	factor fr ee section ble 2a	om Tabl			ıy)							(51) (52) (53)
Energy lost from the state of t	turer's de rage loss neating s from Tal factor fro om water	factor fr ee section ble 2a m Table storage	om Tablon 4.3	e 2 (kW			(47) x (51)) x (52) x (53) =		0		(52)

Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 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)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 0 0 0 0 0 0 0 0 0 0 0	(57)
Primary circuit loss (annual) from Table 3	(58)
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	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 47.04 40.94 43.62 40.56 40.2 37.24 38.49 40.2 40.56 43.62 43.87 47.04	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 183.93 160.66 167.16 148.26 143.54 126.43 121.13 135.03 136.52 155.45 165.94 179.61	(62)
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)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 183.93 160.66 167.16 148.26 143.54 126.43 121.13 135.03 136.52 155.45 165.94 179.61	
Output from water heater (annual) _{1 12} 1823.66	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 57.27 50.04 51.98 45.95 44.41 38.96 37.1 41.58 42.05 48.09 51.56 55.84	(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= 104.66 104.66 104.66 104.66 104.66 104.66 104.66 104.66 104.66 104.66 104.66 104.66	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 20.58 18.28 14.86 11.25 8.41 7.1 7.67 9.97 13.39 17 19.84 21.15	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 183.01 184.91 180.12 169.93 157.07 144.99 136.91 135.01 139.8 149.99 162.85 174.93	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 33.47 33.47 33.47 33.47 33.47 33.47 33.47 33.47 33.47 33.47 33.47 33.47	(69)
Pumps and fans gains (Table 5a)	
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -83.73 -83.73 -83.73 -83.73 -83.73 -83.73 -83.73 -83.73 -83.73 -83.73 -83.73 -83.73 -83.73	(71)
Water heating gains (Table 5)	
	(72)
(72)m= 76.98 74.47 69.87 63.82 59.69 54.12 49.86 55.89 58.4 64.64 71.61 75.05	
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 337.97 335.05 322.25 302.41 282.58 263.6 251.85 258.27 268.98 289.02 311.69 328.53	(73)

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

Orientation:	Access Fa Table 6d	actor	Area m²	a		Flu Tal	x ole 6a		Ta	g_ able 6b		FF Table 6c		Gains (W)	
Northeast 0.9	0.77	X	0	99	x	1	1.28	x		0.63	X	0.7	=	3.4	1 (75)
Northeast 0.9	0.77	X	0	99	x	2	2.97	X		0.63	X	0.7	-	6.9	5 (75)
Northeast 0.9	0.77	X	0	99	x	4	1.38	X		0.63	X	0.7	_	12.5	(75)
Northeast 0.9	0.77	х	0	99	x	6	7.96	X		0.63	×	0.7		20.5	(75)
Northeast 0.9	0.77	х	0	99	x	9	1.35	X		0.63	×	0.7	-	27.6	(75)
Northeast 0.9	0.77	X	0	99	x	9	7.38	X		0.63	X	0.7		29.4	(75)
Northeast 0.9	0.77	X	0	99	X	(91.1	X		0.63	X	0.7		27.5	(75)
Northeast 0.9	0.77	X	0	99	x	7	2.63	X		0.63	X	0.7	=	21.9	7 (75)
Northeast 0.9	0.77	x	0	99	x	5	0.42	X		0.63	×	0.7		15.2	(75)
Northeast 0.9	0.77	X	0	99	X	2	8.07	X		0.63	X	0.7		8.49	9 (75)
Northeast 0.9	0.77	X	0	99	x		14.2	X		0.63	X	0.7	-	4.3	(75)
Northeast 0.9	0.77	x	0	99	x	(9.21	X		0.63	×	0.7		2.79	9 (75)
Northwest 0.9	0.77	х	0	99	x	1	1.28	X		0.63	×	0.7		10.2	(81)
Northwest 0.9	0.77	х	0	99	x	2	2.97	X		0.63	x	0.7	-	20.8	(81)
Northwest 0.9	0.77	х	0	99	x	4	1.38	X		0.63	×	0.7		37.5	(81)
Northwest 0.9	0.77	х	0	99	x	6	7.96	X		0.63	×	0.7		61.6	(81)
Northwest 0.9	0.77	X	0	99	x	9	1.35	X		0.63	X	0.7		82.9	(81)
Northwest 0.9	0.77	х	0	99	x	9	7.38	X		0.63	x	0.7		88.3	(81)
Northwest 0.9	0.77	х	0	99	x	(91.1	X		0.63	X	0.7		82.6	(81)
Northwest 0.9	0.77	x	0	99	x	7	2.63	X		0.63	X	0.7		65.9	(81)
Northwest 0.9	0.77	x	0	99	x	5	0.42	x		0.63	X	0.7		45.7	77 (81)
Northwest 0.9	0.77	X	0	99	x	2	8.07	x		0.63	X	0.7		25.4	.8 (81)
Northwest 0.9	0.77	x	0	99	x		14.2	X		0.63	x	0.7		12.8	(81)
Northwest 0.9	0.77	X	0	99	x	9	9.21	x		0.63	×	0.7	-	8.36	6 (81)
Solar gains i	n watta oo	loulato	d for one	h mon	· ·h			(02\n	a = Cı	um(74)m	 (82)m				
(83)m= 13.65	1 1	50.08	82.24	110.5	\neg	17.86	110.25	87	_	61.02	33.97	1	11.15	٦	(83)
Total gains -	- internal a	nd sola	r (84)m	= (73)n	า + (83)m	, watts	<u>!</u>	!			_ l	<u> </u>	_	
(84)m= 351.6	2 362.85	372.33	384.65	393.1	3 3	81.46	362.1	346	5.17	330	322.9	9 328.87	339.69)	(84)
7. Mean int	ernal temp	erature	(heatin	g seaso	n)							•		<u> </u>	
Temperatu	e during h	eating p	eriods	n the li	ving	area f	rom Tal	ble 9	, Th′	1 (°C)				21	(85)
Utilisation f	actor for ga	ains for	living a	ea, h1,	m (s	ee Ta	ble 9a)								
Jan	Feb	Mar	Apr	Ma	y	Jun	Jul	Α	ug	Sep	Oc	Nov	Dec	:	
(86)m= 1	1	1	0.99	0.97		0.89	0.76	0.	8	0.95	0.99	1	1		(86)
Mean interr	nal tempera	ature in	living a	rea T1	(follo	w ste	ps 3 to 7	7 in 1	Γable	9c)		-		_	
(87)m= 19.78	19.86	20.04	20.32	20.61	7	20.85	20.96	20.	.94	20.76	20.4	20.05	19.76		(87)
Temperatu	e during h	eating p	eriods	n rest o	of dw	velling	from Ta	able	9, Th	n2 (°C)		-		_	
(88)m= 20	20	20	20.01	20.02	2	20.02	20.02	20.	.03	20.02	20.02	20.01	20.01		(88)
Utilisation f	actor for ga	ains for	rest of o	lwelling	, h2	,m (se	e Table	9a)						_ _	
(89)m= 1	1 1	1	0.99	0.95		0.83	0.62	0.6	86	0.92	0.99	1	1	7	(89)
				•					!				•	_	

90)m= 18.36	18.49	18.75	19.16	19.58	19.9	20.01	20	7 in Tabl	19.29	18.77	18.35		(90)
	10.49	10.73	19.10	19.50	19.9	20.01	20	<u> </u>	LA = Livin	<u> </u>	l	0.31	(91)
										`	'	0.01	(0.)
Mean interna		 									I	I	(0.0)
92)m= 18.8	18.91	19.15	19.52	19.89	20.19	20.3	20.29	20.09	19.63	19.16	18.78		(92)
Apply adjust	1	1		· ·					·	1	1	1	
93)m= 18.8	18.91	19.15	19.52	19.89	20.19	20.3	20.29	20.09	19.63	19.16	18.78		(93)
8. Space he	•												
Set Ti to the			•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	Feb	Mar		May	Jun	Jul	Διια	Sep	Oct	Nov	Dec		
Jan Utilisation fa			Apr	iviay	Juli	Jui	Aug	Sep	Oct	INOV	Dec		
94)m= 1	1	0.99	0.98	0.95	0.84	0.67	0.71	0.92	0.99	1	1		(94)
·					0.64	0.07	0.71	0.92	0.99		'		(34)
Useful gains 95)m= 350.73		, VV = (94 370.01	378.57	373.81	322.08	240.8	247.39	303.19	318.15	327.42	338.97		(95)
,						240.8	247.39	303.19	318.15	327.42	338.97		(93)
Monthly ave	 	r i				40.0	40.4		40.0		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)
Heat loss rat	1	1				<u> </u>	- ,	<u> </u>		000 70	1010.01	1	(07)
97)m= 1021.25		886.98	736.59	567.36	383.75	253.55	266.05	412.19	625.41	838.78	1018.04		(97)
Space heating						1		i i		<u> </u>			
98)m= 498.87	418.55	384.63	257.77	144	0	0	0	0	228.6	368.18	505.23		_
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2805.82	(98)
Space heating	ng require	ement in	kWh/m²	/year								43.81	(99)
a. Energy re	au iromo or												
	auremer	nts – Indi	vidual h	eating s	vstems i	ncludina	micro-C	CHP)					
		nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heati	ng:						micro-C	CHP)				0	
Space heati Fraction of s	ng: pace hea	at from se	econdar	y/supple		system	micro-C (202) = 1 -	,					╡`
Space heati Fraction of s Fraction of s	ng: pace hea pace hea	at from se at from m	econdar nain syst	y/supple em(s)		system	(202) = 1 -	- (201) =	(203)] =			1	(20)
Space heati Fraction of s Fraction of s Fraction of to	ing: pace hea pace hea otal heati	at from se at from m ng from i	econdar nain syst main sys	y/supple em(s) stem 1		system	(202) = 1 -	,	(203)] =			1	(202
Space heati Fraction of s Fraction of s Fraction of to	ing: pace hea pace hea otal heati	at from se at from m ng from i	econdar nain syst main sys	y/supple em(s) stem 1		system	(202) = 1 -	- (201) =	(203)] =			1	(202
Space heating Fraction of some services of the Efficiency of Efficiency of the Effic	ng: pace hea pace hea otal heati main spa	at from se at from m ng from i ace heati	econdar nain syst main sys ing syste	y/supple em(s) stem 1 em 1	mentary	system	(202) = 1 -	- (201) =	(203)] =			1	(202
Space heati Fraction of s Fraction of to Efficiency of Efficiency of	ng: pace hea pace hea otal heati main spa	at from se at from m ng from i ace heati	econdary nain syst main sys ing syste ementar	y/supple em(s) stem 1 em 1 y heating	mentary	system	(202) = 1 - (204) = (2	- (201) = 02) × [1 -	(203)] =	Nov	Dec	1 1 93.4 0	(20)
Space heating Fraction of some fraction of the Efficiency of Efficiency of Jan	ng: pace hea pace hea otal heati main spa seconda Feb	at from se at from m ng from r ace heati ry/supple Mar	econdary nain syst main sys ing syste ementar Apr	y/supple em(s) stem 1 em 1 y heating	mentary g systen Jun	system	(202) = 1 -	- (201) =		Nov	Dec	1 1 93.4	(20)
Space heating Fraction of some fraction of the Efficiency of Efficiency of Jan	ng: pace hea pace hea ptal heatil main spa seconda Feb ng require	at from se at from m ng from r ace heati ry/supple Mar	econdary nain syst main sys ing syste ementar Apr	y/supple em(s) stem 1 em 1 y heating	mentary g systen Jun	system	(202) = 1 - (204) = (2	- (201) = 02) × [1 -		Nov 368.18	Dec 505.23	1 1 93.4 0	(20) (20) (20) (20)
Space heating Fraction of some fraction of the Efficiency of Efficiency of Igan Space heating 498.87	pace hea pace hea otal heatin main spa seconda Feb ng require 418.55	at from set from ming from it ace heating ry/supplement (co. 384.63	econdary nain systemain systementar Apr alculatee	y/supple em(s) stem 1 em 1 y heating May d above;	mentary g system Jun	system 1, % Jul	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - (Oct			1 1 93.4 0	(20) (20) (20) (20)
Space heating Fraction of some fraction of the Efficiency of Efficiency of Space heating 498.87	pace hea pace hea ptal heatin main spa seconda Feb ng require 418.55	at from set from ming from reace heating ry/supplement (comment (comment (doing)) and the set of th	econdary nain systemain systementar Apr alculated 257.77	y/supple em(s) stem 1 em 1 y heating May d above	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 1	Oct 228.6	368.18	505.23	1 1 93.4 0	(20) (20) (20) (20)
Space heating Fraction of some fraction of the Efficiency of Efficiency of Jan Space heating 498.87	pace hea pace hea ptal heatin main spa seconda Feb ng require 418.55	at from set from ming from it ace heating ry/supplement (co. 384.63	econdary nain systemain systementar Apr alculatee	y/supple em(s) stem 1 em 1 y heating May d above;	mentary g system Jun	system 1, % Jul	(202) = 1 - (204) = (2 Aug 0	- (201) = 02) × [1 - 1	Oct 228.6	368.18 394.2	505.23 540.93	1 1 93.4 0 kWh/ye	(20) (20) (20) (20) ear
Space heating Fraction of some fraction of some fraction of the Efficiency of Efficiency of Inc. Inc. Inc. Inc. Inc. Inc. Inc. Inc.	pace hear pace h	at from set from many from mace heating from Mar ement (co. 384.63) (4)] } x 1	econdary nain systemain systematar Apr alculatee 257.77 00 ÷ (20 275.99	y/supple em(s) stem 1 em 1 y heating May d above 144 06)	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2 Aug 0	- (201) = 02) × [1 - 1	Oct 228.6	368.18 394.2	505.23 540.93	1 1 93.4 0	(20) (20) (20) (20) ear
Space heating Fraction of some fraction of some fraction of the Efficiency of Efficien	pace hear pace h	at from set from ming from it ace heating ry/supplement (compared as 14)] } x 1 411.81	econdary nain systemain systematar Apr alculater 257.77 00 ÷ (20 275.99	y/supple em(s) stem 1 em 1 y heating May d above 144 06)	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2 Aug 0	- (201) = 02) × [1 - 1	Oct 228.6	368.18 394.2	505.23 540.93	1 1 93.4 0 kWh/ye	(20 (20 (20 (20 ear
Space heating Fraction of some fraction of some fraction of the Efficiency of Efficiency of Efficiency of Space heating the Ef	pace hear pace h	at from set from ming from mace heating from Mar ement (compared and market) and market from the secondary on the secondary of the secondary on the secondary on the secondary on the secondary on the secondary on the secondary on the secondary on the secondary on the secondary on the secondary of the secondary o	econdary nain systemain systematar Apr alculatee 257.77 00 ÷ (20 275.99 y), kWh/8	y/supple em(s) stem 1 em 1 y heating May d above 144 16) 154.18	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (Oct 228.6 244.75 ar) =Sum(2	368.18 394.2 211) _{15,10. 12}	505.23	1 1 93.4 0 kWh/ye	(20) (20) (20) (20) (20) ear
Space heating Fraction of some fraction of some fraction of the Efficiency of Efficiency of Efficiency of Space heating the Ef	pace hear pace h	at from set from ming from it ace heating ry/supplement (compared as 14)] } x 1 411.81	econdary nain systemain systematar Apr alculater 257.77 00 ÷ (20 275.99	y/supple em(s) stem 1 em 1 y heating May d above 144 06)	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 1	Oct 228.6 244.75 ar) =Sum(2	368.18 394.2 211) _{15,10. 12}	505.23 540.93 =	1 93.4 0 kWh/ye	(20) (20) (20) (20) (21) (21)
Space heating Fraction of some fraction of some fraction of the Efficiency of Efficiency of Efficiency of Space heating the Efficiency of	pace hear pace h	at from set from ming from mace heating from Mar ement (compared and market) and market from the secondary on the secondary of the secondary on the secondary on the secondary on the secondary on the secondary on the secondary on the secondary on the secondary on the secondary on the secondary of the secondary o	econdary nain systemain systematar Apr alculatee 257.77 00 ÷ (20 275.99 y), kWh/8	y/supple em(s) stem 1 em 1 y heating May d above 144 16) 154.18	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - (Oct 228.6 244.75 ar) =Sum(2	368.18 394.2 211) _{15,10. 12}	505.23 540.93 =	1 1 93.4 0 kWh/ye	(20) (20) (20) (20) (20) ear
Space heating Fraction of some fraction of some fraction of the Efficiency of Efficien	pace hear pace h	at from set from ming from it ace heating ry/supplement (c 384.63 at 411.81 at 1.81	econdary nain systemain systematra Apr alculated 257.77 00 ÷ (20 275.99 y), kWh/8) 0	y/supple em(s) stem 1 em 1 y heating May d above 144 06) 154.18	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 1	Oct 228.6 244.75 ar) =Sum(2	368.18 394.2 211) _{15,10. 12}	505.23 540.93 =	1 93.4 0 kWh/ye	(20) (20) (20) (20) (20) ear
Space heating Fraction of some fraction of some fraction of the Efficiency of Efficiency of Efficiency of Space heating the Efficiency of Efficiency of Space heating the Efficiency of Efficiency of Space heating the Efficiency of Efficiency of Space heating the Efficiency of Efficiency of Space heating the Efficiency	pace hear pace h	at from set from ming from mace heating ry/supplement (compared) 1 x 1 411.81 econdary 00 ÷ (20 0	econdary nain systemain systemater Apr alculater 257.77 00 ÷ (20 275.99 y), kWh/ 8) 0	y/supple em(s) stem 1 em 1 y heating May d above 144 e6) 154.18 month 0	g system Jun 0	system n, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - + + + + + + + + + + + + + + + + + +	Oct 228.6 244.75 ar) =Sum(2 0 ar) =Sum(2	368.18 394.2 211) _{15,10. 12}	505.23 540.93 = 0	1 93.4 0 kWh/ye	(202) (204) (204) (204) (204) (204) (204)
Space heating Fraction of some fraction of some fraction of the Efficiency of Efficien	pace hear pace h	at from set from ming from ing	econdary nain systemain systematra Apr alculated 257.77 00 ÷ (20 275.99 y), kWh/8) 0	y/supple em(s) stem 1 em 1 y heating May d above 144 06) 154.18	g system Jun 0	system 1, % Jul 0	(202) = 1 - (204) = (2	- (201) = 02) × [1 - 1	Oct 228.6 244.75 ar) =Sum(2	368.18 394.2 211) _{15,10. 12}	505.23 540.93 =	1 93.4 0 kWh/ye	(20) (20) (20) (20) (20) ear

								1	
(217)m= 87.44 87.35 87.08 86.43 85.06	80.3	80.3	80.3	80.3	86.02	87	87.51		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)m= 210.35 183.93 191.96 171.54 168.76	157.44	150.84	168.15	170.01	180.72	190.74	205.23]	
	<u> </u>		Tota	I = Sum(2	19a) ₁₁₂ =			2149.67	(219)
Annual totals					k۱	Wh/yeaı		kWh/yea	<u></u> <u>r</u>
Space heating fuel used, main system 1								3004.09	
Water heating fuel used								2149.67	
Electricity for pumps, fans and electric keep-ho	t								
central heating pump:							30]	(230c)
boiler with a fan-assisted flue							45	j	(230e)
Total electricity for the above, kWh/year			sum	of (230a)	(230g) =			75	(231)
Electricity for lighting								363.41	(232)
12a. CO2 emissions – Individual heating syste	ems inclu	ding mi	cro-CHP						
12a. CO2 emissions – Individual heating syste			cro-CHP		Fmiss	ion fac	tor	Fmissions	8
12a. CO2 emissions – Individual heating syste	Ene	ding mi ergy h/year	cro-CHP		Emiss kg CO2	ion fac 2/kWh	tor	Emissions	_
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Ene	e rgy h/year	cro-CHP			2/kWh	tor =		_
	Ene kW	ergy h/year	cro-CHP		kg CO2	2/kWh		kg CO2/ye	ar
Space heating (main system 1)	Ene kW	ergy h/year) ×	cro-CHP		kg CO2	2/kWh	=	kg CO2/ye	ar (261)
Space heating (main system 1) Space heating (secondary)	Ene kW (211 (215 (219	ergy h/year) ×) ×	cro-CHP + (263) + (0.2°	2/kWh	=	kg CO2/ye	(261) (263)
Space heating (main system 1) Space heating (secondary) Water heating	Ene kW (211 (215 (219 (261	ergy h/year) x) x) x			0.2°	2/kWh	=	kg CO2/ye 648.88 0 464.33	(261) (263) (264)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Ene kW (211 (215 (219 (261	ergy h/year) x) x) x) + (262)			0.2°	2/kWh 16 19 16	= =	kg CO2/ye 648.88 0 464.33	(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-ho	Ene kW (211 (215 (219 (261 t (231	ergy h/year) x) x) x) + (262)		264) =	0.2° 0.5° 0.5°	2/kWh 16 19 16	= = =	kg CO2/ye 648.88 0 464.33 1113.21 38.93	(261) (263) (264) (265) (267)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-ho Electricity for lighting	Ene kW (211 (215 (219 (261 t (231	ergy h/year) x) x) x) + (262)		264) =	0.2° 0.5° 0.5° 0.5°	2/kWh 16 19 16	= = =	kg CO2/ye 648.88 0 464.33 1113.21 38.93 188.61	(261) (263) (264) (265) (267) (268)

TER =

(273)

20.94

		l lear-	Details:						
Access Name	Chris Healmall	– USE ITL		o N	bes-		STD0	016262	
Assessor Name: Software Name:	Chris Hocknell Stroma FSAP 2012		Strom Softwa	-				016363 on: 1.0.4.10	
		roperty	Address			d-Lean	1 3.0.0		
Address :	Unit 7, 40-42 Mill Lane, Lon	don, NV	V6 1NR						
1. Overall dwelling dime	nsions:	_							
Ground floor			a(m²) 54.53	(1a) x		ight(m) 13	(2a) =	Volume(m ³	3) (3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1					13	(2a) -	110.31	(0a)
•	a)+(1b)+(1c)+(1d)+(1e)+(1	'') [54.53	(4))	1) . (20) .	(2n) -	<u></u>	_
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	116.31	(5)
2. Ventilation rate:	main seconda	rv	other		total			m³ per hou	ır
Number of chimneys	heating heating	, +		7 = 6		x 4	40 =	-	(6a)
Number of open flues		_	0	」	0		20 =	0	=
Number of intermittent fa			0		0		10 =	0	(6b)
				Ļ	2		10 =	20	(7a)
Number of passive vents				Ļ	0			0	(7b)
Number of flueless gas fi	res				0	X 2	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimney	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+((7c) =		20		÷ (5) =	0.17	(8)
	een carried out or is intended, procee	ed to (17),	otherwise o	continue fr	om (9) to	(16)			
Number of storeys in the Additional infiltration	ne dwelling (ns)					r(0)	410.4	0	(9)
	.25 for steel or timber frame o	r 0 35 fo	r masoni	ry constr	ruction	[(9)	-1]x0.1 =	0	(10)
	resent, use the value corresponding to			•	dollori			0	(```)
deducting areas of opening	ngs); if equal user 0.35 loor, enter 0.2 (unsealed) or 0	1 (spale	ad) alsa	enter ()					7(12)
If no draught lobby, ent	,	. i (scar	su), cisc	Criter 0				0	(12)
•	s and doors draught 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)
•	q50, expressed in cubic metre	•	•	•	etre of e	envelope	area	5	(17)
•	ity value, then $(18) = [(17) \div 20] + (18)$ s if a pressurisation test has been do.				ie heina u	sad		0.42	(18)
Number of sides sheltere		ie or a de	gree an pe	Titleability	is being u	seu		2	(19)
Shelter factor			(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18) x (20) =				0.36	(21)
Infiltration rate modified for	or monthly wind speed							1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	 		1 .	1			ı	1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4							_	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ition rate (allo	wing for she	lter and	wind sp	peed) =	(21a) x	(22a)m				_	
0.46	0.45 0.44	1 1	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42]	
Calculate effect If mechanica	-	e rate ioi tiit	г арриса	abie cas	e						0	(23a
If exhaust air he	at pump using A	opendix N, (23b	o) = (23a)	× Fmv (ed	quation (I	N5)) , othe	rwise (23b) = (23a)			0	(23b
If balanced with	heat recovery: e	fficiency in % al	llowing for	in-use fa	ctor (fron	n Table 4h) =				0	(230
a) If balance	d mechanical	ventilation w	ith heat	recove	ry (MVI	HR) (24a	a)m = (2	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(24a
b) If balance	d mechanical	ventilation w	ithout h	eat reco	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
•	ouse extract v < 0.5 × (23b)		•	•				.5 × (23b)			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(240
	ventilation or vertilation or vertilation (24							0.5]			_	
(24d)m= 0.6	0.6 0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59]	(240
Effective air	change rate -	enter (24a)	or (24b)	or (24c) or (24	d) in box	(25)				_	
(25)m= 0.6	0.6 0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59]	(25)
3. Heat losses	and heat los	s parameter	:									
ELEMENT	Gross area (m²)	Openings m ²		Net Are		U-valı W/m2		A X U (W/k	()	k-value	-	A X k kJ/K
Doors	,		Γ	2	x	1		2	, T			(26)
Windows Type	1		Ī	0.99	x1	/[1/(1.4)+	0.04] =	1.31	三			(27)
Windows Type	2		Ī	0.99	x1	/[1/(1.4)+	0.04] =	1.31	Ħ			(27)
Windows Type	3		Ī	1.58	x1	/[1/(1.4)+	0.04] =	2.09				(27)
Walls Type1	29.61	6.53	ΠĪ	23.08	x	0.18	= i	4.15	= r			(29)
Walls Type2	14.05	2	T i	12.05	x	0.18	-	2.17	ī i		7	(29)
Walls Type3	4.62	0	T ī	4.62	x	0.18	-	0.83			= =	(29)
Walls Type4	24.69	0	T ī	24.69	x	0.18		4.44			= =	(29)
Roof Type1	42.66	0	T ī	42.66	x	0.13	-	5.55			= =	(30)
Roof Type2	2.85	0	T i	2.85	x	0.13	-	0.37	ī i		7	(30)
Total area of el	ements, m²			118.48	Ħ							(31)
Party wall			Ī	23.58	×	0	=	0	\neg [(32)
Party floor			Ī	54.53	=						7 F	(32a
* for windows and ! ** include the area.					ted using	ı formula 1	/[(1/U-valı	ue)+0.04] a	s given in	paragrapi	h 3.2	
Fabric heat los	s, W/K = S (A	x U)				(26) (30)) + (32) =				28.1	7 (33)
Heat capacity (Cm = S(A x k))					((28)	(30) + (32) + (32a)	(32e) =	7372.	37 (34)
Thermal mass	parameter (TI	MP = Cm ÷ 7	ΓFA) in l	kJ/m²K			Indica	ative Value:	Medium		250	(35)
For design assessi			onstructio	n are not	known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		_
can be used instea	d of a detailed ca	alculation.										

Total fabric he	0 0	are not kn	own (36) =	= 0.15 x (3	1)								_
V 4!! - 4! !			l 41 ₂ 1 ₂					` '	(36) =	05) (5)		47.45	(37)
Ventilation hea			T .			l		` ′	· ·	25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m= 23.2	23.05	22.9	22.18	22.04	21.42	21.42	21.3	21.66	22.04	22.32	22.6		(38)
Heat transfer	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 70.65	70.5	70.35	69.63	69.49	68.87	68.87	68.75	69.11	69.49	69.77	70.05		_
Heat loss para	ameter (H	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39) ₁ (4)	12 /12=	69.63	(39)
(40)m= 1.3	1.29	1.29	1.28	1.27	1.26	1.26	1.26	1.27	1.27	1.28	1.28		
	•						•		Average =	Sum(40) ₁	12 /12=	1.28	(40)
Number of day	ys in mor	nth (Tab	le 1a)			г			r	ī			_
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 ener	av requi	irement								kWh/ye	ear:	
		37 . 5 4 5											
Assumed occi											82		(42)
if TFA > 13.		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (ΓFA -13.	.9)			
if TFA £ 13. Annual averag	•	ator usac	no in litro	se por de	w Vd av	orago =	(25 v NI)	T 36					(40)
Reduce the annu									se target o		.51		(43)
not more that 125	_				_	_			J				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								ООР					
(44)m= 85.26	82.16	79.06	75.96	72.86	69.76	69.76	72.86	75.96	79.06	82.16	85.26		
(***)***	1			1 - 1 - 1			1 -100			m(44) _{1 12} =		930.12	(44)
	f hot water	used - cali	culated mo	onthly = 4	100 1/1	_				(/ / /			
Energy content of		acca can	outated int	, , , , , , , , , , , , , , , , , , ,	190 x va,r	n x nm x L	07m / 3600		nth (see Ta	ables 1b, 1	c, 1d)		_
	110.58	114.11	99.49	95.46	82.37	76.33	77m / 3600 87.59		103.3	ables 1b, 1	<i>c, 1d)</i> 122.45		
			1			1		88.64	103.3	112.76	122.45	1219.53	
	110.58	114.11	99.49	95.46	82.37	76.33	87.59	88.64	103.3	·	122.45	1219.53	(45)
(45)m= 126.44 If instantaneous v	110.58	114.11	99.49	95.46	82.37	76.33	87.59	88.64	103.3	112.76	122.45	1219.53	(45)
(45)m= 126.44 If instantaneous v (46)m= 18.97	110.58 water heatin	114.11	99.49 of use (no	95.46 hot water	82.37 storage),	76.33 enter 0 in	87.59 boxes (46)	88.64 80 (61)	103.3 Total = Su	112.76 m(45) _{1 12} =	122.45	1219.53	
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage	110.58 water heatin 16.59 Floss:	114.11 ng at point 17.12	99.49 of use (no	95.46 hot water 14.32	82.37 storage), 12.36	76.33 enter 0 in 11.45	87.59 boxes (46)	88.64 80 to (61)	103.3 Total = Su 15.49	112.76 m(45) _{1 12} =	122.45	1219.53	
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum	110.58 vater heatin 16.59 closs: ne (litres)	114.11 ng at point 17.12 includin	99.49 of use (not) 14.92 ng any so	95.46 9 hot water 14.32 plar or W	82.37 storage), 12.36	76.33 enter 0 in 11.45 storage	87.59 boxes (46) 13.14 within sa	88.64 80 to (61)	103.3 Total = Su 15.49	112.76 m(45) _{1 12} =	122.45	1219.53	(46)
(45)m= 126.44 If instantaneous v (46)m= 18.97	110.58 vater heatin 16.59 Floss: ne (litres) neating a	114.11 ng at point 17.12 includin nd no ta	99.49 f of use (not) 14.92 ang any so	95.46 95.46 14.32 plar or W velling, e	82.37 * storage), 12.36 /WHRS nter 110	76.33 enter 0 in 11.45 storage litres in	87.59 boxes (46, 13.14 within sa (47)	88.64 80.64 80.64 80.661) 13.3 80.661)	103.3 Total = Su 15.49	112.76 m(45) _{1 12} =	122.45	1219.53	(46)
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum If community h Otherwise if no	110.58 water heatin 16.59 c loss: ne (litres) neating a o stored	114.11 ng at point 17.12 includin nd no ta	99.49 f of use (not) 14.92 ang any so	95.46 95.46 14.32 plar or W velling, e	82.37 * storage), 12.36 /WHRS nter 110	76.33 enter 0 in 11.45 storage litres in	87.59 boxes (46, 13.14 within sa (47)	88.64 80.64 80.64 80.661) 13.3 80.661)	103.3 Total = Su 15.49	112.76 m(45) _{1 12} =	122.45	1219.53	(46)
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum If community h Otherwise if no	110.58 water heatin 16.59 Hoss: He (litres) Heating a Hoss stored Hoss:	114.11 ng at point 17.12 includin nd no ta hot wate	99.49 14.92 ag any sounk in dwer (this in	95.46 95.46 14.32 Dlar or Welling, encludes i	82.37 storage), 12.36 /WHRS nter 110 nstantar	76.33 enter 0 in 11.45 storage litres in neous co	87.59 boxes (46, 13.14 within sa (47)	88.64 80.64 80.64 80.661) 13.3 80.661)	103.3 Total = Su 15.49	112.76 m(45) _{1 12} = 16.91	122.45	1219.53	(46)
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum If community h Otherwise if now Water storage a) If manufact	110.58 water heatin 16.59 he (litres) heating a o stored hoss: turer's de	114.11 ng at point 17.12 includin nd no ta hot wate	99.49 of use (not) 14.92 ng any so ank in dwer (this in oss factors)	95.46 95.46 14.32 Dlar or Welling, encludes i	82.37 storage), 12.36 /WHRS nter 110 nstantar	76.33 enter 0 in 11.45 storage litres in neous co	87.59 boxes (46, 13.14 within sa (47)	88.64 80.64 80.64 80.661) 13.3 80.661)	103.3 Total = Su 15.49	112.76 m(45) _{1 12} = 16.91	122.45	1219.53	(46) (47)
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum If community h Otherwise if now	110.58 vater heatin 16.59 loss: ne (litres) neating a o stored e loss: turer's defactor fro	114.11 17.12 including at point and no tale that water that water that Table	99.49 for use (not) 14.92 and any so ank in dweer (this in oss factors)	95.46 95.46 14.32 plar or Water velling, encludes in the control of the contr	82.37 storage), 12.36 /WHRS nter 110 nstantar	76.33 enter 0 in 11.45 storage litres in neous co	87.59 boxes (46, 13.14 within sa (47)	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	103.3 Total = Su 15.49	112.76 m(45) _{1 12} = 16.91	122.45	1219.53	(46) (47) (48)
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum If community h Otherwise if no Water storage a) If manufact Temperature f	110.58 water heatin 16.59 he (litres) heating a o stored hoss: turer's defactor fro om water	114.11 17.12 including at point and no tale to the water and the management of the	99.49 for use (not) 14.92 and any so ank in dwer (this in oss factors) 2b c, kWh/ye	95.46 95.46 14.32 plar or Water relling, encludes in the control of the contr	82.37 storage), 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous co	87.59 boxes (46, 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	103.3 Total = Su 15.49	112.76 m(45) _{1 12} = 16.91	122.45 18.37 0	1219.53	(46) (47) (48) (49)
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum If community h Otherwise if no Water storage a) If manufact Temperature f Energy lost fro b) If manufact Hot water stor	110.58 water heatin 16.59 Floss: ne (litres) neating a o stored Floss: turer's defactor fro om water turer's defage loss	114.11 17.12 including at point and no tale and the water and the astorage eclared of factor fr	99.49 14.92 ag any so ank in dwer (this in oss factors) 2b k kWh/ye cylinder learn Table	95.46 95.46 14.32 plar or Water velling, encludes it or is known is know	82.37 storage), 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous con/day): known:	87.59 boxes (46, 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	103.3 Total = Su 15.49	112.76 m(45) _{1 12} = 16.91	122.45 18.37 0	1219.53	(46) (47) (48) (49)
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum If community h Otherwise if new Water storage a) If manuface Temperature f Energy lost fro b) If manuface Hot water storage If community h	110.58 vater heatin 16.59 closs: ne (litres) neating a o stored closs: turer's defactor fro om water turer's defage loss neating s	114.11 17.12 including at point 17.12 including at no tale and no tale and no tale and at ale a	99.49 14.92 ag any so ank in dwer (this in oss factors) 2b k kWh/ye cylinder learn Table	95.46 95.46 14.32 plar or Water velling, encludes it or is known is know	82.37 storage), 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous con/day): known:	87.59 boxes (46, 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	103.3 Total = Su 15.49	112.76 m(45) _{1 12} = 16.91	122.45 18.37 0	1219.53	(46) (47) (48) (49) (50)
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum If community h Otherwise if now Water storage a) If manufact Temperature f Energy lost from b) If manufact Hot water storage If community h Volume factor	110.58 vater heatin 16.59 Hoss: The (litres) The ating a constored stored stor	114.11 17.12 including at point and no tale and no tale and tale	99.49 14.92 ag any sounk in dwer (this in oss factors) 2b k, kWh/ye cylinder I com Tablon 4.3	95.46 95.46 14.32 plar or Water velling, encludes it or is known is know	82.37 storage), 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous con/day): known:	87.59 boxes (46, 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	103.3 Total = Su 15.49	112.76 m(45) _{1 12} =	122.45 18.37 0	1219.53	(46) (47) (48) (49) (50) (51) (52)
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum If community h Otherwise if ne Water storage a) If manuface Temperature f Energy lost fro b) If manuface Hot water stor	110.58 vater heatin 16.59 Hoss: The (litres) The ating a constored stored stor	114.11 17.12 including at point and no tale and no tale and tale	99.49 14.92 ag any sounk in dwer (this in oss factors) 2b k, kWh/ye cylinder I from Tablon 4.3	95.46 95.46 14.32 plar or Water velling, encludes it or is known is know	82.37 storage), 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous con/day): known:	87.59 boxes (46, 13.14 within sa (47) mbi boil (48) x (49)	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3 13.3	103.3 Total = Su 15.49 sel er '0' in (112.76 m(45) _{1 12} =	122.45 18.37 0 0	1219.53	(46) (47) (48) (49) (50) (51)
(45)m= 126.44 If instantaneous v (46)m= 18.97 Water storage Storage volum If community h Otherwise if now Water storage a) If manufact Temperature for the community h b) If manufact Hot water storage If community h Volume factor	ne (litres) neating a stored e loss: turer's defactor from water turer's defactor from Tal factor from water form water form Tal factor from water form water form water form water form Tal factor from water form water	114.11 17.12 including at point 17.12 inc	99.49 14.92 ag any so ank in dwer (this in oss factors, kWh/ye cylinder labor 1.3	95.46 95.46 14.32 plar or Water relling, encludes in the control of the contr	82.37 storage), 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous con/day): known:	87.59 boxes (46, 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3 13.3	103.3 Total = Su 15.49 sel er '0' in (112.76 m(45) _{1 12} = 16.91	122.45 18.37 0	1219.53	(46) (47) (48) (49) (50) (51) (52)

	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 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)
Primar	v circuit	loss (an	nual) fro	m Table	e 3							0		(58)
	-	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	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)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	43.45	37.82	40.29	37.46	37.13	34.4	35.55	37.13	37.46	40.29	40.52	43.45		(61)
Total h	eat requ	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=	169.89	148.4	154.4	136.95	132.59	116.78	111.88	124.72	126.1	143.59	153.28	165.9		(62)
Solar DF	-IW input o	calculated	using App	endix G or	· Appendix	r H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter			•						•	•	
(64)m=	169.89	148.4	154.4	136.95	132.59	116.78	111.88	124.72	126.1	143.59	153.28	165.9		
								Outp	out from w	ater heate	r (annual) ₁	12	1684.46	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	_
(65)m=	52.9	46.22	48.01	42.44	41.02	35.99	34.27	38.41	38.84	44.42	47.62	51.58		(65)
inclu	ıde (57)ı	m in calc	culation of	of (65)m	only if c	ylinder i	s in the o	lwelling	or hot w	ator ic fr	om com	munity h	ı Leating	
5 Int								2 VV C IIII 19	OI HOLW	alei is ii	OIII COIII	mumity i	Calling	
-Э. ПІ	ernal da	ains (see	Table 5	and 5a);	•		awog	OI HOLW	alei is ii	OIII COIII	indinity i	leating	
	Ĭ	ains (see):	-		awoming	or not w	alei is ii	om com	munity n	Calling	
	olic gain	s (Table	5), Wat	ts	·		ı							
	Ĭ	·): May	Jun 91.18	Jul 91.18	Aug 91.18	Sep	Oct 91.18	Nov 91.18	Dec 91.18		(66)
Metabo (66)m=	olic gain Jan 91.18	s (Table Feb	5), Wat Mar 91.18	ts Apr 91.18	May 91.18	Jun 91.18	Jul 91.18	Aug 91.18	Sep 91.18	Oct	Nov	Dec		(66)
Metabo (66)m= Lightin	olic gain Jan 91.18	s (Table Feb	5), Wat Mar 91.18	ts Apr 91.18	May 91.18	Jun	Jul 91.18	Aug 91.18	Sep 91.18	Oct	Nov	Dec		(66)
Metabo (66)m= Lightin (67)m=	Jan 91.18 g gains	s (Table Feb 91.18 (calculation)	91.18 ted in Ap	Apr 91.18 opendix 8.61	May 91.18 L, equat 6.43	Jun 91.18 ion L9 o	Jul 91.18 r L9a), a 5.87	Aug 91.18 Iso see	Sep 91.18 Table 5	Oct 91.18	Nov 91.18	Dec 91.18		` ′
Metabo (66)m= Lightin (67)m= Appliar	Jan 91.18 g gains 15.74	s (Table Feb 91.18 (calculat 13.98 ins (calc	91.18 ted in Ap	Apr 91.18 opendix 8.61 Append	May 91.18 L, equat 6.43 dix L, eq	Jun 91.18 ion L9 o 5.43 uation L	Jul 91.18 r L9a), a 5.87 13 or L1	Aug 91.18 Iso see 7.63 3a), also	Sep 91.18 Table 5 10.24 see Ta	Oct 91.18	Nov 91.18 15.17	Dec 91.18		(67)
Metabo (66)m= Lightin (67)m= Appliar (68)m=	Jan 91.18 g gains 15.74 nces ga	s (Table Feb 91.18 (calculat 13.98 ins (calc 160.62	91.18 ted in Ap 11.37 ulated in 156.47	Apr 91.18 ppendix 8.61 Appendix 147.62	May 91.18 L, equat 6.43 dix L, eq	Jun 91.18 ion L9 of 5.43 uation L	Jul 91.18 r L9a), a 5.87 13 or L1	Aug 91.18 Iso see 7.63 3a), also	Sep 91.18 Table 5 10.24 see Ta	Oct 91.18 13 ble 5 130.29	Nov 91.18	Dec 91.18		` ′
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin	Jan 91.18 g gains 15.74 nces gains 158.97	s (Table Feb 91.18 (calcular 13.98 ins (calcular 160.62 (calcular	91.18 ted in Ap 11.37 ulated in 156.47	Apr 91.18 ppendix 8.61 Appendix 147.62	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a	Aug 91.18 Iso see 7.63 3a), also 117.28	Sep 91.18 Table 5 10.24 see Ta 121.44	Oct 91.18 13 ble 5 130.29	Nov 91.18 15.17	Dec 91.18 16.18 151.96		(67)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m=	Jan 91.18 g gains 15.74 nces ga 158.97 ng gains 32.12	s (Table Feb 91.18 (calcular 13.98 ins (calcular 160.62 (calcular 32.12	91.18 ted in Ap 11.37 ulated in 156.47 ted in A	Apr 91.18 opendix 8.61 Append 147.62 opendix 32.12	May 91.18 L, equat 6.43 dix L, eq	Jun 91.18 ion L9 of 5.43 uation L	Jul 91.18 r L9a), a 5.87 13 or L1	Aug 91.18 Iso see 7.63 3a), also	Sep 91.18 Table 5 10.24 see Ta	Oct 91.18 13 ble 5 130.29	Nov 91.18 15.17	Dec 91.18		(67) (68)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps	Jan 91.18 g gains 15.74 nces ga 158.97 ng gains 32.12	s (Table Feb 91.18 (calcular 13.98 ins (calcular 160.62 (calcular	91.18 ted in Ap 11.37 ulated in 156.47 ted in A	Apr 91.18 opendix 8.61 Append 147.62 opendix 32.12	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a	Aug 91.18 Iso see 7.63 3a), also 117.28	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12	Oct 91.18 13 ble 5 130.29	Nov 91.18 15.17 141.46	Dec 91.18 16.18 151.96		(67) (68)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m=	g gains 15.74 nces gains 158.97 ng gains 32.12 and far	s (Table Feb 91.18 (calculat 13.98 ins (calc 160.62 (calculat 32.12 ns gains	91.18 ted in Ap 11.37 ulated in 156.47 ted in Ap 32.12 (Table 5	Apr 91.18 ppendix 8.61 Append 147.62 ppendix 32.12 5a) 3	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44	Oct 91.18 13 ble 5 130.29 5 32.12	Nov 91.18 15.17	Dec 91.18 16.18 151.96		(67) (68) (69)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses	Jan 91.18 g gains 15.74 nces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev	s (Table Feb 91.18 (calculat 13.98 ins (calc 160.62 (calculat 32.12 ns gains 3	91.18 ted in Ap 11.37 ulated in 156.47 ted in Ap 32.12 (Table 5	Apr 91.18 ppendix 8.61 Appendix 147.62 ppendix 32.12 5a) 3 tive valu	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12 3 es) (Tab	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12	Oct 91.18 13 ble 5 130.29 5 32.12	Nov 91.18 15.17 141.46 32.12	Dec 91.18 16.18 151.96 32.12		(67) (68) (69) (70)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	Jan 91.18 g gains 15.74 nces gains 158.97 ng gains 32.12 s and far 3 s e.g. ev	s (Table Feb 91.18 (calculat 13.98 ins (calc 160.62 (calculat 32.12 ns gains 3 aporatio -72.94	91.18 ted in Ap 11.37 ulated in 156.47 ted in A 32.12 (Table 5 3 on (negat	Apr 91.18 ppendix 8.61 Append 147.62 ppendix 32.12 5a) 3	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12	Oct 91.18 13 ble 5 130.29 5 32.12	Nov 91.18 15.17 141.46	Dec 91.18 16.18 151.96		(67) (68) (69)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	g gains 15.74 nces gains 158.97 ng gains 32.12 a and far 3 a e.g. ev -72.94 heating	s (Table Feb 91.18 (calculat 13.98 ins (calculat 160.62 (calculat 32.12 ns gains 3 raporatio -72.94 gains (T	91.18 ted in Ap 11.37 ulated in 156.47 ted in Ap 32.12 (Table 5 3 n (negat	Apr 91.18 ppendix 8.61 Appendix 147.62 ppendix 32.12 5a) 3 tive valu -72.94	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12 3 es) (Tab	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12 3 ole 5) -72.94	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12 3	Oct 91.18 13 ble 5 130.29 5 32.12 3	Nov 91.18 15.17 141.46 32.12 3	Dec 91.18 16.18 151.96 32.12 3		(67) (68) (69) (70)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	olic gain Jan 91.18 g gains 15.74 nces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev -72.94 heating 71.11	s (Table Feb 91.18 (calculat 13.98 ins (calc 160.62 (calculat 32.12 ns gains 3 raporatio -72.94 gains (T 68.78	91.18 ted in Ap 11.37 ulated in 156.47 ted in Ap 32.12 (Table 5 3 In (negation of the context) -72.94 Table 5) 64.54	Apr 91.18 ppendix 8.61 Appendix 147.62 ppendix 32.12 5a) 3 tive valu	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12 3 es) (Tab	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12 3 ole 5) -72.94	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12 3	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12 3	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12 3	Oct 91.18 13 ble 5 130.29 5 32.12 3 -72.94	Nov 91.18 15.17 141.46 32.12 3 -72.94	Dec 91.18 16.18 151.96 32.12 3 -72.94		(67) (68) (69) (70)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	olic gain Jan 91.18 g gains 15.74 nces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev -72.94 heating 71.11	s (Table Feb 91.18 (calculat 13.98 ins (calculat 160.62 (calculat 32.12 ns gains 3 raporatio -72.94 gains (T	91.18 ted in Ap 11.37 ulated in 156.47 ted in Ap 32.12 (Table 5 3 In (negation of the context) -72.94 Table 5) 64.54	Apr 91.18 ppendix 8.61 Appendix 147.62 ppendix 32.12 5a) 3 tive valu -72.94	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12 3 es) (Tab	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12 3 ole 5) -72.94	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12 3	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12 3	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12 3	Oct 91.18 13 ble 5 130.29 5 32.12 3	Nov 91.18 15.17 141.46 32.12 3 -72.94	Dec 91.18 16.18 151.96 32.12 3 -72.94		(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	0.99	x	11.28	x	0.63	×	0.7	=	6.83	(75)
Northeast _{0.9x} 0.77	X	0.99	x	22.97	x	0.63	x	0.7	=	13.9	(75)
Northeast 0.9x 0.77	x	0.99	x	41.38	x	0.63	x	0.7	=	25.04	(75)
Northeast 0.9x 0.77	x	0.99	x	67.96	x	0.63	X	0.7		41.12	(75)
Northeast _{0.9x} 0.77	x	0.99	x	91.35	x	0.63	x	0.7	=	55.27	(75)
Northeast 0.9x 0.77	X	0.99	x	97.38	x	0.63	x	0.7	=	58.93	(75)
Northeast _{0.9x} 0.77	x	0.99	x	91.1	x	0.63	x	0.7	=	55.13	(75)
Northeast _{0.9x} 0.77	X	0.99	x	72.63	x	0.63	x	0.7	=	43.95	(75)
Northeast _{0.9x} 0.77	X	0.99	x	50.42	x	0.63	x	0.7	=	30.51	(75)
Northeast _{0.9x} 0.77	X	0.99	x	28.07	x	0.63	x	0.7	=	16.98	(75)
Northeast _{0.9x} 0.77	X	0.99	x	14.2	x	0.63	x	0.7		8.59	(75)
Northeast _{0.9x} 0.77	X	0.99	x	9.21	x	0.63	x	0.7	=	5.58	(75)
Southeast 0.9x 0.77	X	0.99	x	36.79	x	0.63	x	0.7	=	33.4	(77)
Southeast 0.9x 0.77	X	1.58	X	36.79	X	0.63	x	0.7	=	17.77	(77)
Southeast 0.9x 0.77	x	0.99	x	62.67	x	0.63	x	0.7	=	56.89	(77)
Southeast 0.9x 0.77	X	1.58	x	62.67	x	0.63	x	0.7	=	30.26	(77)
Southeast 0.9x 0.77	X	0.99	x	85.75	x	0.63	x	0.7	=	77.84	(77)
Southeast 0.9x 0.77	x	1.58	x	85.75	x	0.63	x	0.7	=	41.41	(77)
Southeast 0.9x 0.77	X	0.99	x	106.25	х	0.63	x	0.7	=	96.44	(77)
Southeast 0.9x 0.77	X	1.58	x	106.25	x	0.63	x	0.7		51.31	(77)
Southeast 0.9x 0.77	X	0.99	x	119.01	x	0.63	x	0.7	=	108.02	(77)
Southeast 0.9x 0.77	X	1.58	x	119.01	x	0.63	x	0.7		57.47	(77)
Southeast 0.9x 0.77	x	0.99	x	118.15	x	0.63	x	0.7	=	107.24	(77)
Southeast 0.9x 0.77	X	1.58	x	118.15	x	0.63	x [0.7	=	57.05	(77)
Southeast 0.9x 0.77	x	0.99	x	113.91	X	0.63	x	0.7	=	103.39	(77)
Southeast 0.9x 0.77	X	1.58	x	113.91	x	0.63	x	0.7	=	55	(77)
Southeast 0.9x 0.77	X	0.99	x	104.39	x	0.63	x	0.7	=	94.75	(77)
Southeast 0.9x 0.77	X	1.58	X	104.39	x	0.63	X	0.7	=	50.41	(77)
Southeast 0.9x 0.77	X	0.99	X	92.85	x	0.63	×	0.7	=	84.28	(77)
Southeast 0.9x 0.77	X	1.58	X	92.85	x	0.63	X	0.7	=	44.84	(77)
Southeast 0.9x 0.77	X	0.99	X	69.27	X	0.63	X	0.7	=	62.87	(77)
Southeast 0.9x 0.77	X	1.58	X	69.27	x	0.63	×	0.7	=	33.45	(77)
Southeast 0.9x 0.77	X	0.99	X	44.07	x	0.63	X	0.7	=	40	(77)
Southeast 0.9x 0.77	X	1.58	X	44.07	X	0.63	x	0.7	=	21.28	(77)
Southeast 0.9x 0.77	x	0.99	x	31.49	x	0.63	x [0.7	=	28.58	(77)
Southeast 0.9x 0.77	X	1.58	x	31.49	x	0.63	x	0.7	=	15.2	(77)
Solar gains in watts, calcula	$\overline{}$		$\overline{}$			n = Sum(74)m	(82)m			ı	
(83)m= 57.99 101.05 144.2		188.87 220.76		23.22 213.52	189	.11 159.62	113.3	69.87	49.36		(83)
Total gains – internal and so	_	· / · /				00 000 0	000 -		0:0:=		(0.4)
(84)m= 357.16 397.79 430.0	J1 <u> </u>	457.39 472.13	3 4	57.94 437.73	418	.99 398.6	369.65	346	340.17		(84)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.62 19.76 20 20.33 20.65 20.88 20.97 20.96 20.79 20.39 19.95 19.59 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.84 19.85 19.85 19.86 19.86 19.87 19.87 19.87 19.87 19.87 19.86 19.86 19.85 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.96 0.89 0.72 0.5 0.55 0.82 0.97 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.02 18.23 18.58 19.06 19.5 19.78 19.86 19.85 19.69 19.15 18.51 17.99 (90) ## Comparison of the first of the whole dwelling for T2 (follow steps 3 to 7 in Table 9c) (92)m= 18.7 18.88 19.19 19.6 19.99 20.25 20.33 20.32 20.16 19.68 19.12 18.67 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate	7 Me	an inter	nal temr	perature	(heating	season)								
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (88) (88)m= 1 0.99 0.99 0.99 0.97 0.92 0.81 0.85 0.89 0.89 0.98 0.99 1. (88) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.82 19.78 20 20.33 20.65 20.88 20.97 20.96 20.79 20.39 19.95 19.59 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 ("C) (89)m= 10.84 19.85 19.85 19.85 19.86 19.86 19.86 19.87 19.87 19.87 19.87 19.86 19.86 19.85 19.85 19.85 (88) When internal temperature in the rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.88 0.86 0.88 0.72 0.5 0.55 0.82 0.82 0.97 0.99 1 0.89 1 0.89 (90) Mean internal temperature in the rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.88 0.86 0.88 0.72 0.5 0.55 0.82 0.82 0.97 0.99 1 0.99 1 0.99 (90) Mean internal temperature in the rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.88 0.86 0.80 19.5 19.78 19.86 19.85 19.85 19.85 19.85 18.51 17.99 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 18.02 18.23 18.58 19.96 19.5 19.98 20.25 20.33 20.32 20.16 19.88 19.12 18.67 0.43 (91) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 18.7 18.88 19.19 19.6 19.96 20.25 20.33 20.32 20.16 19.88 19.12 18.67 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate 0.99 (93)m= 18.79 (93)m= 18					`			from Tah	nle 9 Th	1 (°C)				21	(85)
Mean internal temperature More	•		•	٠.			•		JIC 0, 111	1 (0)				21	(00)
(86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)ms	Otiliot				<u>`</u> _		<u> </u>	<u> </u>	Aug	Sen	Oct	Nov	Dec		
(87) 19.82 19.76 20 20.33 20.65 20.88 20.97 20.96 20.79 20.39 19.95 19.59 19.59 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (89)m= 19.84 19.85 19.85 19.85 19.86 19.87 19.87 19.87 19.87 19.86 19.86 19.85 19.87 19.87 19.87 19.86 19.86 19.85	(86)m=			-		-		-	⊢ <u> </u>	<u> </u>		-			(86)
(87) 19.82 19.76 20 20.33 20.65 20.88 20.97 20.96 20.79 20.39 19.95 19.59 19.59 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (89)m= 19.84 19.85 19.85 19.85 19.86 19.87 19.87 19.87 19.87 19.86 19.86 19.85 19.87 19.87 19.87 19.86 19.86 19.85	Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				l	
188 19.84 19.85 19.85 19.86 19.86 19.87 19.87 19.87 19.87 19.87 19.86 19.86 19.85 19.85 19.85 19.86 19.86 19.85 19.85 19.86 19.85 19.85 19.85 19.86 19.85 19.12 18.67 19.85 19.95 19.85 19.95 19.85 19.12 18.67 19.85 19.95 19.85 19.95 19.85 19.12 18.67 19.85 19.95 19.85 19.95 19.85 19.12 18.67 19.85 19.12 18.67 19.85 19.12 18.67 19.85 19.12 18.67 19.85 19.12 18.67 19.85 19.95 19.95 20.25 20.33 20.32 20.16 19.68 19.12 18.67 19.67 19.67 19.68 19.12 18.67 19.57 19.57 19.58 19.58 19.12 19.67 19.57 19.68 19.12 18.67 19.57 19.65 19.95 19.95 20.25 20.33 20.32 20.16 19.68 19.12 18.67 19.67 19.67 19.67 19.68 19.12 18.67 19.67 19.67 19.68 19.12 18.67 19.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67	(87)m=			T T		`	r	i 	r		20.39	19.95	19.59		(87)
188 19.84 19.85 19.85 19.86 19.86 19.87 19.87 19.87 19.87 19.87 19.86 19.86 19.85 19.85 19.85 19.86 19.86 19.85 19.85 19.86 19.85 19.85 19.85 19.86 19.85 19.12 18.67 19.85 19.95 19.85 19.95 19.85 19.12 18.67 19.85 19.95 19.85 19.95 19.85 19.12 18.67 19.85 19.95 19.85 19.95 19.85 19.12 18.67 19.85 19.12 18.67 19.85 19.12 18.67 19.85 19.12 18.67 19.85 19.12 18.67 19.85 19.95 19.95 20.25 20.33 20.32 20.16 19.68 19.12 18.67 19.67 19.67 19.68 19.12 18.67 19.57 19.57 19.58 19.58 19.12 19.67 19.57 19.68 19.12 18.67 19.57 19.65 19.95 19.95 20.25 20.33 20.32 20.16 19.68 19.12 18.67 19.67 19.67 19.67 19.68 19.12 18.67 19.67 19.67 19.68 19.12 18.67 19.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67 19.68 19.12 18.67 19.67	Temr	perature	durina h	neating p	eriods ir	rest of	dwelling	from Ta	ble 9. T	h2 (°C)				l	
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89) (89) (80) (8	(88)m=				T .	r		r	· ·	``	19.86	19.86	19.85		(88)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89) (89) (80) (8	Utilisa	ation fac	tor for a	ains for	rest of d	welling,	h2,m (se	e Table	9a)			•	•		
(90) 18.02 18.23 18.58 19.06 19.5 19.78 19.86 19.85 19.69 19.15 18.51 17.99 (90) (1.4 = Living area + (4) =	(89)m=							r		0.82	0.97	0.99	1		(89)
(90) 18.02 18.23 18.58 19.06 19.5 19.78 19.86 19.85 19.69 19.15 18.51 17.99 (90) (1.4 = Living area + (4) =	Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)			l	
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)me									r –			18.51	17.99		(90)
(92) me										f	LA = Livin	g area ÷ (4	4) =	0.43	(91)
(92) me	Mean	interna	l temper	ature (fo	r the wh	ole dwe	llina) = f	LA × T1	+ (1 – fL	A) × T2					
93)me						r		I			19.68	19.12	18.67		(92)
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.99 0.98 0.96 0.89 0.75 0.57 0.61 0.84 0.96 0.99 1 Useful gains, hmGm, W = (94)m x (84)m (95)m= 355.23 394.05 422.06 437.65 421.81 343.78 247.66 256.35 335.99 356.14 342.57 338.69 (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 ((39)m - (96)m)] (97)m= 1017.52 985.59 892.44 745.17 575.92 389.22 256.95 269.73 418.93 631.14 838.78 1013.78 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 492.74 397.52 349.96 221.41 114.65 0 0 0 0 0 204.6 357.27 502.27 Total per year (kWh/year) = Sum(98). 30.17 = 2640.42 (98) Space heating requirement in kWh/m²/year 48.42 (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 heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) = (202) × [1 - (203)] = 1 (204) = (204)	Apply	∟—— ⁄ adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate		ļ.		
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	(93)m=	18.7	18.88	19.19	19.6	19.99	20.25	20.33	20.32	20.16	19.68	19.12	18.67		(93)
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.99 0.98 0.96 0.89 0.75 0.57 0.61 0.84 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m (95)m= 355.23 394.05 422.06 437.65 421.81 343.78 247.66 256.35 335.99 356.14 342.57 338.69 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = [(39)m x (93)m - (96)m] (97)m= 1017.52 985.59 892.44 745.17 575.9 389.22 256.95 269.73 418.93 631.14 838.78 1013.78 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 492.74 397.52 349.96 221.41 114.65 0 0 0 0 0 0.04.6 357.27 502.27 Total per year (kWh/year) = Sum(98)s. 3 = 2640.42 (98) Space heating requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from main system(s) (202) = 1 - (201) =	8. Sp	ace hea	ting requ	uirement											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec					•		ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)m= 0.99 0.99 0.98 0.98 0.96 0.89 0.75 0.57 0.61 0.84 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m (95)m= 355.23 394.05 422.06 437.65 421.81 343.78 247.66 256.35 335.99 356.14 342.57 338.69 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= 1017.52 985.59 892.44 745.17 575.92 389.22 256.95 269.73 418.93 631.14 838.78 1013.78 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 492.74 397.52 349.96 221.41 114.65 0 0 0 0 0 0 204.6 357.27 502.27 Total per year (kWh/year) = Sum(98)sv = 2640.42 (98) Space heating requirement in kWh/m²/year 48.42 (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 heating from main system (s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) × [1 - (203)] = 1 (204)	the ut					i	l .	l				l	_		
(94)m= 0.99 0.99 0.98 0.96 0.89 0.75 0.57 0.61 0.84 0.96 0.99 1 Useful gains, hmGm , W = (94)m x (84)m (95)m= 355.23 394.05 422.06 437.65 421.81 343.78 247.66 256.35 335.99 356.14 342.57 338.69 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= 1017.52 985.59 892.44 745.17 575.92 389.22 256.95 269.73 418.93 631.14 838.78 1013.78 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 492.74 397.52 349.96 221.41 114.65 0 0 0 0 0 204.6 357.27 502.27 Total per year (kWh/year) = Sum(98) ₁₋₈₉₋₁₂ = 2640.42 (98) Space heating requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204)	Litilia				<u> </u>	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = (94)m x (84)m (95)m= 355.23 394.05 422.06 437.65 421.81 343.78 247.66 256.35 335.99 356.14 342.57 338.69 (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= 1017.52 985.59 892.44 745.17 575.92 389.22 256.95 269.73 418.93 631.14 838.78 1013.78 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 492.74 397.52 349.96 221.41 114.65 0 0 0 0 0 204.6 357.27 502.27 Total per year (kWh/year) = Sum(98)92 = 2640.42 (99) 9a. Energy requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204)				r	1	0.80	0.75	0.57	0.61	0.84	0.06	n 00	1		(94)
(95)me 355.23 394.05 422.06 437.65 421.81 343.78 247.66 256.35 335.99 356.14 342.57 338.69 (95)				<u> </u>	<u> </u>		0.73	0.57	0.01	0.04	0.90	0.99	'		(0.1)
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 = 1017.52 985.59 892.44 745.17 575.92 389.22 256.95 269.73 418.93 631.14 838.78 1013.78 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98)m = 492.74 397.52 349.96 221.41 114.65 0 0 0 0 0 204.6 357.27 502.27 Total per year (kWh/year) = Sum(98) _{1-8.9-12} = 2640.42 (98) Space heating requirement in kWh/m²/year 48.42 (99) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204) Efficiency of main space heating system 1				`	´ ` `	 	343 78	247 66	256 35	335 99	356 14	342 57	338 69		(95)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m – (96)m] (97)m= 1017.52 985.59 892.44 745.17 575.92 389.22 256.95 269.73 418.93 631.14 838.78 1013.78 Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98)m= 492.74 397.52 349.96 221.41 114.65 0 0 0 0 0 204.6 357.27 502.27 Total per year (kWh/year) = Sum(98) _{1.5.9.12} 2640.42 (98) Space heating requirement in kWh/m²/year 48.42 (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) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204) Efficiency of main space heating system 1	. ,			l		l		217.00	200.00	000.00	000.11	0 12:01	000.00		()
Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]						i —	i	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98)m= 492.74 397.52 349.96 221.41 114.65 0 0 0 0 0 204.6 357.27 502.27 Total per year (kWh/year) = Sum(98) _{1.59.12} = 2640.42 (98) Space heating requirement in kWh/m²/year 48.42 (99) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204) Efficiency of main space heating system 1		loss rate	for mea	an intern	ıal temp	erature,	Lm,W:	<u> </u> =[(39)m :	x [(93)m	– (96)m]				
(98)m= 492.74 397.52 349.96 221.41 114.65 0 0 0 0 204.6 357.27 502.27 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 2640.42 (98) Space heating requirement in kWh/m²/year 48.42 (99) Space heating: Fraction of space heat from secondary/supplementary system	(97)m=	1017.52	985.59	892.44	745.17	575.92	389.22	256.95	269.73	418.93	631.14	838.78	1013.78		(97)
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 2640.42 (98) Space heating requirement in kWh/m²/year 48.42 (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) = $1 - (201) = 1$ (202) Fraction of total heating from main system 1 (204) = $(202) \times [1 - (203)] = 1$ (204) Efficiency of main space heating system 1 93.4 (206)	Spac	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
Space heating requirement in kWh/m²/year 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 (204) = (202) × [1 – (203)] = 1 (204) (206)	(98)m=	492.74	397.52	349.96	221.41	114.65	0	0	0	0	204.6	357.27	502.27		
9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Space heating system 1 (202) = 1 - (201) = 1 (202) (204) = (202) × [1 - (203)] = 1 (204) (204) = (202) × [1 - (203)] = 1 (204) (206)									Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	2640.42	(98)
Space heating:Fraction of space heat from secondary/supplementary system0(201)Fraction of space heat from main system(s) $(202) = 1 - (201) =$ 1(202)Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1(204)Efficiency of main space heating system 1 93.4 (206)	Spac	e heatin	g require	ement in	kWh/m²	²/year								48.42	(99)
Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = $1 - (201) = 1$ Fraction of total heating from main system 1 (204) = $(202) \times [1 - (203)] = 1$ Efficiency of main space heating system 1 93.4 (206)	9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system(s) $ (202) = 1 - (201) = $ $ (202) = 1 - (201) = $ $ (204) = (202) \times [1 - (203)] = $ $ (204) = (202) $	•		_			/									— (004)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1 (204) Efficiency of main space heating system 1 93.4 (206)							mentary	-		(201) -					=
Efficiency of main space heating system 1		•			•	` ,				, ,	(202)] -				= '
				•	•				(204) = (2	∪∠) × [1 –	(203)] =				= ' '
Efficiency of secondary/supplementary heating system, %		-	•				-	0.						93.4	= '
	Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	า, %						0	(208)

								_	
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement (calculated above)								1	
492.74 397.52 349.96 221.41 114.65	0	0	0	0	204.6	357.27	502.27		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	_	T .			l			1	(211)
527.56 425.61 374.69 237.06 122.75	0	0	0 Tota	0 L (k\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	219.06 ar) =Sum(2	382.52	537.76		7(244)
Change heating final (according) 1/1/h/month			TOLA	ii (KVVIII/yed	ai) –Suiii(2	2 1 1) _{15,10. 12}		2827	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)									
(215)m =	0	0	0	0	0	0	0]	
			Tota	l (kWh/yea	ar) =Sum(2	215) _{15,10. 12}	=	0	(215)
Water heating									_
Output from water heater (calculated above)		1		1	1	1		1	
169.89 148.4 154.4 136.95 132.59	116.78	111.88	124.72	126.1	143.59	153.28	165.9		٦,,,,,
Efficiency of water heater	00.0	I 00 0	I 00 0	00.0	T 05 04	07.44	07.00	80.3	(216)
(217)m= 87.58 87.41 87.05 86.25 84.69	80.3	80.3	80.3	80.3	85.94	87.11	87.66		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)m= 193.99 169.77 177.37 158.77 156.56	145.43	139.33	155.32	157.03	167.07	175.96	189.25		
			Tota	I = Sum(2	19a) ₁₁₂ =			1985.85	(219)
Annual totals					k'	Wh/year	•	kWh/year	7
Space heating fuel used, main system 1								2827	<u> </u>
Water heating fuel used								1985.85	_
Electricity for pumps, fans and electric keep-hot									
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a)	(230g) =			75	(231)
Electricity for lighting								277.94	(232)
12a. CO2 emissions – Individual heating syste	ms inclu	uding mi	cro-CHF)					
	Fn	ergy			Fmiss	ion fac	tor	Emissions	
		/h/year			kg CO			kg CO2/yea	ır
Space heating (main system 1)	(211	1) x			0.2	16	=	610.63	(261)
Space heating (secondary)	(215	5) x			0.5	19	=	0	(263)
Water heating	(219	9) x			0.2	16	=	428.94	(264)
Space and water heating	(26	1) + (262)	+ (263) + (264) =				1039.58	(265)
Electricity for pumps, fans and electric keep-hot	(23	1) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232	2) x			0.5	19	=	144.25	(268)
Total CO2, kg/year				sum o	of (265) (2	271) =		1222.76	(272)
TER =								22.42	(273)

eight associates

Appendix Energy Assessment 40-42 Mill Lane

LEAN Scenario

			User D	etails: _						
Assessor Name:	Chris Hocknell		-ose rb	Strom:	a Num	her:		STRC	0016363	
Software Name:	Stroma FSAP 20)12		Softwa					on: 1.0.4.10	
			roperty <i>i</i>	Address			d-Lean			
Address :	Unit 1, 40-42 Mill L					'				
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				72	(1a) x	2	.75	(2a) =	198	(3a)
Total floor area TFA = (1	(a)+(1b)+(1c)+(1d)+(1	le)+(1r	1)	72	(4)			_		
Dwelling volume				•	(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	198	(5)
2. Ventilation rate:										
	main heating	secondar heating	У	other		total			m³ per hou	ır
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					0	x -	10 =	0	(7a)
Number of passive vents	3				F	0	x -	10 =	0	(7b)
Number of flueless gas f	fires				F	0	X 4	40 =	0	(7c)
Ç					L					`
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has		ded, procee	d to (17), d	otherwise o	ontinue fr	om (9) to ((16)			_
Number of storeys in t	the dwelling (ns)						r/0\	47.04	0	(9)
Additional infiltration) OF for atoal or timbo	. f	0.25 fo				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (oresent, use the value corre				•	uction			0	(11)
deducting areas of open		coponanty to	ino groat	or wan are	a (anor					
If suspended wooden	floor, enter 0.2 (unse	aled) or 0.	.1 (seale	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	stripped							0	(14)
Window infiltration				0.25 - [0.2	. ,	_			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value	• •		•	•	•	etre of e	envelope	area	7	(17)
If based on air permeabi	•					to to do			0.35	(18)
Air permeability value application Number of sides sheltered		as been don	ie or a deg	gree air pei	теарицу	is being u	sea		2	(19)
Shelter factor	Cu			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.3	(21)
Infiltration rate modified	-	ed								`
Jan Feb	Mar Apr May		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]	
N/ 15 (/05)				•			•	•	_	
Wind Factor (22a)m = (2	'	0.05	0.05	0.00	4	1 400	1 4 4 0	440	7	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	

Adjusted infiltra	ation rate	(allowin	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.38	0.37	0.36	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.33	0.35		
Calculate effect		-	ate for t	пе арріі	саріе са	se						0.5	(23a
If exhaust air he			ndix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23b
If balanced with	n heat recov	ery: effici	ency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				74.8	(230
a) If balance	d mechar	nical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2:	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.51	0.5	0.49	0.45	0.45	0.41	0.41	0.4	0.42	0.45	0.46	0.48		(24a
b) If balance	d mechar	nical ve	ntilation	without	heat red	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 if (22b)n	ouse extr			•	•				.5 × (23b))			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)n	ventilatior n = 1, the								0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change ra	ate - en	ter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)					
(25)m= 0.51	0.5	0.49	0.45	0.45	0.41	0.41	0.4	0.42	0.45	0.46	0.48		(25)
3. Heat losse	s and hea	at loss p	aramete	er:									
ELEMENT	Gross area (i	3	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l	〈)	k-value kJ/m²·		A X k kJ/K
Doors					2	x	1.5	=	3				(26)
Windows Type	1				2.3	x1.	/[1/(1.4)+	0.04] =	3.05				(27)
Windows Type	2				3.43	x1.	/[1/(1.4)+	0.04] =	4.55				(27)
Floor					72	x	0.25	=	18				(28)
Walls Type1	48.2		17.23	3	30.97	×	0.25	=	7.74				(29)
Walls Type2	14.96		0		14.96	x	0.2	=	3.05				(29)
Walls Type3	9.9		2		7.9	x	0.23	=	1.78				(29)
Total area of e	lements,	m²			145.0	6							(31)
Party wall					40.96	x	0	=	0				(32)
Party ceiling					72							$\neg \Box$	(32)
* for windows and ** include the area						ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
Fabric heat los	ss, W/K =	S (A x	U)				(26) (30)) + (32) =				56.42	(33)
Heat capacity	Cm = S(A	(xk)						((28)	(30) + (32	2) + (32a)	(32e) =	14109.4	(34)
Thermal mass	paramete	er (TMP) = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assess can be used instead				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	•	,		• .	•	<						21.76	(36)
if details of therma Total fabric he		re not kno	own (36) =	= 0.15 x (3	11)			(33) +	(36) =			78.18	(37)
Ventilation hea	at loss cal	culated	monthly	/				(38)m	= 0.33 × (25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

		,								,		ı	
(38)m= 33.0	2 32.53	32.05	29.62	29.13	26.7	26.7	26.21	27.67	29.13	30.1	31.07		(38)
Heat transfe	er coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 111.	2 110.71	110.23	107.8	107.31	104.88	104.88	104.39	105.85	107.31	108.28	109.25		_
Heat loss pa	arameter (I	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	107.67	(39)
(40)m= 1.54	1.54	1.53	1.5	1.49	1.46	1.46	1.45	1.47	1.49	1.5	1.52		_
Number of o	days in mo	nth (Tab	le 1a)					,	Average =	Sum(40)₁	12 /12=	1.5	(40)
Jai	n 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 he	eating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed or	ccupancy	N									00		(42)
if TFA > 1	3.9, N = 1 3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13		.29		(42)
Annual aver	age hot wa										3.68		(43)
Reduce the an not more that 1	Ū				•	Ū	to achieve	a water us	se target o	of -		l	
		· ·	<u> </u>			<u> </u>	Ι Δ	Con	Oat	Nov	Daa		
Jar Hot water usag		Mar r day for ea	Apr ach month	May Vd,m = fa	Jun ctor from 7	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 97.5	<u> </u>	90.45	86.9	83.35	79.81	79.81	83.35	86.9	90.45	94	97.54		
(11)	1 0.	1 00.10	00.0	00.00	70.01	70.01	00.00			m(44) _{1 12} =	L	1064.1	(44)
Energy conten	t of hot water	used - cal	culated me	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m= 144.6	65 126.51	130.55	113.82	109.21	94.24	87.33	100.21	101.41	118.18	129	140.09		
If instantaneous	o watar baati	ina at naint	of was /n	, bot water	r otorogo)	antar O in	haves (46		Total = Su	m(45) _{1 12} =		1395.2	(45)
If instantaneou										T			(40)
(46)m= 21.7 Water storage	1	19.58	17.07	16.38	14.14	13.1	15.03	15.21	17.73	19.35	21.01		(46)
Storage volu	•) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If communit	y heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)					l	
Otherwise if		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage a) If manufa	•	oolorod l	ana fant	ar ia kaa	/Id\A/k	2/dox4):					_		(40)
Temperatur				JI IS KIIO	wii (Kvvi	i/uay).					0		(48)
Energy lost				ar			(48) x (49	١ =			0		(49) (50)
b) If manufa		-	-		or is not		(40) X (40)				0		(30)
Hot water st	_			e 2 (kW	h/litre/da	ay)					0		(51)
If community			on 4.3									l	
Volume fact Temperature			2h								0		(52) (53)
Energy lost				aar			(47) x (51)	\ v (52) v (53) =				, ,
Enter (50)		_	, KVVII/ y	zai			(41) X (31)	/ X (32) X (55) =		0		(54) (55)
Water stora	. , .	,	for each	month			((56)m = (55) × (41)ı	m				(3.2)
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder conta	ains dedicate				-	-		7)m = (56)	_		_	ix H	•
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
	•						•			-		'	

Primary circuit lo	oss (annual) fro	om Table	: 3							0		(58)
Primary circuit lo			•	•	. ,	, ,						
`	actor from Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)	1	l	
(59)m= 0	0 0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calc	ulated for each	n month (61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 49.71	43.26 46.09	42.86	42.48	39.36	40.67	42.48	42.86	46.09	46.35	49.71		(61)
Total heat requir	red for water h	eating ca	lculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)n	า
(62)m= 194.36	169.78 176.64	156.67	151.69	133.6	128	142.69	144.26	164.27	175.36	189.8		(62)
Solar DHW input cal	lculated using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additional I	ines 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 wat	er heater											
(64)m= 194.36	169.78 176.64	156.67	151.69	133.6	128	142.69	144.26	164.27	175.36	189.8		
		•				Outp	out from wa	ater heate	r (annual)₁	12	1927.11	(64)
Heat gains from	water heating	, kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	א 0.8 + [ר	κ [(46)m	+ (57)m	+ (59)m]	_
(65)m= 60.52	52.88 54.93	48.56	46.93	41.17	39.2	43.94	44.43	50.82	54.48	59.01		(65)
include (57)m	in calculation	of (65)m	only if c	vlinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal gair		. , ,	-	,		5					J	
	·	·	, .									
Metabolic gains Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	114.68 114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68		(66)
Lighting gains (c					<u> </u>	<u> </u>					I	
	15.99 13	9.84	7.36	6.21	6.71	8.73	11.71	14.87	17.36	18.5		(67)
Appliances gain					<u> </u>	<u> </u>	l .	<u> </u>			I	()
· · · · · · · · · · · · · · · · · · ·	204.01 198.73	187.49	173.3	159.97	151.06	148.96	154.24	165.48	179.67	193.01		(68)
` '		ļ l			<u> </u>	<u> </u>		<u> </u>	175.07	100.01		(00)
Cooking gains (cooking -	34.47	-	34.47	34.47			34.47	24.47	24.47		(69)	
` '	34.47 34.47		34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47		(00)
Pumps and fans			0]	(70)
(70)m= 3	3 3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. eva	· · · · ·		, ,								l	(74)
` '	-91.75 -91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75		(71)
Water heating g	``								1	1	1	
(72)m= 81.35	78.69 73.83	67.44	63.08	57.19	52.69	59.06	61.71	68.3	75.67	79.31		(72)
Total internal g	ains =			(66)	m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	m	•	
` '	359.1 345.97	325.19	304.15	283.77	270.87	277.15	288.07	309.06	333.1	351.23		(73)
6. Solar gains:												
Solar gains are cal	•		Table 6a		·	itions to co		ie applicat		ion.		
Orientation: Ac	cess Factor ble 6d	Area m²		Flu Tal	x ble 6a	Т	g_ able 6b	T	FF able 6c		Gains (W)	
						. —					` '	-
Northeast 0.9x	0.77 ×				1.28	x	0.57	_ ×	0.7	=	10.7	(75)
Northeast _{0.9x}	0.77 ×	3.4	3	x 2	22.97	x	0.57	x	0.7	=	21.78	(75)

Northeast 0,8			_											_
Northeast 0 94	Northeast _{0.9x}	0.77	X	3.43		x	11.38	X	0.57	X	0.7	=	39.24	(75)
Northeast 0 9x	Northeast _{0.9x}	0.77	X	3.43		x 6	67.96	X	0.57	X	0.7	=	64.45	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	3.43		x 9	91.35	X	0.57	X	0.7	=	86.63	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	3.43		x (97.38	X	0.57	Х	0.7	=	92.36	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	3.43		x	91.1	x	0.57	X	0.7		86.4	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	3.43		x 7	72.63	X	0.57	Х	0.7		68.88	(75)
Northeast 0.9x	Northeast 0.9x	0.77	X	3.43		x 5	50.42	x	0.57	х	0.7	-	47.82	(75)
Northwest 0.9x	Northeast _{0.9x}	0.77	X	3.43		x 2	28.07	X	0.57	x	0.7		26.62	(75)
Northwest 0.9x	Northeast _{0.9x}	0.77	X	3.43		x	14.2	X	0.57	Х	0.7		13.46	(75)
Northwest 0.9x	Northeast 0.9x	0.77	X	3.43		x :	9.21	x	0.57	x	0.7	_	8.74	(75)
Northwest 0.9x	Northwest 0.9x	0.77	X	2.3		x 1	11.28	X	0.57	х	0.7	=	43.05	(81)
Northwest 0.9x	Northwest 0.9x	0.77	X	2.3		x 2	22.97	х	0.57	х	0.7	=	87.64	(81)
Northwest 0.9x	Northwest 0.9x	0.77	X	2.3		x	11.38	x	0.57	x	0.7		157.89	(81)
Northwest 0.9x	Northwest 0.9x	0.77	X	2.3		x 6	67.96	x	0.57	x	0.7	-	259.31	(81)
Northwest 0.9x	Northwest 0.9x	0.77	X	2.3		x = 9	91.35	x	0.57	x	0.7		348.56	(81)
Northwest 0.9x	Northwest 0.9x	0.77	X	2.3		x = 9	97.38	x	0.57	x	0.7	-	371.6	(81)
Northwest 0.9x	Northwest 0.9x	0.77	x	2.3	ī	x =	91.1	x	0.57	x	0.7	╡ -	347.62	(81)
Northwest 0.9x	Northwest 0.9x	0.77	X	2.3		x 7	72.63	x	0.57	x	0.7	-	277.13	(81)
Northwest 0.9x	Northwest 0.9x	0.77	x	2.3		x 5	50.42	x	0.57	x	0.7	╡ =	192.4	(81)
Northwest 0.9x	Northwest 0.9x	0.77	x	2.3		x 2	28.07	х	0.57	x	0.7	╡ -	107.1	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m (83)m = \$53.75 109.42 197.14 323.76 435.19 463.96 434.03 346.01 240.21 133.72 67.64 43.9 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = \$415.43 468.52 543.11 648.94 739.34 747.73 704.9 623.16 528.29 442.78 400.74 395.12 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m = 1 1 0.99 0.97 0.9 0.76 0.61 0.69 0.91 0.99 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m = 19.24 19.4 19.71 20.17 20.59 20.87 20.96 20.94 20.69 20.17 19.65 19.24 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m = 19.65 19.66 19.66 19.69 19.69 19.72 19.72 19.73 19.71 19.69 19.68 19.67 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m = 1 1 0.99 0.96 0.86 0.86 0.45 0.53 0.85 0.98 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (80)m = 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)	Northwest 0.9x	0.77	X	2.3	司	x	14.2	x	0.57	x	0.7	=	54.17	(81)
(83)m= 53.75	Northwest 0.9x	0.77	x	2.3		x =	9.21	x	0.57	x	0.7	╡ =	35.16	(81)
(83)m= 53.75	_							•						
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 415.43	Solar gains in	watts, calcul	lated	for each m	onth			(83)m	= Sum(74)m	(82)m			_	
(84)m= 415.43 468.52 543.11 648.94 739.34 747.73 704.9 623.16 528.29 442.78 400.74 395.12 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.97 0.9 0.76 0.61 0.69 0.91 0.99 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.24 19.4 19.71 20.17 20.59 20.87 20.96 20.94 20.69 20.17 19.65 19.24 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.65 19.66 19.69 19.69 19.72 19.72 19.73 19.71 19.69	(83)m= 53.75	109.42 197	7.14	323.76 43	5.19	463.96	434.03	346	.01 240.21	133.72	67.64	43.9		(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 1 0.99 0.97 0.9 0.76 0.61 0.69 0.91 0.99 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.24 19.4 19.71 20.17 20.59 20.87 20.96 20.94 20.69 20.17 19.65 19.24 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.65 19.66 19.66 19.69 19.69 19.72 19.72 19.73 19.71 19.69 19.68 19.67 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 0.99 0.96 0.86 0.66 0.45 0.53 0.85 0.98 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)	Total gains – ir	nternal and	solar	(84)m = (73)	3)m +	- (83)m	, watts						•	
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	(84)m= 415.43	468.52 543	3.11	648.94 73	9.34	747.73	704.9	623	.16 528.29	442.78	400.74	395.12		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	7. Mean inter	nal tempera	ture	(heating sea	ason))								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature	during heati	ing p	eriods in the	e livir	ig area	from Tal	ole 9	Th1 (°C)				21	(85)
(86)m= 1 1 0.99 0.97 0.9 0.76 0.61 0.69 0.91 0.99 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.24 19.4 19.71 20.17 20.59 20.87 20.96 20.94 20.69 20.17 19.65 19.65 19.24 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.65 19.66 19.66 19.69 19.72 19.72 19.73 19.71 19.69 19.68 19.67 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 0.99 0.96 0.86 0.66 0.45 0.53 0.85 0.98 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 17.35<	Utilisation fac	tor for gains	for I	iving area, I	h1,m	(see Ta	able 9a)							_
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.24 19.4 19.71 20.17 20.59 20.87 20.96 20.94 20.69 20.17 19.65 19.65 19.24 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.65 19.66 19.69 19.69 19.72 19.72 19.73 19.71 19.69 19.68 19.67 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 0.99 0.96 0.86 0.66 0.45 0.53 0.85 0.98 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)	Jan	Feb N	/lar	Apr N	May	Jun	Jul	Α	ug Sep	Oct	Nov	Dec		
(87)m= 19.24 19.4 19.71 20.17 20.59 20.87 20.96 20.94 20.69 20.17 19.65 19.24 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.65 19.66 19.69 19.69 19.72 19.72 19.73 19.71 19.69 19.68 19.67 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 0.99 0.96 0.86 0.66 0.45 0.53 0.85 0.98 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)	(86)m= 1	1 0.	99	0.97).9	0.76	0.61	0.6	0.91	0.99	1	1		(86)
(87)m= 19.24 19.4 19.71 20.17 20.59 20.87 20.96 20.94 20.69 20.17 19.65 19.24 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.65 19.66 19.69 19.69 19.72 19.72 19.73 19.71 19.69 19.68 19.67 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 0.99 0.96 0.86 0.66 0.45 0.53 0.85 0.98 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)	Mean internal	l temperatur	e in I	iving area	Γ1 (fo	llow ste	ps 3 to 7	7 in T	able 9c)	-		-		
(88)m= 19.65 19.66 19.66 19.69 19.69 19.72 19.72 19.73 19.71 19.69 19.68 19.67 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 0.99 0.96 0.86 0.66 0.45 0.53 0.85 0.98 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)					<u> </u>		i –	1		20.17	19.65	19.24		(87)
(88)m= 19.65 19.66 19.66 19.69 19.69 19.72 19.72 19.73 19.71 19.69 19.68 19.67 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 0.99 0.96 0.86 0.66 0.45 0.53 0.85 0.98 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)	Temperature	during heati	ina n	eriods in re	et of	dwelling	ı from Ta	hle (Th2 (°C)	Į.				
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 1 0.99 0.96 0.86 0.66 0.45 0.53 0.85 0.98 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)	· -			The second second			1	1		19.69	19.68	19.67		(88)
(89)m= 1 1 0.99 0.96 0.86 0.66 0.45 0.53 0.85 0.98 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)	` '	<u> </u>	!				ļ	<u> </u>		1		<u> </u>	1	
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)							1	T	3 0.85	0.98	1	1		(89)
(90)m= 17.35 17.58 18.03 18.72 19.29 19.64 19.71 19.7 19.45 18.72 17.95 17.35 (90)		<u> </u>	!	I			ļ			!				(-0)
						•	1	·		- ·	17.05	47.05	1	(00)
1LA - Living area + (4) - 0.34 (91)	(90)m= 17.35	17.58 18	.03	18.72 19	1.∠9	19.64	19./1	19				l .	0.04	_
										ILA - LIV	ing area · (- -, =	0.34	(81)

NA: :		41	ا میں امیا	I:\ _ £ I	I A T4	. /4 £1	A) TO					
Mean internal ter (92)m= 17.98 18	nperature (16	or the wh	19.73	20.05	LA × 11 20.13	+ (1 – TL 20.12	.A) × 12	19.2	18.52	17.99		(92)
Apply adjustmen						l	l		10.32	17.99		(32)
	3.04 18.44	19.05	19.58	19.9	19.98	19.97	19.72	19.05	18.37	17.84		(93)
8. Space heating			10.00	10.0	10.00	10.01	10.72	10.00	10.01	11.01		
Set Ti to the mea	ın internal te	mperatui		ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor		<u> </u>	May	Ouri	1 001	_ / tug	СОР	001	1101			
	.99 0.98	0.95	0.85	0.67	0.49	0.57	0.85	0.97	0.99	1		(94)
Useful gains, hm	Gm , W = (9	14)m x (84	4)m		!	ļ	ļ		<u> </u>	<u> </u>		
(95)m= 413.68 46	5.13 533.96	615.5	631.48	503.29	344.04	353.65	449.14	430.55	397.86	393.78		(95)
Monthly average	external ten	nperature	from Ta	able 8								
(96)m= 4.3	.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 fo	mean inter	nal tempe		Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m= 1505.06 145			845.6	556	354.27	372.19	594.43	907.15	1220.49	1489.7		(97)
Space heating re	<u> </u>	1		Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 811.99 66	4.75 582.14	344.94	159.3	0	0	0	0	354.6	592.29	815.36		_
						Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	4325.37	(98)
Space heating re	quirement ir	n kWh/m²	²/year								60.07	(99)
9a. Energy require	ements – Inc	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:					J							
Fraction of space	heat from s	secondar	y/supple	mentary	system						0	(201)
Fraction of space	heat from r											
•	ilcal Ilolli i	naın syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of total I		-	• ,				- (201) = 02) × [1 -	(203)] =			1	(202)
Fraction of total I	neating from	main sys	stem 1				, ,	(203)] =				╡
Fraction of total I	neating from	main syste	stem 1 em 1	g systen			, ,	(203)] =			1	(204)
Fraction of total I Efficiency of mai	neating from n space hea ondary/supp	main syste	stem 1 em 1 y heating	-	າ, %	(204) = (2	02) × [1 –	` '-	Nov	Dec	90.3	(204) (206) (208)
Fraction of total I Efficiency of mai	neating from In space heat Condary/supp Teb Mar	main systementar Apr	stem 1 em 1 y heating May	Jun			, ,	(203)] =	Nov	Dec	90.3	(204) (206) (208)
Fraction of total I Efficiency of mai Efficiency of secondary Jan Space heating re	neating from In space heat Condary/supp Teb Mar	main systementar Apr	stem 1 em 1 y heating May	Jun	າ, %	(204) = (2	02) × [1 –	` '-	Nov 592.29	Dec 815.36	90.3	(204) (206) (208)
Fraction of total I Efficiency of mai Efficiency of second Jan Space heating re 811.99 66	neating from n space hea ondary/supp Feb Mar equirement (4.75 582.14	main systementar Apr calculated 344.94	stem 1 em 1 y heating May d above)	Jun	n, %	(204) = (2 Aug	02) × [1 –	Oct			90.3	(204) (206) (208)
Fraction of total I Efficiency of mai Efficiency of second Jan Space heating re 811.99 66 (211)m = {[(98)m]	neating from n space hea ondary/supp Feb Mar equirement (4.75 582.14	main systementar Apr calculated 344.94	stem 1 em 1 y heating May d above)	Jun	n, %	(204) = (2 Aug	02) × [1 –	Oct			90.3	(204) (206) (208) ar
Fraction of total I Efficiency of mai Efficiency of second Jan Space heating re 811.99 66 (211)m = {[(98)m]	neating from n space hea condary/supp Feb Mar equirement (4.75 582.14 x (204)] } x	main systementar Apr calculate 344.94	stem 1 em 1 y heating May d above) 159.3	Jun) 0	1, % Jul 0	(204) = (2 Aug 0	02) × [1 – Sep	Oct 354.6	592.29 655.91	815.36 902.95	90.3	(204) (206) (208) ar
Fraction of total I Efficiency of mai Efficiency of second Jan I Space heating re 811.99 66 (211)m = {[(98)m 899.21 73	neating from n space head and ary/supp Feb Mar equirement (4.75 582.14 x (204)] } x 6.16 644.67	main systementar Apr calculated 344.94 100 ÷ (20 381.99	stem 1 em 1 y heating May d above) 159.3 06) 176.42	Jun) 0	1, % Jul 0	(204) = (2 Aug 0	02) × [1 – Sep 0	Oct 354.6	592.29 655.91	815.36 902.95	1 90.3 0 kWh/yea	(204) (206) (208) (211)
Fraction of total I Efficiency of mai Efficiency of second Jan Space heating re 811.99 66 (211)m = {[(98)m]	neating from n space head ondary/supp Feb Mar equirement (4.75 582.14 x (204)] } x 6.16 644.67 el (seconda	main systementar Apr calculate 344.94 100 ÷ (20 381.99	stem 1 em 1 y heating May d above) 159.3 06) 176.42	Jun) 0	1, % Jul 0	(204) = (2 Aug 0	02) × [1 – Sep 0	Oct 354.6	592.29 655.91	815.36 902.95	1 90.3 0 kWh/yea	(204) (206) (208) (211)
Fraction of total I Efficiency of mai Efficiency of second Jan F Space heating re 811.99 66 (211)m = {[(98)m 899.21 73 Space heating fu	neating from n space head ondary/supp Feb Mar equirement (4.75 582.14 x (204)] } x 6.16 644.67 el (seconda	main systementar Apr calculate 344.94 100 ÷ (20 381.99	stem 1 em 1 y heating May d above) 159.3 06) 176.42	Jun) 0	1, % Jul 0	(204) = (2 Aug 0	02) × [1 – Sep 0	Oct 354.6	592.29 655.91	815.36 902.95	1 90.3 0 kWh/yea	(204) (206) (208) (211)
Fraction of total I Efficiency of mai Efficiency of second I Jan I Space heating re 811.99 66 (211)m = {[(98)m 899.21 73} Space heating fu = {[(98)m x (201)]	neating from n space hear andary/supp reb Mar equirement (4.75 582.14 x (204)] } x 6.16 644.67 el (seconda } x 100 ÷ (20	main systementar Apr calculated 344.94 100 ÷ (20 381.99	stem 1 em 1 y heating May d above) 159.3 06) 176.42	Jun 0 0	n, % Jul 0	(204) = (2 Aug 0 Tota	02) × [1 – Sep 0 0 I (kWh/yea	Oct 354.6 392.69 ar) =Sum(2	592.29 655.91 211) _{15,10. 12}	902.95 =	1 90.3 0 kWh/yea	(204) (206) (208) (211)
Fraction of total I Efficiency of mai Efficiency of second I Jan I Space heating re 811.99 66 (211)m = {[(98)m 899.21 73} Space heating fu = {[(98)m x (201)]	neating from n space hear andary/supp reb Mar equirement (4.75 582.14 x (204)] } x 6.16 644.67 el (seconda } x 100 ÷ (20	main systementar Apr calculated 344.94 100 ÷ (20 381.99	stem 1 em 1 y heating May d above) 159.3 06) 176.42	Jun 0 0	n, % Jul 0	(204) = (2 Aug 0 Tota	02) × [1 – Sep 0 I (kWh/yea	Oct 354.6 392.69 ar) =Sum(2	592.29 655.91 211) _{15,10. 12}	902.95 =	1 90.3 0 kWh/yea	(204) (206) (208) (211) (211)
Fraction of total I Efficiency of mai Efficiency of second Jan I Space heating real 811.99 66 (211)m = {[(98)m 899.21 73} Space heating fu = {[(98)m x (201)] (215)m= 0} Water heating Output from water	neating from n space hear condary/supp Teb Mar equirement (4.75 582.14 x (204)] } x 6.16 644.67 el (seconda } x 100 ÷ (20 0 0	main systementar Apr calculatee 344.94 100 ÷ (20 381.99 ry), kWh/ 08) 0	stem 1 em 1 y heating May d above) 159.3 06) 176.42 month	Jun 0 0	n, % Jul 0	(204) = (2 Aug 0 Tota	02) × [1 – Sep 0 I (kWh/yea	Oct 354.6 392.69 ar) =Sum(2	592.29 655.91 211) _{15,10. 12}	902.95 =	1 90.3 0 kWh/yea	(204) (206) (208) (211) (211)
Fraction of total I Efficiency of mai Efficiency of second Jan Final Space heating results and the second	neating from n space hear ondary/supp Teb Mar quirement (4.75 582.14 x (204)] } x 6.16 644.67 el (seconda } x 100 ÷ (20 0 0	main systementar Apr calculatee 344.94 100 ÷ (20 381.99 ry), kWh/ 08) 0	stem 1 em 1 y heating May d above) 159.3 06) 176.42 month	Jun 0 0	n, % Jul 0	(204) = (2 Aug 0 Tota	02) × [1 – Sep 0 I (kWh/yea	Oct 354.6 392.69 ar) =Sum(2	592.29 655.91 211) _{15,10. 12}	902.95 =	1 90.3 0 kWh/yea	(204) (206) (208) (211) (211) (215)
Fraction of total I Efficiency of mai Efficiency of second Jan I Space heating real 811.99 66 (211)m = {[(98)m 899.21 73} Space heating fu = {[(98)m x (201)] (215)m= 0} Water heating Output from water	neating from n space hear ondary/supp Teb Mar quirement (4.75 582.14 x (204)] } x 6.16 644.67 el (seconda } x 100 ÷ (20 0 0	main systementar Apr calculated 344.94 100 ÷ (20 381.99 ry), kWh/ 08) 0	stem 1 em 1 y heating May d above) 159.3 06) 176.42 month 0	Jun 0 0	n, % Jul 0	(204) = (2 Aug 0 Tota 0 Tota	02) × [1 – Sep 0 0 I (kWh/yea	Oct 354.6 392.69 ar) =Sum(2 0 ar) =Sum(2	592.29 655.91 211) _{15,10. 12} 0	902.95	1 90.3 0 kWh/yea	(204) (206) (208) (211) (211)
Fraction of total I Efficiency of mai Efficiency of second Jan Fraction of second Jan Fraction of second Space heating reading for a second for	neating from n space hear ondary/supp Teb Mar quirement (4.75 582.14 x (204)] } x 6.16 644.67 el (seconda } x 100 ÷ (20 0 0	main systementar Apr calculated 344.94 100 ÷ (20 381.99 ry), kWh/ 08) 0	stem 1 em 1 y heating May d above) 159.3 06) 176.42 month 0	Jun 0 0	n, % Jul 0	(204) = (2 Aug 0 Tota 0 Tota	02) × [1 – Sep 0 0 I (kWh/yea	Oct 354.6 392.69 ar) =Sum(2 0 ar) =Sum(2	592.29 655.91 211) _{15,10. 12} 0	902.95	1 90.3 0 kWh/yea 4790	(204) (206) (208) (211) (211) (215)
Fraction of total I Efficiency of mai Efficiency of second Jan II Space heating research 811.99 66 (211)m = {[(98)m 899.21 73 Space heating fu = {[(98)m x (201)] (215)m= 0 Water heating Output from water 194.36 16 Efficiency of water (217)m= 88.34 88 Fuel for water heating	neating from n space hear andary/supp Teb Mar equirement (4.75 582.14 x (204)] } x 6.16 644.67 el (seconda) x 100 ÷ (20 0 0 Theater (calc 9.78 176.64 r heater 3.24 87.95 ating, kWh/m	main systementar Apr calculated 344.94 100 ÷ (20 381.99 ry), kWh/ 08) 0 culated at 156.67 87.17 onth	month bove) 151.69	Jun 0 0 0 133.6	1, % Jul 0 0	(204) = (2 Aug 0 Tota 142.69	02) × [1 – Sep 0 0 I (kWh/yea 144.26	Oct 354.6 392.69 ar) =Sum(2 0 ar) =Sum(2	592.29 655.91 211) _{15,10. 12} 0 215) _{15,10. 12}	902.95 = 0 = 189.8	1 90.3 0 kWh/yea 4790	(204) (206) (208) (208) ar (211) (211)
Fraction of total I Efficiency of mai Efficiency of second Jan I Space heating results and second II Space heating results and second II Space heating for a	neating from n space hear condary/supp reb	main systementar Apr calculated 344.94 100 ÷ (20 381.99 ry), kWh/ 08) 0 culated al 156.67 87.17 onth)m	stem 1 em 1 y heating May d above) 159.3 06) 176.42 month 0 bove) 151.69	Jun 0 0 133.6	1, % Jul 0 0	(204) = (2 Aug 0 Tota 142.69	02) × [1 – Sep 0 0 I (kWh/yea 144.26	Oct 354.6 392.69 ar) =Sum(2 0 164.27 87.13	592.29 655.91 211) _{15,10. 12} 0 215) _{15,10. 12}	902.95 = 0 = 189.8	1 90.3 0 kWh/yea 4790	(204) (206) (208) (208) ar (211) (211)
Fraction of total I Efficiency of mai Efficiency of second Jan Fraction of second Jan Fraction of second Space heating reference for the second	neating from n space hear andary/supp Teb Mar equirement (4.75 582.14 x (204)] } x 6.16 644.67 el (seconda) x 100 ÷ (20 0 0 Theater (calc 9.78 176.64 r heater 3.24 87.95 ating, kWh/m	main systementar Apr calculated 344.94 100 ÷ (20 381.99 ry), kWh/ 08) 0 culated at 156.67 87.17 onth	month bove) 151.69	Jun 0 0 0 133.6	1, % Jul 0 0	(204) = (2 Aug 0 Tota 142.69 81	02) × [1 – Sep 0 0 I (kWh/yea 144.26	Oct 354.6 392.69 ar) =Sum(2 164.27 87.13	592.29 655.91 211) _{15,10. 12} 0 215) _{15,10. 12}	902.95 = 0 = 189.8	1 90.3 0 kWh/yea 4790	(204) (206) (208) (208) ar (211) (211)

Annual totals		kWh/yea	r	kWh/year	,
Space heating fuel used, main system 1				4790	_
Water heating fuel used				2250.15	
Electricity for pumps, fans and electric keep-hot					
mechanical ventilation - balanced, extract or posi-	tive input from outside		181.17		(230a)
central heating pump:			30		(230c)
Total electricity for the above, kWh/year	sum of (230	a) (230g) =		211.17	(231)
Electricity for lighting				317.91	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission factors in the Emissi	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	<u> </u>		etor =		ir](261)
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	_
	kWh/year	kg CO2/kWh	=	kg CO2/yea	(261)
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea 1034.64 0 486.03	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= = =	kg CO2/yea 1034.64 0 486.03 1520.67	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216 0.519	= = =	kg CO2/yea 1034.64 0 486.03 1520.67 109.6	(261) (263) (264) (265) (267)

El rating (section 14)

			Lloor F) otoilo:						
Assessor Name: Software Name:	Chris Hocknell Stroma FSAP 20		User D	Strom Softwa	are Ve	rsion:			0016363 on: 1.0.4.10	
Address :	Unit 2, 40-42 Mill L			Address	: Unit 2-l	Propose	ed-Lean			
1. Overall dwelling dim	•	Larie, Lori	don, ivv	VO TIVIX						
			Are	a(m²)		Av. He	eight(m)		Volume(m ³	3)
Ground floor					(1a) x		2.75	(2a) =	106.04	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	le)+(1r	n) 3	88.56	(4)			-		_
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	106.04	(5)
2. Ventilation rate:										
	main heating	secondaı heating	у	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 f	ans					0	х	10 =	0	(7a)
Number of passive vent	s				Ī	0	X	10 =	0	(7b)
Number of flueless gas	fires				Ē	0	x -	40 =	0	(7c)
								A ! I		_
			_	_ 、	_				nanges per ho	_
Infiltration due to chimne	eys, flues and fans = been carried out or is inten				continuo fr	0		÷ (5) =	0	(8)
Number of storeys in		иеи, ргосее	u 10 (17), 1	ourei wise (conunue n	OIII (9) 10	(10)		0	(9)
Additional infiltration	g ()						[(9)	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or timbe	r frame or	0.35 fo	r masoni	ry constr	uction	• ,	•	0	(11)
	present, use the value corre	esponding to	the great	ter wall are	ea (after					
•	nings); if equal user 0.35 floor, enter 0.2 (unse	aled) or 0	1 (coale	مال مادم	antar ()					7(12)
·	nter 0.05, else enter 0	,	. i (Scait	eu), eise	enter 0				0	(12)
•	vs and doors draught								0	(14)
Window infiltration	re and deere araagin			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	e, q50, expressed in cu	ubic metre	s per ho	our per s	quare m	etre of e	envelope	area	7	(17)
If based on air permeab	oility value, then (18) = [(17) ÷ 20]+(8), otherw	ise (18) = ((16)				0.35	(18)
	ies if a pressurisation test h	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides shelter	red			(20) = 1 -	[0.075 x (1	10)1 =			3	(19)
Shelter factor Infiltration rate incorpora	ating shelter factor			(20) = 13 (21) = (18)	•	19)] =			0.78	(20)
Infiltration rate modified	-	ad		(21) - (10) X (20) —				0.27	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
		, J Juli	l oui	Aug	ССР	1 001	1100	Dec]	
Monthly average wind s (22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
` ' <u>L L</u>	I	1	L	<u> </u>	I	I -	1	1	J	
Wind Factor (22a)m = (2	'								1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.35	0.34	<u> </u>	ng for sr	o.29	d wind s		`	`	0.00	0.04	1 0 00	1	
Calculate effec		0.33 change i				0.26 <i>se</i>	0.25	0.27	0.29	0.31	0.32	J	
If mechanica		_		• •								0.5	(2
If exhaust air he	eat pump ı	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(2
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				74.8	(2
a) If balance	d mecha	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)) ÷ 100]	
24a)m= 0.47	0.47	0.46	0.42	0.42	0.38	0.38	0.38	0.4	0.42	0.43	0.44		(2
b) If balance	d mecha	anical ve	entilation	without	heat rec	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)		_	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				5 (00)	,			
if (22b)n		<u> </u>	<u> </u>	<u> </u>	ŕ	· ` ·	ŕ		· ` `	ŕ	Ι ,	1	
4c)m= 0	0	0		0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)n					•				0.51				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(
Effective air	change	rate - er	ıter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	<u> </u>	ļ	<u> </u>	J	
5)m= 0.47	0.47	0.46	0.42	0.42	0.38	0.38	0.38	0.4	0.42	0.43	0.44	1	(2
												1	
. Heat losse	_	·			NIa4 Am		11		A V I I		le control	- ^	V I.
LEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-valud kJ/m²·		X k J/K
indows					3.43	x1	/[1/(1.4)+	0.04] =	4.55	$\dot{\Box}$			(
oor					38.56	x	0.25	= i	9.64	₹ r			
alls Type1	16.5	51	3.43		13.08	x	0.25	-	3.27	=		-	<u> </u>
alls Type2	3.9	5	0		3.95	×	0.23	=	0.89	F i			<u> </u>
tal area of e	lements	, m²			59.02								— (
arty wall					57.49) x	0		0				
arty ceiling					38.56	=				<u> </u> 		-	= `
or windows and	roof winde	ows, use e	effective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] a	L as given in	paragrapi		
include the area						_		-	,	-			
abric heat los	s, W/K =	= S (A x	U)				(26) (30)) + (32) =				18.35	(
eat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	8086.62	(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(
r design assess n be used inste				construct	ion are not	known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
nermal bridge				usina Ap	pendix k	<						8.85	<u> </u>
letails of therma	,	•		• .	•							0.00	`
otal fabric he								(33) +	(36) =			27.2	(
entilation hea	t loss ca	alculated	l monthly	/				(38)m	= 0.33 × (25)m x (5)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 16.51	16.27	16.04	14.85	14.61	13.43	13.43	13.19	13.9	14.61	15.09	15.56]	(
eat transfer o	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
9)m= 43.71	43.48	43.24	42.05	41.81	40.63	40.63	40.39	41.1	41.81	42.29	42.76]	

Heat lose param	actor (L	71 D) 747/	m21/					(40)m	- (20)m ·	(4)			
Heat loss param (40)m= 1.13	1.13	1.12	1.09	1.08	1.05	1.05	1.05	1.07	= (39)m ÷	1.1	1.11		
(40)111-	1.13	1.12	1.09	1.00	1.00	1.00	1.00		<u> </u>	Sum(40) ₁		1.09	(40)
Number of days	in mor	nth (Tabl	le 1a)					,	Wordgo	Cum (10)	12712	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 heatir	ng ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occup if TFA > 13.9, if TFA £ 13.9,	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9))2)] + 0.(0013 x (⁻	ΓFA -13.		37		(42)
Annual average Reduce the annual anot more that 125 lit	average	hot water	usage by	5% if the a	welling is	designed t			se target o		6.7		(43)
			• •		_	,	A	0	0-4	Nan	Dan		
Jan Hot water usage in I	Feb litres per	Mar day for ea	Apr	May Vd m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
							, ,	05.07	00.04	70.74	72.27		
(44)m= 73.37	70.71	68.04	65.37	62.7	60.03	60.03	62.7	65.37	68.04	70.71 m(44) _{1 12} =	73.37	800.45	(44)
Energy content of h	ot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	Tm / 3600			` '	L	000.43	(++)
(45)m= 108.81	95.17	98.21	85.62	82.15	70.89	65.69	75.38	76.28	88.9	97.04	105.38		
` /									I Total = Su	m(45) _{1 12} =	:	1049.52	(45)
If instantaneous wat	ter heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)		, ,			
(46)m= 16.32	14.28	14.73	12.84	12.32	10.63	9.85	11.31	11.44	13.33	14.56	15.81		(46)
Water storage lo										`			
Storage volume	` ,					Ū		ame ves	sel		0		(47)
If community he	_			_					(O) ! (47)			
Otherwise if no s Water storage lo		not wate	er (tnis in	iciuaes i	nstantar	ieous co	illod idmi	ers) ente	er o in (47)			
a) If manufactur		eclared lo	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
Temperature fac					(, ,.							(49)
Energy lost from				ear			(48) x (49)) =			0		(50)
b) If manufactur		_	-		or is not		(10) // (10)	,			<u> </u>		(30)
Hot water storag	ge loss	factor fr	om Tabl	e 2 (kWl	h/litre/da	ıy)					0		(51)
If community he			on 4.3										
Volume factor fr			O.L.							—	0		(52)
Temperature fac											0		(53)
Energy lost from		•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (5	, ,	,					((50) (EE) (44).			0		(55)
Water storage lo	oss car	culated t	or each	montn			((56)m = (55) × (41)I	m 	,			
(56)m= 0 If cylinder contains of	0 dedicate	0 d solar sto	0 rage, (57)ı	0 n = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (0 H11) is fro	0 m Appendi	ix H	(56)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit lo	oss (an	nual) fro	m Table	3							0		(58)
Primary circuit lo	•	•			59)m = ((58) ÷ 36	55 × (41)	m					
(modified by f	actor fi	rom Tabl	e 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)

Oamshi Isaa		f		(04)	(00) . 0	OF (44	\						
Combi loss (61)m= 37.				<u>` </u>	` ´ 	- ` ` 	<u> </u>	NE 22.24	1 24 67	1 24 07	1 27 20	1	(61)
` '		34.67	32.24	31.95	29.61	30.59	31.9	<u> </u>	34.67	34.87	37.39	(50) (04)	(01)
	-i						`		` 	` 	ì ´	(59)m + (61)m 1	(62)
(62)m= 146		132.88	117.86	114.1	100.5	96.28	107.				142.77	J	(02)
Solar DHW in									ar contribu	ition to wate	er neating)		
(add addition (63)m=		0	0	0		o, see Ap	pena 0		0	0	0	1	(63)
(11)									1 "			J	(00)
Output from (64)m= 146		132.88	117.86	114.1	100.5	96.28	107.	33 108.52	123.57	131.91	142.77	1	
(64)m= 146	0.2 121.11	132.00	117.00	114.1	100.5	90.20		Output from v			L	1449.64	(64)
Lloot goine	framaatam	haatina	LAN A Iba I bas	anth 0 0	E ([O O	· v. (4E) ma							J (04)
Heat gains (65)m= 45.		41.32	36.53	35.3	30.97	29.49	33.0		38.23	1 + (57)m 1 _{40.98}	+ (59)II	']]	(65)
` '				l .			ļ	<u> </u>		1	ļ		(00)
·	57)m in cal				yıınaer	is in the o	aweiii	ng or not v	vater is	rom com	imunity r	neating	
	l gains (see):									
Metabolic o	<u> </u>	T ''	i			11			0.4	T N		1	
Ja (CC) CC		Mar	Apr	May	Jun	Jul	Αι		Oct	Nov	Dec	ł	(66)
(66)m= 68.		68.43	68.43	68.43	68.43	68.43	68.4		68.43	68.43	68.43	J	(66)
Lighting ga	<u>`</u>		-				_			T=	1	1	(07)
(67)m= 12.		8.77	6.64	4.96	4.19	4.53	5.8	ļ	10.03	11.7	12.48	J	(67)
Appliances	` 				ı —	r	 		1	_	ı	1	
(68)m= 117	.93 119.15	116.07	109.5	101.22	93.43	88.23	87	90.09	96.65	104.94	112.73	J	(68)
Cooking ga	<u>, `</u>					 	_			_	•	1	
(69)m= 29.	34 29.84	29.84	29.84	29.84	29.84	29.84	29.8	29.84	29.84	29.84	29.84	J	(69)
Pumps and	fans gains	(Table 5	5a)									1	
(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)	T				_	1	1	
(71)m= -54	74 -54.74	-54.74	-54.74	-54.74	-54.74	-54.74	-54.	74 -54.74	-54.74	-54.74	-54.74]	(71)
Water heat		Table 5)							,		•	1	
(72)m= 61.	19 59.2	55.54	50.73	47.45	43.02	39.64	44.4	3 46.42	51.38	56.92	59.66		(72)
Total inter	nal gains =	:			(66)m + (67)m	1 + (68)m + (69)m +	(70)m + (71)m + (72)m	•	
(73)m= 237		226.91	213.4	200.16	187.16	178.92	183.	84 190.93	204.59	220.09	231.39		(73)
6. Solar g													
-	are calculated	•					tions t		he applica		tion.		
Orientation	: Access F Table 6d		Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	, -	FF Fable 6c		Gains (W)	
North coat a							1 [. ,	٦,
Northeast 0.			3.4			11.28] X [0.57	×	0.7	=	10.7	(75)
Northeast o.	<u> </u>		3.4			22.97	X 	0.57	× [0.7	=	21.78	(75)
Northeast 0.	<u> </u>	_	3.4			41.38] X [0.57	× [0.7	=	39.24	<u> </u> (75)
Northeast 0.	9x 0.77	X	3.4	13 l	X	67.96	X	0.57	X	0.7	=	64.45	(75)
Northeast 0.	9x 0.77	X			<u> </u>	91.35]	0.57	x [0.7	= =	86.63	(75)

Northeast 0.9x	0.77	×	3.4	3	X S	97.38] x [0.57	x	0.7	=	92.36	(75)
Northeast 0.9x	0.77	x	3.4	3	x	91.1	x [0.57	x	0.7	=	86.4	(75)
Northeast 0.9x	0.77	x	3.4	13	x	72.63	x [0.57	x	0.7		68.88	(75)
Northeast 0.9x	0.77	x	3.4	13	x .	50.42] x		0.57	x	0.7	-	47.82	(75)
Northeast 0.9x	0.77	X	3.4	13	x 2	28.07] x		0.57	x	0.7	-	26.62	(75)
Northeast 0.9x	0.77	×	3.4	3	x	14.2	×		0.57	x	0.7		13.46	(75)
Northeast 0.9x	0.77	X	3.4	13	х	9.21	x		0.57	_ x [0.7	<u> </u>	8.74	(75)
							•							
Solar gains i	n watts, c	alculated	I for eac	h month			(83)m	= Sı	um(74)m	(82)m				
(83)m= 10.7	21.78	39.24	64.45	86.63	92.36	86.4	68.8	88	47.82	26.62	13.46	8.74		(83)
Total gains -	internal a	and solar	(84)m =	(73)m	+ (83)m	, watts							•	
(84)m= 248.4	9 257.44	266.15	277.85	286.79	279.53	265.32	252.	.72	238.75	231.21	233.56	240.13		(84)
7. Mean into	ernal temp	perature	(heating	season)									
Temperatur	e during h	neating p	eriods ir	n the livii	ng area	from Tal	ble 9,	Th	1 (°C)				21	(85)
Utilisation fa	actor for g	ains for l	living are	ea, h1,m	(see Ta	able 9a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.98	0.94	0.81	0.65	0.6	9	0.91	0.98	1	1		(86)
Mean intern	al temper	ature in	livina ar	22 T1 (fc	llow etc	ne 3 to 3	7 in T	ahle	2 0c)					
(87)m= 19.82		20.11	20.42	20.7	20.92	20.98	20.9		20.83	20.49	20.13	19.82		(87)
` ′					-l 113	. f T.	- - - 0		-0 (00)					
Temperatur (88)m= 19.97		19.98	20.01	20.01	20.04	20.04	20.0	Т	20.03	20.01	20	19.99		(88)
, ,	<u> </u>				<u> </u>	L		J4	20.03	20.01	20	19.99		(00)
Utilisation fa		1			· ·	1	T				1		1	(00)
(89)m= 1	0.99	0.99	0.97	0.91	0.73	0.52	0.5	7	0.85	0.97	0.99	1		(89)
Mean interr	al temper	ature in	the rest	of dwelli	ng T2 (f	follow ste	eps 3	to 7	in Tabl	e 9c)		_		
(90)m= 18.41	18.55	18.84	19.3	19.7	19.98	20.03	20.0	03	19.88	19.41	18.87	18.43		(90)
									f	LA = Livir	ng area ÷ (4) =	0.69	(91)
Mean intern	al temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 -	– fL	A) × T2					
(92)m= 19.38	19.49	19.72	20.07	20.39	20.63	20.69	20.6	86	20.54	20.15	19.74	19.39		(92)
Apply adjus	tment to t	he mean	interna	temper	ature fro	m Table	4e, \	whe	re appro	priate		•		
(93)m= 19.23	19.34	19.57	19.92	20.24	20.48	20.54	20.5	53	20.39	20	19.59	19.24		(93)
8. Space he	eating req	uirement												
Set Ti to the					ned at st	ep 11 of	Table	e 9b	o, so tha	t Ti,m=(76)m an	d re-cald	culate	
the utilisation					1	1	<u> </u>	1	0	0-4	Nex			
Jan Utilisation fa		Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(94)m= 1	0.99	0.99	0.97	0.92	0.77	0.59	0.6	3	0.87	0.97	0.99	1		(94)
Useful gain:					0.77	0.00	0.0		0.01	0.01	0.00			()
(95)m= 247.3	-	263.16	269.92	263.01	215.3	155.6	160.	42	208.6	225.18	231.7	239.21		(95)
Monthly ave						<u> </u>	<u> </u>	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)
Heat loss ra	ate for me	an intern	al tempe	erature,	Lm , W	=[(39)m	x [(93	 3)m-	– (96)m]	1	<u> </u>	ı	
(97)m= 652.7		564.95	463.41	357.19	238.72	159.91	166.	_	258.43	393.13	528.05	643.18		(97)
Space heat	ing 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= 301.6	1 249.96	224.53	139.31	70.07	0	0	0		0	124.95	213.37	300.55		

											_
					Tota	l per year	(kWh/yea	r) = Sum(9	18)15,912 =	1624.35	(98)
Space heating requirement i	n kWh/m	²/year								42.13	(99)
9a. Energy requirements – Ind	dividual h	eating s	ystems i	including	micro-C	CHP)					
Space heating:	dar		monton	, avatam							— (204)
Fraction of space heat from			ementary	-	(202) = 1 -	(201) -				0	(201)
Fraction of space heat from	•	, ,			(202) = 1		(202)] =			1	(202)
Fraction of total heating from	•				(204) - (2	02) * [1 –	(203)] -			1	(204)
Efficiency of main space hea			~ ~	m 0/						90.3	(206)
Efficiency of secondary/supp	1 .	r	· ·	1	l .					0	(208)
Jan Feb Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (301.61 249.96 224.53		70.07	0	0	0	0	124.95	213.37	300.55	1	
$(211)m = \{[(98)m \times (204)] \} x$		<u> </u>	<u> </u>	1	<u> </u>			<u> </u>		l	(211)
334.01 276.81 248.65		77.6	0	0	0	0	138.37	236.29	332.84	1	(=11)
	.!	!	!	!	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,10. 1}		1798.84	(211)
Space heating fuel (seconda	ıry), kWh	month/									
= {[(98)m x (201)]} x 100 \div (2	T									1	
(215)m= 0 0 0	0	0	0	0	0	0	0	0	0		–
					Tota	ii (kvvn/yea	ar) =Sum(2	215) _{15,10. 1}	2	0	(215)
Water heating Output from water heater (cal	culated a	hove)									
146.2 127.71 132.88		114.1	100.5	96.28	107.33	108.52	123.57	131.91	142.77]	
Efficiency of water heater	•	•	•		•		•		•	81	(216)
(217)m= 87.04 86.93 86.6	85.79	84.3	81	81	81	81	85.42	86.51	87.08		(217)
Fuel for water heating, kWh/m											
(219) m = (64) m x $100 \div (217)$ (219)m = 167.98 146.92 153.43		135.35	124.07	118.87	132.51	133.97	144.66	152.49	163.95]	
<u> </u>				•	Tota	I = Sum(2	19a) ₁₁₂ =	ļ.		1711.59	(219)
Annual totals							k'	Wh/yea	r	kWh/yea	<u>r</u>
Space heating fuel used, main	n system	1								1798.84	
Water heating fuel used										1711.59	
Electricity for pumps, fans and	d electric	keep-ho	t								
mechanical ventilation - bala	nced, ex	tract or p	ositive i	nput fror	n outside	Э			97.03]	(230a)
central heating pump:									30	j	(230c)
Total electricity for the above,	kWh/yea	ar			sum	of (230a)	(230g) =			127.03	(231)
Electricity for lighting										214.37	(232)
12a. CO2 emissions – Indivi	dual heat	ing syste	ems incl	uding mi	cro-CHE)					
			En	nergy				ion fac	tor	Emission	
				Vh/year			kg CO	∠/KVVh ———		kg CO2/ye	_
Space heating (main system	1)		(21	1) x			0.2	16	=	388.55	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	369.7	(264)
Space and water heating	(261) + (262) + (263) + (264) =			758.25	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	65.93	(267)
Electricity for lighting	(232) x	0.519	=	111.26	(268)
Total CO2, kg/year	sum	of (265) (271) =		935.44	(272)
Dwelling CO2 Emission Rate	(272	?) ÷ (4) =		24.26	(273)
El rating (section 14)				85	(274)

			User D	etails: _						
Assessor Name:	Chris Hocknell		- Use r L	Strom	a Nium	hor:		STDC	0016363	
Software Name:	Stroma FSAP 20	112		Softwa					on: 1.0.4.10	
Contware realine.	5115111a 1 57 11 25		roperty	Address			d-Lean	VOION	511. 1.5.1.15	
Address :	Unit 3, 40-42 Mill L		·							
1. Overall dwelling dime	•	·	,							
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	')
Ground floor			6	6.43	(1a) x	2	.75	(2a) =	182.68	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	le)+(1r	n) 6	6.43	(4)			-		
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	182.68	(5)
2. Ventilation rate:										
	main heating	secondar heating	y	other		total			m³ per hou	r
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	T + F	0	Ī - Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	0	x -	10 =	0	(7a)
Number of passive vents	S				F	0	x	10 =	0	(7b)
Number of flueless gas f					F	0	x	40 =	0	(7c)
Trainber of fideless gas i	100				L	0				(/'C)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	a)+(7b)+(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has I	been carried out or is inten	ded, procee	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
if both types of wall are p deducting areas of openi	oresent, use the value corre ings); if equal user 0.35	esponaing to	tne great	er wall are	а (апег					
If suspended wooden	floor, enter 0.2 (unse	aled) or 0	.1 (seale	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	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value,	• •		•	•	•	etre of e	envelope	area	7	(17)
If based on air permeabi	•								0.35	(18)
Air permeability value applie Number of sides sheltere		as been dor	ne or a deg	gree air pe	meability	is being u	sed			(19)
Shelter factor	su			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18	x (20) =				0.3	(21)
Infiltration rate modified	•	ed								` ′
Jan Feb	Mar Apr May	1	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]	
140		1					•		_	
Wind Factor (22a)m = (2	 	1 005	0.05	0.00	4	1 4 00	440		7	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	_	

Adjusted infiltr	ation rate	(allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.38	0.37	0.36	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.33	0.35		
Calculate effect		•	rate for t	he appli	cable cas	3 <i>e</i>	•		-				
If mechanica			andiv N (2	3h) = (23a	a) x Emy (e	guation (1	(15)) other	wice (23h) = (23a)		<u>[</u>	0.5	(23a
If balanced with) – (2 5a)		[[0.5	(23b
		-		_					2h\ma_1 //	20h\ v [74.8	(23c
a) If balance (24a)m= 0.51		0.49	0.45	0.45	0.41	0.41	0.4	0.42	20)m + (2 0.45	23D) × [0.46	0.48	- 100]	(24a
b) If balance	LL		<u> </u>								0.40		(= :-
(24b)m= 0		0	0	0	0	0	0	0	0	0	0		(24)
c) If whole h	ļļ.	act ven	ıtilation o	or positiv	/e input v	entilatio	n from c	utside					
(24c)m = 0	0.5 × (.	0	0	0	0	0	0	0	0	0	0		(240
d) If natural					ا				U I				(210
,	m = 1, then			•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change ra	ate - er	nter (24a	or (24b	o) or (24c	or (24	d) in box	(25)					
(25)m= 0.51	0.5	0.49	0.45	0.45	0.41	0.41	0.4	0.42	0.45	0.46	0.48		(25)
3. Heat losse	e and hear	t loss r	naramet	ar.	•								
ELEMENT	Gross area (n	İ	Openin m	gs	Net Are A ,m		U-valı W/m2		A X U (W/ł	()	k-value kJ/m²·k		A X k kJ/K
Doors					2	X	1.5	= [3				(26)
Windows Type	e 1				3.43	x1/	/[1/(1.4)+	0.04] =	4.55	$\overline{}$			(27)
Windows Type	e 2				2.38	x1/	/[1/(1.4)+	0.04] =	3.16	$\overline{}$			(27)
Windows Type	e 3				5	x1/	/[1/(1.4)+	0.04] =	6.63	三			(27)
Windows Type	e 4				1.35	x1	/[1/(1.4)+	0.04] =	1.79				(27)
Windows Type	e 5				1.26	一 x1/	/[1// 1 //)+	i i					(07)
Floor							/[I/(I. T)'	0.04] =	1.67				(27)
					66.43	=	0.25	0.04] = [1.67 16.6075			–	(27)
Walls Type1	48.84		12.1	3		X		—, ¦					(28)
• •	48.84	\exists	12.1	=	66.43	x x	0.25	_ = [16.6075				(29)
Walls Type1 Walls Type2 Walls Type3			1.26	=	66.43 36.68	x x x	0.25 0.25 0.15	= [= [9.17 2.91				(28) (29) (29)
Walls Type2	20.68		1.26	=	66.43 36.68 19.42 14.86	x x x x	0.25 0.25 0.15 0.23	= [= [= [9.17 2.91 3.35				(28) (29) (29) (29)
Walls Type2 Walls Type3 Roof	20.68 16.86 23.24	n²	1.26	=	66.43 36.68 19.42 14.86 23.24	x x x x x x x	0.25 0.25 0.15	= [= [= [= [9.17 2.91				(28) (29) (29) (29) (29)
Walls Type2 Walls Type3 Roof Total area of e	20.68 16.86 23.24	n²	1.26	=	66.43 36.68 19.42 14.86 23.24 176.05	x x x x x x 5	0.25 0.25 0.15 0.23 0.18	= [= [= [= [9.17 2.91 3.35 4.18				(28) (29) (29) (29) (30) (31)
Walls Type2 Walls Type3 Roof Total area of e	20.68 16.86 23.24	n²	1.26	=	66.43 36.68 19.42 14.86 23.24 176.05 37.33	x x x x x x 5	0.25 0.25 0.15 0.23	= [= [= [= [9.17 2.91 3.35				(28) (29) (29) (29) (30) (31) (32)
Walls Type2 Walls Type3 Roof Total area of e Party wall	20.68 16.86 23.24 elements, r	/s, use e	1.26 2 0	ndow U-va	66.43 36.68 19.42 14.86 23.24 176.05 37.33 43.2	x x x x x x x x x x x x x x x x x x x	0.25 0.25 0.15 0.23 0.18		16.6075 9.17 2.91 3.35 4.18		paragraph	3.2	(28) (29) (29) (29) (30) (31) (32)
Walls Type2 Walls Type3 Roof Total area of e Party wall Party ceiling * for windows and	20.68 16.86 23.24 elements, r	vs, use e des of in	1.26 2 0	ndow U-va	66.43 36.68 19.42 14.86 23.24 176.05 37.33 43.2	x x x x x x x x x x x x x x x x x x x	0.25 0.25 0.15 0.23 0.18	= [= [= [= [= [] = [16.6075 9.17 2.91 3.35 4.18		paragraph	3.2	(28) (29) (29)
Walls Type2 Walls Type3 Roof Total area of e Party wall Party ceiling * for windows and ** include the area	20.68 16.86 23.24 elements, r	rs, use e des of in S (A x	1.26 2 0	ndow U-va	66.43 36.68 19.42 14.86 23.24 176.05 37.33 43.2	x x x x x x x x x x x x x x x x x x x	0.25 0.25 0.15 0.23 0.18	= [= [= [= [] = [] = [] + (32) =	16.6075 9.17 2.91 3.35 4.18	[] [] [] [] [] [] [] [] [] [] [] [] [] [[(28) (29) (29) (30) (31) (32) (32b
Walls Type2 Walls Type3 Roof Total area of e Party wall Party ceiling * for windows and ** include the area Fabric heat los	20.68 16.86 23.24 elements, r	vs, use e des of in S (A x x k)	1.26 2 0	ndow U-va	66.43 36.68 19.42 14.86 23.24 176.05 37.33 43.2 alue calculatitions	x x x x x x x x x x x x x x x x x x x	0.25 0.25 0.15 0.23 0.18	= [= [= [= [] = [] = [] = [] = [] = [(1/U-value] + (32) = ((28)	16.6075 9.17 2.91 3.35 4.18 0	s given in	[57.02	(28) (29) (29) (30) (31) (32) (32)

can ha i	read inetar	ad of a do	tailed calci	ulation											
			x Y) cal		usina Ar	nendix k	K						26.41	(36)	
	Ū	•	are not kn		• •	•	•						20.41	(00)	
	abric hea			, ,	,	,			(33) +	(36) =			83.43	(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=	30.46	30.01	29.57	27.32	26.88	24.63	24.63	24.19	25.53	26.88	27.77	28.67		(38)	
Heat tr	Heat transfer coefficient, W/K (39)m = (37) + (38)m														
(39)m=	39)m= 113.89 113.44 112.99 110.75 110.3 108.06 108.06 107.61 108.96 110.3 111.2 112.1														
Heat lo	Average = Sum(39) _{1 12} /12= Heat loss parameter (HLP), W/m ² K (40)m = (39)m ÷ (4) 40)m = 1.71														
(40)m=															
Numbe	Average = Sum(40) _{1 12} /12= Number of days in month (Table 1a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31]	(41)	
4. Wa	iter heat	ing ener	rgy requi	rement:								kWh/y	ear:		
if TF	ed occu A > 13.9 A £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (1	ΓFA -13		16]	(42)	
Annua Reduce	l averag	e hot wa d average		usage by	5% if the a	lwelling is	designed i	(25 x N) to achieve		se target o		i.42]	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1		
Hot water			day for ea		,				ОСР	OCI	INOV	Dec			
(44)m=	93.96	90.54	87.12	83.71	80.29	76.87	76.87	80.29	83.71	87.12	90.54	93.96	1		
	ļ ļ		ļ		<u>!</u>	<u>!</u>	<u>!</u>	Į	-	Γotal = Su	m(44) _{1 12} =	! =	1024.98	(44)	
Energy	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mon	nth (see Ta	ables 1b, 1	c, 1d)			
(45)m=	139.34	121.86	125.75	109.63	105.2	90.78	84.12	96.53	97.68	113.84	124.26	134.94		_	
If instan	taneous w	ater heatii	na at noint	of use (no	hot water	r storage)	enter () in	boxes (46)		Γotal = Su	m(45) _{1 12} =	=	1343.92	(45)	
(46)m=	20.9	18.28	18.86	16.45	15.78	13.62	12.62	14.48	14.65	17.08	18.64	20.24	1	(46)	
	storage		10.00	10.43	13.70	13.02	12.02	14.40	14.00	17.00	10.04	20.24		(40)	
Storag	e volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)	
If com	munity h	eating a	ind 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		eclared l	nee facto	nr ie kna	wn (k\//h	n/day).					0	1	(40)	
,			m Table		JI IS KIIO	vvii (Kvvi	irday).					0	<u>]</u>]	(48) (49)	
•			storage		ear			(48) x (49)	١ =			0]	(50)	
			eclared o	-		or is not	known:	(10) X (40)	•			0	J	(50)	
		_	factor fr		e 2 (kW	h/litre/da	ay)					0]	(51)	
	-	_	ee secti	on 4.3									1	(50)	
	e factor erature fa		bie ∠a m Table	2b								0 0	1	(52) (53)	
												-	1	()	

Energy lost from v	_	e, kWh/ye	ear			(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 = ((55) × (41)ı	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dec	icated 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 los	(annual) fro	om Table	e 3							0		(58)
Primary circuit los	calculated	for each	month (59)m = ((58) ÷ 36	65 × (41))m					
(modified by fac	or from Tab	le H5 if t	here is s	olar wat	ter heati	ng and a	cylinde	thermo	stat)		ı	
(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= 47.88 41	67 44.4	41.28	40.92	37.91	39.17	40.92	41.28	44.4	44.65	47.88		(61)
Total heat require	l for water h	eating ca	alculated	for eacl	h month	(62)m =	· 0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
	.54 170.15	150.91	146.11	128.69	123.29	137.44	138.96	158.23	168.91	182.82		(62)
Solar DHW input calcu	ated using App	endix G o	r Appendix	: H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	on to wate	r heating)	l	
(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	heater										l.	
	.54 170.15	150.91	146.11	128.69	123.29	137.44	138.96	158.23	168.91	182.82		
		1		I		Outp	out from wa	ater heate	r (annual)₁	12	1856.27	(64)
Heat gains from w	ater heating	. kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n1 + 0 8 x	/ [(46)m	+ (57)m	+ (59)m	1	-
		,										
(65)m= 58.3 50	94 52.91	46.77	45.21	39.66	37.76	42.32	42.8	48.95	52.48	56.84] 	(65)
` ′	ļ .	<u> </u>	45.21	39.66	37.76	42.32	42.8	48.95	52.48	56.84		(65)
include (57)m ir	calculation	of (65)m	45.21 only if c	39.66	37.76	42.32	42.8	48.95	52.48	56.84		(65)
include (57)m in 5. Internal gains	calculation (see Table !	of (65)m 5 and 5a	45.21 only if c	39.66	37.76	42.32	42.8	48.95	52.48	56.84		(65)
include (57)m in 5. Internal gains Metabolic gains (7	calculation (see Table sable 5), Wa	of (65)m 5 and 5a tts	45.21 only if c	39.66 ylinder is	37.76 s in the o	42.32 dwelling	42.8 or hot w	48.95 ater is fr	52.48 om com	56.84 munity h		(65)
include (57)m in 5. Internal gains Metabolic gains (1 Jan F	calculation (see Table sable 5), Wareb Mar	of (65)m 5 and 5a tts Apr	45.21 only if c	39.66 ylinder is	37.76 s in the o	42.32 dwelling	42.8 or hot w	48.95 ater is fr	52.48 om com	56.84 munity h		
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10	calculation (see Table 5), Wa eb Mar .82 107.82	of (65)m 5 and 5a tts Apr 107.82	45.21 only if c): May 107.82	39.66 ylinder is Jun 107.82	37.76 s in the o	42.32 dwelling Aug 107.82	42.8 or hot w Sep 107.82	48.95 ater is fr	52.48 om com	56.84 munity h		(65)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 107.82 10 Lighting gains (cal	calculation (see Table sable 5), Wareb Mar (.82 107.82 culated in A	of (65)m and 5a tts Apr 107.82 ppendix	45.21 only if c): May 107.82 L, equati	Jun 107.82	37.76 s in the o Jul 107.82 r L9a), a	42.32 dwelling Aug 107.82 lso see	42.8 or hot w Sep 107.82 Table 5	48.95 ater is fr Oct 107.82	52.48 om com Nov 107.82	56.84 munity h		(66)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14	calculation (see Table 5), Wareb Mar .82 107.82 culated in A	of (65)m and 5a tts Apr 107.82 ppendix 9.2	45.21 only if c): May 107.82 L, equati 6.88	39.66 ylinder is Jun 107.82 ion L9 of	37.76 s in the o Jul 107.82 r L9a), a 6.28	Aug 107.82 Iso see	42.8 or hot w Sep 107.82 Table 5	48.95 ater is fr Oct 107.82	52.48 om com	56.84 munity h		
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains	calculation (see Table 5), Wareb Mar (82 107.82) culated in A 95 12.16 calculated in	of (65)m 5 and 5a tts Apr 107.82 ppendix 9.2 n Append	45.21 only if c): May 107.82 L, equati 6.88 dix L, eq	Jun 107.82 ion L9 of 5.81 uation L	37.76 s in the o Jul 107.82 r L9a), a 6.28 13 or L1	Aug 107.82 Iso see 8.16 3a), also	42.8 or hot w Sep 107.82 Table 5 10.95 see Tal	48.95 ater is fr Oct 107.82 13.9 ble 5	52.48 om com Nov 107.82	56.84 munity h		(66) (67)
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19	calculation (see Table 5), Wa eb Mar 7.82 107.82 culated in A 95 12.16 calculated in 7.79 185.85	of (65)m 5 and 5a tts	45.21 only if c): May 107.82 L, equati 6.88 dix L, eq 162.07	39.66 ylinder is Jun 107.82 ion L9 of 5.81 uation L 149.6	37.76 s in the o Jul 107.82 r L9a), a 6.28 13 or L1 141.26	42.32 dwelling Aug 107.82 lso see 8.16 3a), also 139.3	42.8 or hot w Sep 107.82 Table 5 10.95 o see Ta	48.95 ater is fr Oct 107.82 13.9 ble 5 154.75	52.48 om com Nov 107.82	56.84 munity h		(66)
include (57)m in 5. Internal gains Metabolic gains (T Jan (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal	calculation (see Table sable 5), Wareb Mar (.82 107.82 culated in A ps 12.16 calculated in A ps 185.85 culated in A	of (65)m of (65)m of and 5a tts Apr 107.82 ppendix 9.2 n Append 175.34 ppendix	45.21 only if c): May 107.82 L, equati 6.88 dix L, equati 162.07 L, equat	Jun 107.82 ion L9 of 5.81 uation L 149.6 ion L15	37.76 s in the o Jul 107.82 r L9a), a 6.28 13 or L1 141.26 or L15a	42.32 dwelling Aug 107.82 lso see 8.16 3a), also 139.3	42.8 or hot w Sep 107.82 Table 5 10.95 o see Tal 144.24 ee Table	48.95 ater is fr Oct 107.82 13.9 ole 5 154.75 5	52.48 om com Nov 107.82 16.23	56.84 munity h		(66) (67) (68)
include (57)m in 5. Internal gains Metabolic gains (T Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal	calculation (see Table 5), Wa eb Mar 7.82 107.82 culated in A 95 12.16 calculated in 7.79 185.85	of (65)m 5 and 5a tts	45.21 only if c): May 107.82 L, equati 6.88 dix L, eq 162.07	39.66 ylinder is Jun 107.82 ion L9 of 5.81 uation L 149.6	37.76 s in the o Jul 107.82 r L9a), a 6.28 13 or L1 141.26	42.32 dwelling Aug 107.82 lso see 8.16 3a), also 139.3	42.8 or hot w Sep 107.82 Table 5 10.95 o see Ta	48.95 ater is fr Oct 107.82 13.9 ble 5 154.75	52.48 om com Nov 107.82	56.84 munity h		(66) (67)
include (57)m in 5. Internal gains Metabolic gains (T Jan (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal	calculation (see Table 5), Wareb Mar (82 107.82) culated in Ar (95 12.16) calculated in Ar (1.79 185.85) culated in Ar (1.78 33.78)	of (65)m 5 and 5a tts Apr 107.82 ppendix 9.2 Append 175.34 ppendix 33.78	45.21 only if c): May 107.82 L, equati 6.88 dix L, equati 162.07 L, equat	Jun 107.82 ion L9 of 5.81 uation L 149.6 ion L15	37.76 s in the o Jul 107.82 r L9a), a 6.28 13 or L1 141.26 or L15a	42.32 dwelling Aug 107.82 lso see 8.16 3a), also 139.3	42.8 or hot w Sep 107.82 Table 5 10.95 o see Tal 144.24 ee Table	48.95 ater is fr Oct 107.82 13.9 ole 5 154.75 5	52.48 om com Nov 107.82 16.23	56.84 munity h		(66) (67) (68)
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal (69)m= 33.78 33 Pumps and fans g	calculation (see Table 5), Wareb Mar (82 107.82) culated in Ar (95 12.16) calculated in Ar (1.79 185.85) culated in Ar (1.78 33.78)	of (65)m 5 and 5a tts Apr 107.82 ppendix 9.2 Append 175.34 ppendix 33.78	45.21 only if c): May 107.82 L, equati 6.88 dix L, equati 162.07 L, equat	Jun 107.82 ion L9 of 5.81 uation L 149.6 ion L15	37.76 s in the o Jul 107.82 r L9a), a 6.28 13 or L1 141.26 or L15a	42.32 dwelling Aug 107.82 lso see 8.16 3a), also 139.3	42.8 or hot w Sep 107.82 Table 5 10.95 o see Tal 144.24 ee Table	48.95 ater is fr Oct 107.82 13.9 ole 5 154.75 5	52.48 om com Nov 107.82 16.23	56.84 munity h		(66) (67) (68)
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal (69)m= 33.78 33 Pumps and fans g	calculation (see Table state Sable	of (65)m 5 and 5a tts Apr 107.82 ppendix 9.2 n Append 175.34 ppendix 33.78 5a) 3	45.21 only if c): May 107.82 L, equati 6.88 dix L, equ 162.07 L, equat 33.78	39.66 ylinder is Jun 107.82 ion L9 of 5.81 uation L 149.6 ion L15 33.78	Jul 107.82 r L9a), a 6.28 13 or L1 141.26 or L15a 33.78	Aug 107.82 Iso see 8.16 3a), also 139.3), also se 33.78	42.8 or hot w Sep 107.82 Table 5 10.95 o see Tal 144.24 ee Table 33.78	48.95 ater is fr Oct 107.82 13.9 ble 5 154.75 5 33.78	52.48 om com Nov 107.82 16.23	Dec 107.82 17.3 180.49 33.78		(66) (67) (68) (69)
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal (69)m= 33.78 33 Pumps and fans g (70)m= 3 Losses e.g. evaporations	calculation (see Table state Sable	of (65)m 5 and 5a tts Apr 107.82 ppendix 9.2 n Append 175.34 ppendix 33.78 5a) 3	45.21 only if c): May 107.82 L, equati 6.88 dix L, equ 162.07 L, equat 33.78	39.66 ylinder is Jun 107.82 ion L9 of 5.81 uation L 149.6 ion L15 33.78	Jul 107.82 r L9a), a 6.28 13 or L1 141.26 or L15a 33.78	Aug 107.82 Iso see 8.16 3a), also 139.3), also se 33.78	42.8 or hot w Sep 107.82 Table 5 10.95 o see Tal 144.24 ee Table 33.78	48.95 ater is fr Oct 107.82 13.9 ble 5 154.75 5 33.78	52.48 om com Nov 107.82 16.23	Dec 107.82 17.3 180.49 33.78		(66) (67) (68) (69)
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal (69)m= 33.78 33 Pumps and fans g (70)m= 3 Losses e.g. evaporations	calculation (see Table state of the calculated in A state of the calculate	of (65)m 5 and 5a tts Apr 107.82 ppendix 9.2 n Append 175.34 ppendix 33.78 5a) 3 tive valu	45.21 only if c): May 107.82 L, equati 6.88 dix L, eq 162.07 L, equat 33.78 3 es) (Tab	39.66 ylinder is Jun 107.82 ion L9 of 5.81 uation L 149.6 ion L15 33.78 3 le 5)	37.76 s in the o Jul 107.82 r L9a), a 6.28 13 or L1 141.26 or L15a 33.78	42.32 dwelling 107.82 lso see 8.16 3a), also 139.3), also se 33.78	42.8 or hot w Sep 107.82 Table 5 10.95 o see Tal 144.24 ee Table 33.78	48.95 ater is fr Oct 107.82 13.9 ble 5 154.75 5 33.78	52.48 om com Nov 107.82 16.23 168.02 33.78	56.84 munity h Dec 107.82 17.3 180.49 33.78		(66) (67) (68) (69) (70)
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal (69)m= 33.78 33 Pumps and fans g (70)m= 3 Losses e.g. evapol (71)m= -86.26 -86 Water heating gain	calculation (see Table state of the calculated in A state of the calculate	of (65)m 5 and 5a tts Apr 107.82 ppendix 9.2 n Append 175.34 ppendix 33.78 5a) 3 tive valu	45.21 only if c): May 107.82 L, equati 6.88 dix L, eq 162.07 L, equat 33.78 3 es) (Tab	39.66 ylinder is Jun 107.82 ion L9 of 5.81 uation L 149.6 ion L15 33.78 3 le 5)	37.76 s in the o Jul 107.82 r L9a), a 6.28 13 or L1 141.26 or L15a 33.78	42.32 dwelling 107.82 lso see 8.16 3a), also 139.3), also se 33.78	42.8 or hot w Sep 107.82 Table 5 10.95 o see Tal 144.24 ee Table 33.78	48.95 ater is fr Oct 107.82 13.9 ble 5 154.75 5 33.78	52.48 om com Nov 107.82 16.23 168.02 33.78	56.84 munity h Dec 107.82 17.3 180.49 33.78		(66) (67) (68) (69) (70)
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal (69)m= 33.78 33 Pumps and fans g (70)m= 3 Losses e.g. evapol (71)m= -86.26 -86 Water heating gain	calculation (see Table seb Mar 82 107.82 culated in A 95 12.16 calculated in A 78 33.78 ains (Table seb A 78 3.78 aration (negana) 26 -86.26 as (Table 5) 8 71.12	of (65)m 5 and 5a tts	45.21 only if c): May 107.82 L, equati 6.88 dix L, eqi 162.07 L, equati 33.78 3 es) (Tab	39.66 ylinder is Jun 107.82 ion L9 of 5.81 uation L 149.6 ion L15 33.78 3 le 5) -86.26	37.76 s in the of Jul 107.82 r L9a), a 6.28 13 or L1 141.26 or L15a 33.78 3 -86.26	42.32 dwelling 107.82 lso see 8.16 3a), also 139.3), also se 33.78	42.8 or hot w Sep 107.82 Table 5 10.95 See Tal 144.24 ee Table 33.78 3	48.95 ater is fr Oct 107.82 13.9 ble 5 154.75 5 33.78 3 -86.26	52.48 om com Nov 107.82 16.23 168.02 33.78 3 -86.26	56.84 munity h Dec 107.82 17.3 180.49 33.78 3 -86.26		(66) (67) (68) (69) (70) (71)
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal (69)m= 33.78 33 Pumps and fans g (70)m= 3 Losses e.g. evapol (71)m= -86.26 -86 Water heating gain (72)m= 78.36 75 Total internal gains	calculation (see Table seb Mar 82 107.82 culated in A 95 12.16 calculated in A 78 33.78 ains (Table seb A 78 3.78 aration (negana) 26 -86.26 as (Table 5) 8 71.12	of (65)m 5 and 5a tts	45.21 only if c): May 107.82 L, equati 6.88 dix L, eqi 162.07 L, equati 33.78 3 es) (Tab	39.66 ylinder is Jun 107.82 ion L9 of 5.81 uation L 149.6 ion L15 33.78 3 le 5) -86.26	37.76 s in the of Jul 107.82 r L9a), a 6.28 13 or L1 141.26 or L15a 33.78 3 -86.26	42.32 dwelling 107.82 lso see 8.16 3a), also 139.3), also se 33.78	42.8 or hot w Sep 107.82 Table 5 10.95 see Ta 144.24 ee Table 33.78 3 -86.26	48.95 ater is fr Oct 107.82 13.9 ble 5 154.75 5 33.78 3 -86.26	52.48 om com Nov 107.82 16.23 168.02 33.78 3 -86.26	56.84 munity h Dec 107.82 17.3 180.49 33.78 3 -86.26		(66) (67) (68) (69) (70) (71)
include (57)m in 5. Internal gains Metabolic gains (7 Jan F (66)m= 107.82 10 Lighting gains (cal (67)m= 16.83 14 Appliances gains (68)m= 188.83 19 Cooking gains (cal (69)m= 33.78 33 Pumps and fans g (70)m= 3 Losses e.g. evapol (71)m= -86.26 -86 Water heating gain (72)m= 78.36 75 Total internal gains	calculation (see Table see Table see Table 5), Wareb Mar 8.82 107.82 culated in A 95 12.16 calculated in A 185.85 culated in A 18 33.78 ains (Table 18 3 3 ration (negative 19 18 18 18 18 18 18 18 18 18 18 18 18 18	of (65)m 5 and 5a tts	45.21 only if c): May 107.82 L, equati 6.88 dix L, eqi 162.07 L, equati 33.78 3 es) (Tab -86.26	39.66 ylinder is Jun 107.82 ion L9 of 5.81 uation L 149.6 tion L15 33.78 3 lle 5) -86.26 55.08 (66)	37.76 s in the of Jul 107.82 r L9a), a 6.28 13 or L1 141.26 or L15a 33.78 3 -86.26 50.76 om + (67)m	42.32 dwelling Aug 107.82 lso see 8.16 3a), also 139.3), also se 33.78 3 -86.26	42.8 or hot w Sep 107.82 Table 5 10.95 See Tal 144.24 ee Table 33.78 3 -86.26 59.44 + (69)m + (48.95 ater is fr Oct 107.82 13.9 ble 5 154.75 5 33.78 3 -86.26 65.79 70)m + (7	52.48 om com Nov 107.82 16.23 168.02 33.78 3 -86.26 72.89 1)m + (72)	56.84 munity h Dec 107.82 17.3 180.49 33.78 3 -86.26		(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.

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	3.43	x	11.28	x	0.57	x	0.7] =	10.7	(75)
Northeast 0.9x	0.77	x	1.35	x	11.28	X	0.57	x	0.7	=	4.21	(75)
Northeast 0.9x	0.77	x	3.43	x	22.97	x	0.57	x	0.7	=	21.78	(75)
Northeast 0.9x	0.77	x	1.35	x	22.97	x	0.57	x	0.7	=	8.57	(75)
Northeast 0.9x	0.77	x	3.43	x	41.38	X	0.57	x	0.7	=	39.24	(75)
Northeast 0.9x	0.77	x	1.35	x	41.38	x	0.57	x	0.7	=	15.45	(75)
Northeast 0.9x	0.77	x	3.43	x	67.96	x	0.57	x	0.7] =	64.45	(75)
Northeast 0.9x	0.77	x	1.35	x	67.96	x	0.57	x	0.7	=	25.37	(75)
Northeast 0.9x	0.77	x	3.43	x	91.35	x	0.57	x	0.7	=	86.63	(75)
Northeast 0.9x	0.77	x	1.35	x	91.35	x	0.57	x	0.7	=	34.1	(75)
Northeast 0.9x	0.77	x	3.43	x	97.38	x	0.57	x	0.7	=	92.36	(75)
Northeast 0.9x	0.77	x	1.35	x	97.38	x	0.57	x	0.7	=	36.35	(75)
Northeast 0.9x	0.77	x	3.43	x	91.1	x	0.57	x	0.7] =	86.4	(75)
Northeast 0.9x	0.77	x	1.35	x	91.1	x	0.57	x	0.7	=	34.01	(75)
Northeast 0.9x	0.77	X	3.43	x	72.63	x	0.57	x	0.7	=	68.88	(75)
Northeast 0.9x	0.77	X	1.35	x	72.63	x	0.57	X	0.7	=	27.11	(75)
Northeast 0.9x	0.77	X	3.43	x	50.42	X	0.57	X	0.7	=	47.82	(75)
Northeast 0.9x	0.77	X	1.35	x	50.42	x	0.57	x	0.7	=	18.82	(75)
Northeast 0.9x	0.77	X	3.43	x	28.07	x	0.57	x	0.7	=	26.62	(75)
Northeast 0.9x	0.77	x	1.35	x	28.07	x	0.57	x	0.7	=	10.48	(75)
Northeast 0.9x	0.77	X	3.43	x	14.2	x	0.57	x	0.7	=	13.46	(75)
Northeast 0.9x	0.77	X	1.35	x	14.2	x	0.57	x	0.7	=	5.3	(75)
Northeast 0.9x	0.77	x	3.43	x	9.21	x	0.57	x	0.7	=	8.74	(75)
Northeast 0.9x	0.77	x	1.35	x	9.21	x	0.57	x	0.7	=	3.44	(75)
Southeast 0.9x	0.77	x	2.38	x	36.79	X	0.57	X	0.7	=	24.21	(77)
Southeast 0.9x	0.77	x	5	x	36.79	x	0.57	x	0.7	=	50.87	(77)
Southeast 0.9x	0.77	x	2.38	x	62.67	x	0.57	x	0.7	=	41.24	(77)
Southeast 0.9x	0.77	x	5	x	62.67	x	0.57	X	0.7] =	86.65	(77)
Southeast 0.9x	0.77	x	2.38	x	85.75	x	0.57	x	0.7] =	56.43	(77)
Southeast 0.9x	0.77	x	5	x	85.75	x	0.57	x	0.7] =	118.56	(77)
Southeast 0.9x	0.77	x	2.38	x	106.25	x	0.57	X	0.7	=	69.92	(77)
Southeast 0.9x	0.77	x	5	x	106.25	x	0.57	x	0.7	=	146.9	(77)
Southeast 0.9x	0.77	X	2.38	x	119.01	x	0.57	x	0.7	=	78.32	(77)
Southeast 0.9x	0.77	X	5	x	119.01	x	0.57	x	0.7	=	164.54	(77)
Southeast 0.9x	0.77	x	2.38	x	118.15	x	0.57	x	0.7	=	77.75	(77)
Southeast 0.9x	0.77	X	5	x	118.15	x	0.57	x	0.7] =	163.35	(77)
Southeast 0.9x	0.77	X	2.38	x	113.91	x	0.57	x	0.7] =	74.96	(77)
Southeast 0.9x	0.77	X	5	x	113.91	x	0.57	х	0.7] =	157.48	(77)
Southeast 0.9x	0.77	X	2.38	x	104.39	x	0.57	x	0.7] =	68.7	(77)
				-		-		•		-		_

Southeast 0.60	Southeast $0.9x$ 0.77 x 5 x 104.39 x 0.57 x 0.7 = 144.32 (77)														
Southwesto 9x	Southeast _{0.9x}	0.77	X	5		x	104.39		x	0.57	x	0.7	=	144.32	(77)
Southwesto as a continuesto as a continu	Southeast _{0.9x}	0.77	X	2.3	8	x	92.85		x	0.57	x	0.7	=	61.1	(77)
Southeast 0 9x	Southeast _{0.9x}	0.77	X	5		x	92.85		x	0.57	x	0.7	=	128.37	(77)
Southwesto 9x	Southeast _{0.9x}	0.77	X	2.3	8	x	69.27		x	0.57	x	0.7	=	45.58	(77)
Southwesto 9x	Southeast _{0.9x}	0.77	X	5		x	69.27		x	0.57	x	0.7	=	95.76	(77)
Southwest 0, 9x	Southeast _{0.9x}	0.77	x	2.3	8	x	44.07	\exists	x	0.57	x	0.7	=	29	(77)
Southwesto 9x	Southeast 0.9x	0.77	x	5		x	44.07	ī	x	0.57	x	0.7	=	60.93	(77)
Southwesty 9x 0.77 x 1.26 x 62.67 0.57 x 0.7 = 12.82 (79) Southwesty 9x 0.77 x 1.26 x 62.67 0.57 x 0.7 = 29.88 (79) Southwesty 9x 0.77 x 1.26 x 106.25 0.57 x 0.7 = 29.88 (79) Southwesty 9x 0.77 x 1.26 x 119.01 0.57 x 0.7 = 37.02 (79) Southwesty 9x 0.77 x 1.26 x 119.01 0.57 x 0.7 = 41.46 (79) Southwesty 9x 0.77 x 1.26 x 119.01 0.57 x 0.7 = 41.46 (79) Southwesty 9x 0.77 x 1.26 x 119.01 0.57 x 0.7 = 41.46 (79) Southwesty 9x 0.77 x 1.26 x 113.91 0.57 x 0.7 = 39.69 (79) Southwesty 9x 0.77 x 1.26 x 113.91 0.57 x 0.7 = 39.69 (79) Southwesty 9x 0.77 x 1.26 x 104.39 0.57 x 0.7 = 39.69 (79) Southwesty 9x 0.77 x 1.26 x 12.6 x 19.25 0.57 x 0.7 = 39.69 (79) Southwesty 9x 0.77 x 1.26 x 12.6 x 19.25 0.57 x 0.7 = 39.69 (79) Southwesty 9x 0.77 x 1.26 x 19.25 0.57 x 0.7 = 39.69 (79) Southwesty 9x 0.77 x 1.26 x 19.25 0.57 x 0.7 = 30.37 (79) Southwesty 9x 0.77 x 1.26 x 19.25 0.57 x 0.7 = 30.37 (79) Southwesty 9x 0.77 x 1.26 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.25 0.57 x 0.7 = 15.35 (79) Southwesty 9x 0.77 x 1.26 x 19.25 x 19.2	Southeast _{0.9x}	0.77	x	2.3	8	x	31.49	╗	x	0.57	x	0.7	=	20.72	(77)
Southwesto, 9x	Southeast _{0.9x}	0.77	X	5		x	31.49		x	0.57	x	0.7	=	43.53	(77)
Southwesto, 9x	Southwest _{0.9x}	0.77	X	1.2	6	x	36.79			0.57	x	0.7	=	12.82	(79)
Southwesto 9x	Southwest _{0.9x}	0.77	X	1.2	6	x	62.67		Ī	0.57	×	0.7	=	21.84	(79)
Southwesto, 9x	Southwest _{0.9x}	0.77	X	1.2	6	x	85.75		Ī	0.57	x	0.7	=	29.88	(79)
Southwesto, 9x	Southwest _{0.9x}	0.77	x	1.2	6	x	106.25		Ī	0.57	x	0.7	=	37.02	(79)
Southwesto, 9x	Southwest _{0.9x}	0.77	x	1.2	6	x	119.01	╗	Ī	0.57	x	0.7	=	41.46	(79)
Southwest0,9x	Southwest _{0.9x}	0.77	X	1.2	6	x	118.15			0.57	x	0.7	=	41.16	(79)
Southwest0.9x	Southwest _{0.9x}	0.77	X	1.2	6	x	113.91		Ī	0.57	x	0.7	=	39.69	(79)
Southwest0.9x	Southwest _{0.9x}	0.77	X	1.2	6	x	104.39			0.57	x	0.7	=	36.37	(79)
Southwesto, 9x	Southwest _{0.9x}	0.77	X	1.2	6	x	92.85			0.57	x	0.7	=	32.35	(79)
Southwesto, 9x 0.77 x 1.26 x 31.49 0.57 x 0.7 = 10.97 (79) Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m (83)m = 102.81 180.08 259.56 343.65 405.05 410.98 392.54 345.38 288.47 202.58 124.05 87.4 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.13 19.32 19.64 20.08 20.49 20.81 20.94 20.91 20.67 20.14 19.57 19.11 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.53 19.54 19.54 19.56 19.57 19.59 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89)m= 17.11 17.38 17.85 18.5 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (80)	Southwest _{0.9x}	0.77	X	1.2	6	x	69.27			0.57	x	0.7	=	24.13	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m (83)m = 102.81 180.08 259.56 343.65 405.05 410.98 392.54 345.38 288.47 202.58 124.05 87.4 (84)m = 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84)m = 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84)m = 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84)m = 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84)m = 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84)m = 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84)m = 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84)m = 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84)m = 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84)m = 445.18 519.97 489.18 649.18 608.08 561.45 495.38 439.53 419.94 (85)m = 10.99 0.99 0.99 0.97 0.91 0.8 0.66 0.71 0.89 0.99 0.99 1 (86)m = 10.99 0.99 0.97 0.91 0.8 0.66 0.71 0.89 0.98 0.99 1 (87)m = 19.13 19.32 19.64 20.08 20.49 20.81 20.94 20.91 20.67 20.14 19.57 19.56 19.55 (88)m = 19.53 19.54 19.54 19.56 19.57 19.59 19.59 19.59 19.58 19.57 19.56 19.55 (88)m = 19.53 19.54 19.54 19.56 19.57 19.59 19.59 19.59 19.59 19.58 19.57 19.56 19.55 (89)m = 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m = 17.11 17.38 17.85 18.5 19.07	Southwest _{0.9x}	0.77	X	1.2	6	x	44.07			0.57	x	0.7	=	15.35	(79)
(83)m=	Southwest _{0.9x}	0.77	X	1.2	6	x	31.49			0.57	x	0.7	=	10.97	(79)
(83)m=															
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.99 0.97 0.91 0.8 0.66 0.71 0.89 0.98 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.13 19.32 19.64 20.08 20.49 20.81 20.94 20.91 20.67 20.14 19.57 19.11 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.53 19.54 19.54 19.56 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.52 18.6 17.76 17.09 (90)	Solar gains in	watts, calcu	ulated	for each	n month			(8	33)m	= Sum(74)m	(82)m				
(84)m= 445.18 519.97 587.03 651.5 693.11 679.81 649.18 608.08 561.45 495.38 439.53 419.94 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) [86)m= 1 0.99 0.99 0.97 0.91 0.8 0.66 0.71 0.89 0.98 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) [87)m= 19.13 19.32 19.64 20.08 20.49 20.81 20.94 20.91 20.67 20.14 19.57 19.11 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) [88)m= 1 0.99 0.98 0.95 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) [89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) [90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90)	(83)m= 102.81	180.08 2	59.56	343.65	405.05	4	10.98 392.5	54 3	345.3	38 288.47	202.58	124.05	87.4		(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.99 0.97 0.91 0.8 0.66 0.71 0.89 0.98 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.13 19.32 19.64 20.08 20.49 20.81 20.94 20.91 20.67 20.14 19.57 19.11 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.53 19.54 19.54 19.56 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90)	Total gains – i	nternal and	solar	(84)m =	(73)m	+ (8	33)m , watt	s							
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 (86)m= 1 0.99 0.99 0.97 0.91 0.8 0.66 0.71 0.89 0.98 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.13 19.32 19.64 20.08 20.49 20.81 20.94 20.91 20.67 20.14 19.57 19.11 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.53 19.54 19.54 19.56 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90)	(84)m= 445.18	519.97 58	87.03	651.5	693.11	6	79.81 649.1	18 (608.0	08 561.45	495.38	439.53	419.94		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.99 0.97 0.91 0.8 0.66 0.71 0.89 0.98 0.99 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.13 19.32 19.64 20.08 20.49 20.81 20.94 20.91 20.67 20.14 19.57 19.11 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.53 19.54 19.56 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow st	7. Mean inter	nal tempera	ature ((heating	seasor	1)									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature	during hea	iting p	eriods ir	the livi	ng	area from 7	Γable	e 9,	Th1 (°C)				21	(85)
(86)m= 1 0.99 0.99 0.97 0.91 0.8 0.66 0.71 0.89 0.98 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.13 19.32 19.64 20.08 20.49 20.81 20.94 20.91 20.67 20.14 19.57 19.11 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.54 19.54 19.56 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90) <td>Utilisation fac</td> <td>ctor for gain</td> <td>s for li</td> <td>iving are</td> <td>a, h1,m</td> <td>า (s</td> <td>ee Table 9a</td> <td>a)</td> <td></td> <td></td> <td></td> <td></td> <td><u> </u></td> <td></td> <td></td>	Utilisation fac	ctor for gain	s for li	iving are	a, h1,m	า (s	ee Table 9a	a)					<u> </u>		
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.13 19.32 19.64 20.08 20.49 20.81 20.94 20.91 20.67 20.14 19.57 19.11 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.53 19.54 19.56 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90)	Jan	Feb	Mar	Apr	May		Jun Jul		Au	g Sep	Oct	Nov	Dec		
(87)m= 19.13 19.32 19.64 20.08 20.49 20.81 20.94 20.91 20.67 20.14 19.57 19.11 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.53 19.54 19.54 19.56 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90)	(86)m= 1	0.99	0.99	0.97	0.91		0.8	3	0.7	0.89	0.98	0.99	1		(86)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.53 19.54 19.54 19.56 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90)	Mean interna	ıl temperatu	ıre in I	iving are	ea T1 (f	ollo	w steps 3 t	o 7 i	n Ta	able 9c)					
(88)m= 19.53 19.54 19.54 19.56 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90)	(87)m= 19.13	19.32 1	9.64	20.08	20.49	2	0.81 20.9	4	20.9	1 20.67	20.14	19.57	19.11		(87)
(88)m= 19.53 19.54 19.54 19.56 19.57 19.59 19.59 19.6 19.58 19.57 19.56 19.55 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90)	Temperature	during hea	iting p	eriods ir	rest of	dw	elling from	Tab	le 9	 , Th2 (°C)				•	
(89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09						_		$\overline{}$		- 	19.57	19.56	19.55		(88)
(89)m= 1 0.99 0.98 0.95 0.87 0.69 0.48 0.54 0.82 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09	Utilisation fac	tor for gain	ıs for r	est of d	vellina	h2	m (see Tal	ole a)a)					ı	
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90)								$\overline{}$		0.82	0.96	0.99	1		(89)
(90)m= 17.11 17.38 17.85 18.5 19.07 19.46 19.57 19.56 19.32 18.6 17.76 17.09 (90)	` ′						l	ctor.		!!	0.00			I	
			r			Ť	<u>`</u>	-				17 76	17 00		(90)
0.34	(30)111- 17.11	17.11 17.30 17.30 10.3 10.37 10.40						<u>' </u>	13.0					0.34	_
												.5 5.00 (-	,	0.54	(01)

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

(92)m=	17.8	18.05	18.46	19.04	19.55	19.92	20.04	20.03	19.78	19.13	18.38	17.78		(92)
Appl	y adjustn	nent to t	he mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate			l	
(93)m=	17.65	17.9	18.31	18.89	19.4	19.77	19.89	19.88	19.63	18.98	18.23	17.63		(93)
8. Sp	ace hea	ting requ	uirement											
	i to the r					ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the u	tilisation											1	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac		1											(0.4)
(94)m=	0.99	0.99	0.97	0.94	0.86	0.71	0.52	0.58	0.82	0.95	0.99	0.99		(94)
	ul gains,		<u> </u>	_ `		400.00	220.00	240.70	400.0	470.55	400.75	447.00		(OE)
(95)m=		512.87	571.23	612.13	598.35	482.66	338.62	349.72	460.3	472.55	433.75	417.39		(95)
	hly avera	age exte	ernai tem 6.5	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
(96)m=			ļ						l		7.1	4.2		(90)
	loss rate			1106.53	849.83	559.12	355.37	374.12	- (96)m	923.92	1237.82	1506.01		(97)
(97)m=												1300.01		(01)
(98)m=	e heating	646.01	568.01	355.96	187.1	0	0.02	0	0	335.82	578.93	809.93		
(90)111=	002.34	040.01	300.01	333.90	107.1	U	U					l	4284.1	(98)
_								TOla	ıl per year	(KVVII/yeai) – Suiii(9	O)15,912 -	4204.1	╡``
Spac	e heatin	g require	ement in	kWh/m²	/year								64.49	(99)
9a. Er	nergy rec	uiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
•	e heatir	_										ı		_
Frac	tion of sp	ace hea	it from se	econdar	y/supple	mentary	system						0	(201)
Frac	ion of sp	ace hea	it from m	ain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Frac	tion of to	tal heati	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Effici	ency of r	main spa	ace heat	ing syste	em 1								90.3	(206)
Effici	ency of s	seconda	ry/supple	ementar	y heating	g system	ı, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊒ ar
Spac	e heating						oui	Aug	ССР	001	1101	Dec	KVVIII y C	ai
Орис	802.34	646.01	568.01	355.96	187.1	0	0	0	0	335.82	578.93	809.93		
(211)r	n = {[(98	\m v (20	// l l v 1	00 ÷ (20	L				<u> </u>		ļ	<u> </u>		(211)
(211)	888.53	715.41	629.02	394.2	207.19	0	0	0	0	371.89	641.12	896.94		(211)
	000.00		020.02	00					l (kWh/yea				4744.3	(211)
Space	o bootin	a fuel (e	ooondar	(A) (A) (A) (A) (A) (A) (A) (A) (A) (A) (A)	month				, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	, (/15,10. 12		4744.5	(=1.1)
•	e heating 3)m x (20	`		, , .	monun									
– \[(30 (215)m		0	00 / (20	0	0	0	0	0	0	0	0	0		
(- 7		-				-	-	Tota	l (kWh/yea	ar) =Sum(2	215), 540 40	 =	0	(215)
Water	heating	ı									715,10. 12			
	t from wa		ter (calc	ulated al	oove)									
Carpo	187.21	163.54	170.15	150.91	146.11	128.69	123.29	137.44	138.96	158.23	168.91	182.82		
Efficie	ncy of w	ater hea	iter									ı	81	(216)
(217)m	88.38	88.25	87.97	87.32	85.97	81	81	81	81	87.1	88.02	88.43		(217)
Fuel f	or water	heating	kWh/ma	onth					I	<u> </u>	I	ı		
(219)r	n = (64)	•		m								•	ı	
(219)m	211.83	185.3	193.41	172.84	169.95	158.87	152.21	169.68	171.55	181.67	191.91	206.74		
									I = Sum(2					

Annual totals Space heating fuel used, main system 1		kWh/yea	ar 	kWh/year 4744.3	7
			ļ	4744.5	_
Water heating fuel used				2165.98	
Electricity for pumps, fans and electric keep-hot					
mechanical ventilation - balanced, extract or pos	tive input from outside		167.15		(230a)
central heating pump:			30		(230c)
Total electricity for the above, kWh/year	sum of (230a)	(230g) =		197.15	(231)
Electricity for lighting				297.25	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh		Emissions kg CO2/yea	
Space heating (main system 1)	<u> </u>				
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	ar -
	kWh/year (211) x	kg CO2/kWh	= [kg CO2/yea	ar](261)
Space heating (secondary)	kWh/year (211) x (215) x	0.216 0.519	=	kg CO2/yea	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	0.216 0.519	=	kg CO2/yea 1024.77 0 467.85	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	=	kg CO2/yea 1024.77 0 467.85 1492.62	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.519	=	kg CO2/yea 1024.77 0 467.85 1492.62 102.32	(261) (263) (264) (265) (267)

El rating (section 14)

(274)

			User D	etails: -						
Assessor Name:	Chris Hocknell			Stroma	a Nium	hor:		STDC	0016363	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.10	
Contware Hame.	500 ma 1 57 ti 25			Address			d-Lean	VOION	511. 1.5.1.15	
Address :	Unit 4, 40-42 Mill L		·							
1. Overall dwelling dime	·	,	·							
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	·)
Ground floor			7	3.27	(1a) x	2	2.6	(2a) =	190.5	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	e)+(1n) 7	3.27	(4)			_		
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	190.5	(5)
2. Ventilation rate:										
		secondary heating	y	other		total			m³ per hou	r
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	1 + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				, 	0	x ·	10 =	0	(7a)
Number of passive vents	S				F	0	x ·	10 =	0	(7b)
Number of flueless gas f	fires				F	0	X	40 =	0	(7c)
					<u>L</u>					(,
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7a	a)+(7b)+(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has		ded, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration			00=1				[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (J.25 for steel or timber oresent, use the value corre 				•	uction			0	(11)
deducting areas of open		sponding to	ine great	ei waii aie	a (anei					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0.	1 (seale	d), 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 s	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value	• •		•	•	•	etre of e	envelope	area	7	(17)
If based on air permeabi	•								0.35	(18)
Air permeability value application Number of sides sheltered		as been done	e or a deg	gree air pei	meability	is being u	sed			7(40)
Shelter factor	eu			(20) = 1 -	0.075 x (1	19)] =			0.85	(19) (20)
Infiltration rate incorpora	iting shelter factor			(21) = (18)	,	, ,			0.3	(21)
Infiltration rate modified	-	ed							0.0	(,
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s		_!1							<u> </u>	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
		1 1		ı	I	1	1	1	_	
Wind Factor (22a)m = (2	'	1 00= 1		0.05			T		7	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation rate (all	owing for sl	helter an	d wind s	peed) =	(21a) x	(22a)m					
0.38	0.37 0.30	I	0.32	0.28	0.28	0.28	0.3	0.32	0.33	0.35]	
Calculate effect	-	ge rate for t	he appli	cable ca	se						- 	(22)
	al ventilation: eat pump using A	onnendix N (2	23h) = (23a	ı) × Fmv (e	equation (N5)) othe	rwise (23h	n) = (23a)			0.5	(238
	n heat recovery:) (20a)			0.5	(23)
	ed mechanica	-	_					2h\m + (23h) x [1 (23c)	73.1	(230
(24a)m= 0.51	0.51 0.5		0.45	0.42	0.42	0.41	0.43	0.45	0.47	0.48]	(24a
` '	d mechanica				<u> </u>	ļ				00	J	`
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0	1	(24)
	ouse extract	entilation (or positiv	e input v	l ventilatio	on from (outside		<u> </u>		J	•
,	n < 0.5 × (23b		•	•				.5 × (23b)			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(240
d) If natural	ventilation or	whole hous	se positiv	e input	ventilati	on from	loft		!		•	
if (22b)n	n = 1, then (2	4d)m = (22	b)m othe	rwise (2	4d)m =	0.5 + [(2	22b)m² x	0.5]			,	
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(240
Effective air	change rate -	enter (24a	a) or (24b	<u> </u>	c) or (24	d) in bo	x (25)			,	,	
(25)m= 0.51	0.51 0.5	0.46	0.45	0.42	0.42	0.41	0.43	0.45	0.47	0.48		(25)
3. Heat losse	s and heat los	ss paramet	er:									
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-valud kJ/m²·	-	A X k kJ/K
Doors	,			2	x	1.5	=	3	$\stackrel{\prime}{\Box}$			(26)
Windows Type	e 1			1.35	x1	/[1/(1.4)+	0.04] =	1.79	Ħ			(27)
Windows Type	2			1.35	= _x 1	/[1/(1.4)+	0.04] =	1.79	Ħ			(27)
Walls Type1	45.57	6.75	5	38.82	_	0.25		9.7	=			(29)
Walls Type2	11.73	2		9.73	=	0.23		2.21	믁		╡ ├	(29)
Walls Type3	12.88	0	_	12.88	=	0.23		2.63	륵 ¦		3	(29)
Roof	15.07	0	_		=	0.18			륵 ¦		╡	(30)
Total area of e		0		15.07		0.16		2.71				
	ilements, m			85.25	=							(31)
Party floor				37.7	×	0	=	0	<u> </u>		╡	(32)
Party floor				73.27	=				Ĺ		╡	(328
Party ceiling	land tarks a			58.2			1/5/4/11 -1	.) 0.047				(32)
* for windows and ** include the area					atea using	j tormula 1	1/[(1/U-vail	ue)+0.04] a	is given in	paragrapi	n 3.2	
Fabric heat los	ss, W/K = S (A	AxU)	,			(26) (30) + (32) =				29.21	(33)
Heat capacity	Cm = S(A x k)					((28)	(30) + (32)	2) + (32a)	(32e) =	13327.5	59 (34)
1	noromotor /T	MD 0	- TFΔ\ in	. l. 1/m21/			Indica	ative Value	: Medium		250	(35)
Thermal mass	parameter (1	MP = Cm ·		i KJ/III-N								1 ' '
	sments where the	e details of the	,			recisely the			TMP in T	able 1f		
Thermal mass	sments where the	e details of the calculation.	constructi	ion are not	t known pi	recisely the			TMP in T	able 1f	12.79	(36)
Thermal mass For design assess can be used inste	sments where the ad of a detailed on es:S(L x Y)	e details of the calculation. calculated	constructi	on are not	t known pi	recisely the			TMP in T	able 1f	12.79	(36)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	32.3	31.83	31.37	29.03	28.56	26.22	26.22	25.76	27.16	28.56	29.5	30.43		(38)
Heat tr	ansfer c	coefficier	nt, W/K	•	•	•	•	•	(39)m	= (37) + (37)	38)m	•		
(39)m=	74.3	73.83	73.36	71.02	70.55	68.22	68.22	67.75	69.15	70.55	71.49	72.42		
Heat lo	ss para	meter (H	HLP), W	m²K				•		Average = = (39)m ÷	Sum(39) ₁	12 /12=	70.91	(39)
(40)m=	1.01	1.01	1	0.97	0.96	0.93	0.93	0.92	0.94	0.96	0.98	0.99		
Numbe	er of day	s in moi	nth (Tab	le 1a)			•	•		Average =	Sum(40) ₁	12 /12=	0.97	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting enei	rgy requi	irement:								kWh/ye	ear:	
Assum	ed occu	ıpancy, l	N								2	.32		(42)
if TF.		9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.02		(/
			ater usaç).37		(43)
		-	hot water person per			-	-	to achieve	a water us	se target o	f			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	98.3	94.73	91.15	87.58	84.01	80.43	80.43	84.01	87.58	91.15	94.73	98.3		
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) _{1 12} = ables 1b, 1		1072.41	(44)
(45)m=	145.78	127.5	131.57	114.71	110.06	94.98	88.01	100.99	102.2	119.1	130.01	141.18		
If instant	taneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) _{1 12} =		1406.09	(45)
(46)m=	21.87	19.13	19.74	17.21	16.51	14.25	13.2	15.15	15.33	17.87	19.5	21.18		(46)
	storage											•		
_		, ,) includir				•		ame ves	sel		0		(47)
Otherw	-	stored	ind no ta hot wate		_			• •	ers) ente	er '0' in (47)			
	•		eclared I	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	rature fa	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 ble 2a	011 4.3								0		(52)
			m Table	2b							-	0		(52)
•			storage		ear			(47) x (51) x (52) x (53) =		0		(54)
		(54) in (5	_	,y				(11) // (31	, - (- -) · · (/		0		(55)
			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)
(- 2)···	-					I				I	<u> </u>	<u> </u>		(==)

If cylinder con	ains dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circ	cuit loss (ar	nual) fro	m Table	÷ 3							0		(58)
Primary circ	cuit loss ca	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				'	
(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= 50.0	9 43.6	46.45	43.19	42.81	39.66	40.99	42.81	43.19	46.45	46.72	50.09		(61)
Total heat r	equired 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= 195.	88 171.1	178.02	157.9	152.87	134.64	129	143.8	145.39	165.55	176.73	191.28		(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 \	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= 195.	88 171.1	178.02	157.9	152.87	134.64	129	143.8	145.39	165.55	176.73	191.28		
	•						Outp	out from wa	ater heate	r (annual) ₁	12	1942.15	(64)
Heat gains	from 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= 61	53.29	55.36	48.94	47.3	41.5	39.51	44.28	44.78	51.21	54.91	59.47		(65)
include (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	eating	
5. Interna	gains (see	e Table 5	and 5a):									
Metabolic g				,									
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 116.	14 116.14	116.14	116.14	116.14	116.14	116.14	116.14	116.14	116.14	116.14	116.14		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 20.9	18.58	15.11	11.44	8.55	7.22	7.8	10.14	13.61	17.28	20.17	21.51		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5			'	
(68)m= 204.	81 206.93	201.58	190.17	175.78	162.26	153.22	151.09	156.45	167.85	182.24	195.77		(68)
Cooking ga	ins (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)), also se	ee Table	5			ı	
(69)m= 34.6	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61	34.61		(69)
Pumps and	fans gains	(Table 5	Ба)									l	
(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)							l	
(71)m= -92.		-92.91	-92.91	-92.91	-92.91	-92.91	-92.91	-92.91	-92.91	-92.91	-92.91		(71)
Water heati	ng gains (rable 5)	!	!			!	I .		!	<u> </u>	l	
(72)m= 81.9	~~	74.41	67.97	63.57	57.63	53.1	59.52	62.19	68.84	76.26	79.93		(72)
Total inter	nal gains =	! :			(66)	m + (67)m	ı + (68)m +	⊦ (69)m + ((70)m + (7	1)m + (72))m	l	
(73)m= 368.		351.94	330.43	308.75	287.95	274.97	281.6	293.1	314.81	339.52	358.05		(73)
6. Solar ga													
	re calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	e applicat	ole orientat	ion.		
Orientation	Access F	actor	Area		Flu			g_		FF		Gains	
	Table 6d		m²		Tal	ole 6a	Т	able 6b	T	able 6c		(W)	

Northeast _{0.9x}	0.77	,	(1.35] x		11.28] x	0.57		x	0.7		=	4.21	(75)
Northeast _{0.9x}	0.77		ו 	1.35] ×		22.97] X	0.57	=	х	0.7		=	8.57	(75)
Northeast _{0.9x}	0.77	-	ו 	1.35] x		11.38] X	0.57	=	х	0.7		=	15.45	(75)
Northeast _{0.9x}	0.77	-	, 	1.35	X		67.96] x	0.57		x	0.7	_	=	25.37	(75)
Northeast 0.9x	0.77	-	י 	1.35	j ×		91.35] x	0.57	=	х	0.7	_	=	34.1	(75)
Northeast _{0.9x}	0.77		, i	1.35	X		97.38	X	0.57	一	x	0.7		=	36.35	(75)
Northeast _{0.9x}	0.77	,	ι	1.35	j ×		91.1	X	0.57		x	0.7		=	34.01	(75)
Northeast _{0.9x}	0.77		ι	1.35	j×	7	72.63	X	0.57		x	0.7		=	27.11	(75)
Northeast _{0.9x}	0.77	,	ι	1.35	×	5	50.42	X	0.57		x	0.7	i	=	18.82	(75)
Northeast 0.9x	0.77	,	ι	1.35	Īx	2	28.07	X	0.57		x	0.7		=	10.48	(75)
Northeast _{0.9x}	0.77	 ,	ι	1.35	Īx		14.2	X	0.57		x	0.7		=	5.3	(75)
Northeast _{0.9x}	0.77	,	آ	1.35	x		9.21	X	0.57		x	0.7		=	3.44	(75)
Northwest _{0.9x}	0.77	,	٠ <u> </u>	1.35	x	1	11.28	X	0.57		x	0.7		=	16.85	(81)
Northwest _{0.9x}	0.77	,	٠ <u>[</u>	1.35	x	2	22.97	X	0.57		x	0.7		=	34.29	(81)
Northwest _{0.9x}	0.77	,	, [1.35	x		11.38	X	0.57		x	0.7		=	61.78	(81)
Northwest _{0.9x}	0.77	,	(1.35	x	(67.96	X	0.57		x	0.7		=	101.47	(81)
Northwest _{0.9x}	0.77	,	(1.35	X	9	91.35	X	0.57		x	0.7		=	136.39	(81)
Northwest _{0.9x}	0.77	,	· [1.35	x	9	97.38	X	0.57		X	0.7		=	145.41	(81)
Northwest _{0.9x}	0.77	,	([1.35	x		91.1	X	0.57		X	0.7		=	136.03	(81)
Northwest _{0.9x}	0.77	,	•	1.35	x	7	72.63	X	0.57		X	0.7		=	108.44	(81)
Northwest 0.9x	0.77	,	(1.35	X	5	50.42	X	0.57		x	0.7		=	75.29	(81)
Northwest _{0.9x}	0.77	,	· [1.35	x	2	28.07	X	0.57		X	0.7		=	41.91	(81)
Northwest _{0.9x}	0.77	,	•	1.35	x		14.2	X	0.57		X	0.7		=	21.2	(81)
Northwest _{0.9x}	0.77	,	' [1.35	X		9.21	X	0.57		X	0.7		=	13.76	(81)
Solar gains in			d 1			104.70	1	Ť	n = Sum(74)m	<u> </u>	2)m	20.5	47		1	(83)
(83)m= 21.06 Total gains – ii	1 42.87 nternal ar	77.23	l ar ($\frac{126.83 \mid 170.4}{(84)m = (73)r}$		181.76 (83)m	170.03 watts	135	94.11	52	2.39	26.5	17	.2		(83)
(84)m= 389.62	408.53	429.17	_	457.26 479.2		169.71	445	417	.15 387.2	36	37.2	366.02	375	.24		(84)
7. Mean inter	<u> </u>		_					<u>. </u>								` '
Temperature						area	from Tal	hle 0	Th1 (°C)						21	(85)
Utilisation fac	•	_	•		_			DIC 3	, 1111 (0)						21	
Jan	Feb	Mar	Ť	Apr Ma	Ť	Jun	Jul	ΙΑ	ug Sep	T_{C}	Oct	Nov	D	ec		
(86)m= 1	1	1	Ť	0.99 0.95		0.82	0.65	0.7		+-	.99	1	1			(86)
Mean interna	l temners	ature ir	Lli	ving area T1	(follo	ow ste	one 3 to 7	7 in T	ahle 9c)						l	
(87)m= 19.88	19.97	20.16	Ϊ	20.46 20.73	Ť	20.93	20.99	20.		20	0.51	20.17	19.	89		(87)
Temperature	during h	aating	ne	riode in rest	of dv	welling	ı from Ta	abla (L D_Th2 (°C)							
(88)m= 20.07	20.14	20.14	20.		$\overline{}$	0.11	20.1	20.	09		(88)					
(88)m= 20.07 20.08 20.08 20.11 20.11 Utilisation factor for gains for rest of dwelling												1 -			I	
(89)m= 1	tor for ga	0.99	T	0.98 0.93		2,m (se 0.75	0.54	9a) 0.	6 0.88	n	.99	1	1			(89)
	<u> </u>		ļ			' '	'	•	I	()						
Mean interna	ı tempera	ature ir	ı tr	ne rest of dwe	elling	j 12 (f	ollow ste	eps 3	το / in Tab	oie 9	C)					

(aa)	40-	40.00	40.44	10.00		20.44		10.00	40 = 4	10.01	40.50		(00)
(90)m= 18.56	18.7	18.98	19.44	19.82	20.09	20.14	20.14	19.99	19.51	19.01	18.59		(90)
								Ť	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean interna	ıl temper	ature (fo	r the wh	ole dwe	lling) = fl	_A × T1	+ (1 – fL	A) × T2					
(92)m= 19.02	19.14	19.39	19.79	20.14	20.38	20.43	20.43	20.28	19.86	19.41	19.04		(92)
Apply adjustr	nent to t	he mean	interna	l temper	ature fro	m Table	4e, whe	re appro	priate				
(93)m= 18.87	18.99	19.24	19.64	19.99	20.23	20.28	20.28	20.13	19.71	19.26	18.89		(93)
8. Space hea	iting requ	uirement		ı	ı								
Set Ti to the				re obtain	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation						•		,	, (,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	:										
(94)m= 1	1	0.99	0.98	0.92	0.76	0.56	0.61	0.88	0.98	1	1		(94)
Useful gains,	hmGm	, W = (94	1)m x (8	4)m									
(95)m= 388.77	407.2	426.24	447.41	442.52	356.16	247.24	256.3	342.62	360.95	364.54	374.59		(95)
Monthly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]		•		
(97)m= 1082.23	1040.14	934.46	762.57	584.66	384.06	250.88	262.57	416.97	642.41	869.08	1063.68		(97)
Space heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	h = 0.02	4 x [(97)m – (95)m] x (4	1)m			
(98)m= 515.93	425.34	378.12	226.91	105.75	0	0	0	0	209.41	363.27	512.68		
							T-4-	l nor year	(k)Mh/yoor) = Cum(0	8) -	2737.41	(98)
	•						rota	i pei yeai	(KVVII/yeai) = Sum(9)	O J15,912 -	_, , , , , ,	(00)
Snace heatin	n require	ement in	k\\/h/m²	²/vear			rota	грегуеаг	(KVVII/yeai) = Sum(9	O J15,912 -		╡ .
Space heatin	• .			-					(KVVIII/yeai) = Sum(9	O /15,912 —	37.36	╡ .
9a. Energy red	quiremer			-	ystems i	ncluding			(KWIII/yeai) = Sum(9	O)15,912 —		╡ .
9a. Energy red Space heati i	quiremer	nts – Indi	vidual h	eating s			micro-C		(KWIII/yeai) = Sum(9	O J15,912 —	37.36	(99)
9a. Energy red Space heatin Fraction of sp	quiremer ng: pace hea	nts – Indi at from se	vidual h	eating s		system	micro-C	CHP)	(kwiiiyeai) = 2um(9	O)15.912 —	37.36	(99)
9a. Energy red Space heati i	quiremer ng: pace hea	nts – Indi at from se	vidual h	eating s		system	micro-C (202) = 1	CHP) - (201) =) – 2um(9	O)15,912	37.36	(99)
9a. Energy red Space heatin Fraction of sp	quiremerng: pace head	nts – Indi at from se at from m	vidual h econdar nain syst	eating sy y/supple em(s)		system	micro-C	CHP) - (201) =) – 2mil(8	O)15,912	37.36	(201)
9a. Energy red Space heatin Fraction of sp	quirements ng: pace head pace head tal heati	nts – Indi at from se at from m ng from i	vidual h econdar nain syst main sys	eating sysy/supple eem(s) stem 1		system	micro-C (202) = 1	CHP) - (201) =) – 2mil(8	O)15,912	37.36 0 1	(20 ²) (20 ²) (20 ²)
9a. Energy red Space heatil Fraction of sp Fraction of sp Fraction of to	quirement ng: pace hea pace hea patal heati main spa	nts – Indi at from se at from m ng from i ace heati	vidual h econdar nain syst main sys ing syste	eating syy/supple em(s) stem 1	mentary	system	micro-C (202) = 1	CHP) - (201) =) – 2mil(8	O)15,912	37.36 0 1	(99) (201 (202 (204 (206
9a. Energy red Space heating Fraction of space fraction of to Efficiency of	quirement ng: pace hea pace hea pace hea patal heati main spa seconda	at from set from ming from it ace heati	vidual h econdar nain syst main sys ing syste ementar	eating syy/supple em(s) stem 1 em 1	mentary	system	micro-C (202) = 1 - (204) = (2	CHP) - (201) = - (202) × [1 - ((203)] =			37.36 0 1 1 90.3	(201 (202 (204 (206 (208
9a. Energy red Space heating Fraction of space fraction of to Efficiency of Efficiency of Space fraction of to Efficiency of Space fraction of to Efficiency of Space fraction of to Efficiency of Space fraction of to Efficiency of Space fraction of to Efficiency of Space fraction of to Efficiency of Space fraction of the Efficiency of Space fraction of the Efficiency of Space fraction of the Efficiency of Space fraction of the Efficiency of Space fraction of the Efficiency of Space fraction of the Efficiency of Space fraction of the Efficiency of Space fraction of the Efficiency of Space fraction of the Efficiency of Space fraction of Space fraction of the Efficiency of Space fraction of Space fraction of Space fraction of the Efficiency of Space fraction of	quirement ng: pace hea pace hea stal heati main spa seconda	at from set from ming from the ace heating from the ace Mar	vidual h econdar nain syst main sys ing syste ementar Apr	eating syysupple rem(s) stem 1 em 1 y heating	mentary g system	system	micro-C (202) = 1	CHP) - (201) =		Nov	Dec	37.36 0 1 1 90.3	(201 (202 (204 (206 (208
9a. Energy red Space heating Fraction of space fraction of to Efficiency of Efficiency of Space heating	quirements ng: pace head pace head patal heati main space seconda Feb ng require	nts – Indi at from se at from m ng from i ace heati ry/supple Mar ement (c	vidual h econdar nain systemain systementar Apr alculate	eating syysupplemen(s) stem 1 em 1 y heating May d above	mentary g system Jun	system 1, % Jul	micro-C (202) = 1 - (204) = (2	SHP) - (201) = 02) × [1 - ((203)] =	Nov	Dec	37.36 0 1 1 90.3	(201 (202 (204 (206 (208
9a. Energy red Space heatin Fraction of sp Fraction of to Efficiency of Efficiency of Jan Space heatin 515.93	quirement ng: pace heat pace heat tal heat it main space secondary is grequire 425.34	at from set from ming from it ace heating ry/supplement (con 378.12	vidual h econdari nain systemain systementar Apr alculatee	eating syysupplemem(s) stem 1 y heating May d above	mentary g system	system	micro-C (202) = 1 - (204) = (2	CHP) - (201) = - (202) × [1 - ((203)] =			37.36 0 1 1 90.3	(201 (202 (204 (206 (208
9a. Energy red Space heatin Fraction of sp Fraction of to Efficiency of Efficiency of Jan Space heatin 515.93 (211)m = {[(98)	puirement pace head pace h	at from set from many from it ace heating ry/supplement (commans of the set o	vidual hecondarinain systemain systementar Apr alculater 226.91 00 ÷ (20	eating syysupple tem(s) stem 1 y heating May d above 105.75	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204)	SHP) - (201) = 02) × [1 - 0	(203)] = Oct	Nov 363.27	Dec 512.68	37.36 0 1 1 90.3	(201 (202 (204 (206 (208
9a. Energy red Space heatin Fraction of sp Fraction of to Efficiency of Efficiency of Jan Space heatin 515.93	quirement ng: pace heat pace heat tal heat it main space secondary is grequire 425.34	at from set from ming from it ace heating ry/supplement (con 378.12	vidual h econdari nain systemain systementar Apr alculatee	eating syysupplemem(s) stem 1 y heating May d above	mentary g system Jun	system 1, % Jul	micro-C (202) = 1 - (204) = (204) Aug 0	SHP) - (201) = 02) × [1 - (0) 0	Oct 209.41	Nov 363.27 402.29	Dec 512.68	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) (211)
9a. Energy red Space heatin Fraction of sp Fraction of to Efficiency of Efficiency of Jan Space heatin 515.93 (211)m = {[(98)	puirement pace head pace h	at from set from many from it ace heating ry/supplement (commans of the set o	vidual hecondarinain systemain systementar Apr alculater 226.91 00 ÷ (20	eating syysupple tem(s) stem 1 y heating May d above 105.75	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0	SHP) - (201) = 02) × [1 - 0	Oct 209.41	Nov 363.27 402.29	Dec 512.68	37.36 0 1 1 90.3	(202 (202 (204 (208 (208 ear
9a. Energy red Space heatin Fraction of sp Fraction of to Efficiency of Jan Space heatin 515.93 (211)m = {[(98) 571.35	puirement of the property of t	at from set from ming from it ace heating ry/supplement (compared at 18.74)] } x 1 418.74	vidual hecondary nain systemain systematrar Apr alculater 226.91 00 ÷ (20 251.29	eating sy/supplemem(s) stem 1 y heating May d above 105.75	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0	SHP) - (201) = 02) × [1 - (Oct 209.41	Nov 363.27 402.29	Dec 512.68	0 1 1 90.3 0 kWh/ye	(202 (202 (204 (208 (208 ear
9a. Energy reconstruction of space heating Fraction of space fraction of to Efficiency of Efficiency of Space heating 515.93 (211)m = {[(98)	puirement pace head pace h	at from set from many from in the set of the	vidual hecondary nain systemain systematar Apr alculate 226.91 00 ÷ (20 251.29 y), kWh/8	eating sy/supplemem(s) stem 1 y heating May dabove 105.75 06) 117.11	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	SHP) - (201) = 02) × [1 - (Oct 209.41 231.9 ar) = Sum(2	Nov 363.27 402.29 211) _{15,10. 12}	Dec 512.68	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) (211)
9a. Energy red Space heatin Fraction of sp Fraction of to Efficiency of Jan Space heatin 515.93 (211)m = {[(98) 571.35	puirement of the property of t	at from set from ming from it ace heating ry/supplement (compared at 18.74)] } x 1 418.74	vidual hecondary nain systemain systematrar Apr alculater 226.91 00 ÷ (20 251.29	eating sy/supplemem(s) stem 1 y heating May d above 105.75	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 209.41 231.9 ar) = Sum(2	Nov 363.27 402.29 211) _{15,10. 12}	Dec 512.68 567.75	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. Energy reconstruction of space heating Fraction of space fraction of to Efficiency of Efficiency of Space heating 515.93 (211)m = {[(98)	puirement pace head pace h	at from set from many from in the set of the	vidual hecondary nain systemain systematar Apr alculate 226.91 00 ÷ (20 251.29 y), kWh/8	eating sy/supplemem(s) stem 1 y heating May dabove 105.75 06) 117.11	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	SHP) - (201) = 02) × [1 - (Oct 209.41 231.9 ar) = Sum(2	Nov 363.27 402.29 211) _{15,10. 12}	Dec 512.68 567.75	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) (211)
9a. Energy reconstruction of space heating Fraction of space fraction of to Efficiency of Efficiency of Space heating 515.93 (211)m = {[(98)	puirement pace head pace h	at from set from many from in the set of the	vidual hecondary nain systemain systematar Apr alculate 226.91 00 ÷ (20 251.29 y), kWh/8	eating sy/supplemem(s) stem 1 y heating May dabove 105.75 06) 117.11	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 209.41 231.9 ar) = Sum(2	Nov 363.27 402.29 211) _{15,10. 12}	Dec 512.68 567.75	37.36 0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. Energy recomplete Space heating Fraction of space fraction of to Efficiency of Efficiency of Space heating 515.93 (211)m = {[(98)	puirement page pace head p	at from set from many from in the set of the	vidual hecondarinain systemain systematrar Apralculater 226.91 00 ÷ (20 251.29 y), kWh/8) 0	eating syysupple tem(s) stem 1 y heating May d above 105.75 06) 117.11	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	SHP) - (201) = 02) × [1 - (1) Sep 0 1 (kWh/yea	Oct 209.41 231.9 ar) = Sum(2	Nov 363.27 402.29 211) _{15,10. 12}	Dec 512.68 567.75 =	37.36 0 1 1 90.3 0 kWh/ye	(99) (201) (202) (204) (206) (208) ear
Space heating Fraction of sp Fraction of to Efficiency of Efficiency of Space heating 515.93 (211)m = {[(98) 571.35 Space heating (215)m = 0	puirement ng: pace head pa	at from set at from many from in the set of	vidual hecondary nain systemain systematrar Apr alculater 226.91 00 ÷ (20 251.29 y), kWh/8) 0	eating syy/supplements em(s) stem 1 em 1 y heating May d above 105.75 06) 117.11	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 209.41 231.9 ar) = Sum(2	Nov 363.27 402.29 211) _{15,10. 12}	Dec 512.68 567.75	37.36 0 1 1 90.3 0 kWh/ye	(201 (202 (204 (206 (208

							Ī	
(217)m= 87.53 87.42 87.1 86.24 84.56	81 81	81	81	85.94	87.03	87.57		(217)
Fuel for water heating, kWh/month								
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 223.77	66.22 159.25	177.53	179.49	192.63	203.06	218.43		
		Tota	ıl = Sum(2	19a) ₁₁₂ =	ļ.	1	2284.39	(219)
Annual totals				k\	Wh/yea	r	kWh/year	_
Space heating fuel used, main system 1							3031.46]
Water heating fuel used							2284.39]
Electricity for pumps, fans and electric keep-hot								
mechanical ventilation - balanced, extract or pos	sitive input from	n outside	е			206.27		(230a)
central heating pump:						30		(230c)
Total electricity for the above, kWh/year		sum	of (230a)	(230g) =			236.27	(231)
Electricity for lighting							369.53	(232)
12a. CO2 emissions – Individual heating system	s including m	icro-CHF)					
12a. CO2 emissions – Individual heating system		icro-CHF)	Emiss	ion fac	tor	Emissions	
12a. CO2 emissions – Individual heating system	Energy kWh/year)	Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	r
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy				2/kWh	tor =		ır (261)
	Energy kWh/year			kg CO	2/kWh		kg CO2/yea	-
Space heating (main system 1)	Energy kWh/year			kg CO	2/kWh	=	kg CO2/yea	(261)
Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x			0.2 0.5	2/kWh	=	kg CO2/yea	(261) (263)
Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x			0.2 0.5	2/kWh 16 19	=	kg CO2/yea 654.8 0 493.43	(261) (263) (264)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Energy kWh/year (211) x (215) x (219) x (261) + (262)			0.2 0.5 0.2	2/kWh 16 19 16 19	= = =	kg CO2/yea 654.8 0 493.43 1148.22	(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-hot	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x		(264) =	0.2 0.5 0.5	2/kWh 16 19 16 19 19	= = =	654.8 0 493.43 1148.22 122.62	(261) (263) (264) (265) (267)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x		(264) = sum c	0.2 0.5 0.5 0.5	2/kWh 16 19 16 19 19	= = =	kg CO2/yea 654.8 0 493.43 1148.22 122.62 191.79](261)](263)](264)](265)](267)](268)

			User D	etails: _						
Accesses Names	Chris Hocknell				a Muuma	bou.		STD(0016363	
Assessor Name: Software Name:	Stroma FSAP 20	12		Strom Softwa					on: 1.0.4.10	
Software Name.	Ottoma 1 O/11 20			Address			d-l ean	VCISIO	511. 1.0.4.10	
Address :	Unit 5, 40-42 Mill L		i i		OTHE O	Торосо	a Loan			
Overall dwelling dime		,	,							
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			8	2.21	(1a) x	2	2.6	(2a) =	213.75	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	e)+(1n	1) 8	2.21	(4)			•		_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	213.75	(5)
2. Ventilation rate:										
		secondar heating	У	other		total			m³ per hou	r
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	ī + Ē	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	0	x ·	10 =	0	(7a)
Number of passive vents	S					0	x	10 =		(7b)
Number of flueless gas t					L		x	40 =		(7c)
Number of fluciess gas i					L	0			0	(/c)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7	a)+(7b)+(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intend	ded, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (•	uction			0	(11)
if both types of wall are p deducting areas of open	oresent, use the value corre ings); if equal user 0.35	esponaing to	tne great	er wall are	а (апег					
If suspended wooden	• /	aled) or 0.	1 (seale	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	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	7	(17)
If based on air permeabi	•								0.35	(18)
Air permeability value application Number of sides sheltered		as been don	e or a deg	gree air pe	meability	is being u	sed			7(40)
Shelter factor	eu			(20) = 1 -	0.075 x (1	19)] =			0.85	(19) (20)
Infiltration rate incorpora	iting shelter factor			(21) = (18	· ·	, ,			0.3	(21)
Infiltration rate modified	-	ed							0.0	(_ · /
Jan Feb	Mar Apr May	1 1	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	I		I	ı	1	1	_	
Wind Factor $(22a)m = (2a)m =$	'	1 1	0.5						7	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	

3.88	Adjusted infiltr	ation rate (allov	ving for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
If exchanical ventilation:	0.38	0.37 0.36	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.33	0.35]	
Fire Analyst air heat pump using Appendix N. (23b) = (23a) × Firry (equation (NS)). otherwise (23b) = (23a)		_	rate for t	he appli	icable ca	se	•	•					
It balanced with heat recovery efficiency in % allowing for in-use factor (from Table 4h) =			nendiy N (2	3h) = (23;	a) x Emy (e	equation (I	N5)) othe	rwise (23h	n) = (23a)				===
a) If balanced mechanical ventilation with heat recovery (MVVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] (24a)m = 0.51			•	, ,	,	•	.,	,) (20a)				
24a m			-	_					2h\m + (23h) x [[,]	1 _ (23c)		(230)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) . (24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		 	1		1	- ` ` 	- ^ ` 	í `	, 		- ` ']	(24a)
Cab)m	` ′	<u> </u>		without	heat rec	<u> </u>		$\frac{1}{1}$		23h)		J	
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24d)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· ·		1				- ^ ` 	ŕ	- ^ `	- 	0]	(24b)
Catching O		iouse extract ve	ntilation o	r positiv	ve input v	ventilatio	on from o	utside				J	
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m² x 0.5] (24d)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	•			•	•				.5 × (23b))			
The content of the	(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24c)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)me	,			•	•				-	-	-	-	
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.51 0.51 0.5 0.46 0.45 0.42 0.42 0.41 0.43 0.45 0.47 0.48 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings area (m²)		r ' '	` ` ` 		`		 	 				1	(0.4.1)
Cabin		<u> </u>			<u> </u>				0	0	0		(24d)
3. Heat losses and heat loss parameter. ELEMENT Gross area (m²) Openings area (m²) Net Area A, m² W/m2K (W/K) kJ/m²-K kJ/k² (W/K) Doors 2 x 1.5 = 3 (28) Windows Type 1 1.35 x1(1/(1.4) + 0.04) = 1.79 (27) Windows Type 2 1.35 x1(1/(1.4) + 0.04) = 1.79 (27) Windows Type 3 1.35 x1(1/(1.4) + 0.04) = 1.79 (27) Windows Type 4 2.66 x1(1/(1.4) + 0.04) = 1.79 (27) Windows Type 5 0.72 x1(1/(1.4) + 0.04) = 0.95 (27) Windows Type 6 1.35 x1(1/(1.4) + 0.04) = 0.95 (27) Walls Type 1 52.72 8.06 44.66 x 0.25 = 11.17 (29) Walls Type 2 19.71 2.07 17.64 x 0.15 = 2.65 (29) Walls Type 3 18.72 2 16.72 x 0.23 = 3.8 (29) Roof 25.4 0 25.4 x 0.18 = 4.57 (30) Total area of elements, m² (116.55) Party wall 30.66 x 0 = 0 (32) Party floor 82.21 Party floor 82.21 Party floor 82.21 Party ceiling 56.82 (30) + (32) = 38.61 (33) Heat capacity Cm = S(A x K) ((28) (30) + (32) + (32a) (32a) = 38.61 (33) Heat capacity Cm = S(A x K) ((28) (30) + (32) + (32a) (32a) = 14861.9 (34) Thermal mass parameter (TMP = Cm + TFA) in kJ/m²K indicative Value: Medium 250 (35)			- ` 	<u> </u>	´`	´`	 	` ´ 	1.	T .	T	1	(O=)
ELEMENT Gross area (m²) Openings m² Net Area A, m² U-value W/m2K A X U (W/K) k-value kJ/m²-K A X k kJ/K Doors 2 x 1.5 = 3 (26) Windows Type 1 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Windows Type 2 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Windows Type 3 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Windows Type 4 2.66 x1/[1/(1.4) + 0.04] = 0.95 (27) Windows Type 5 0.72 x1/[1/(1.4) + 0.04] = 0.95 (27) Windows Type 6 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Walls Type 1 52.72 8.06 44.66 x 0.25 = 11.17 (29) Walls Type 2 19.71 2.07 17.64 x 0.15 = 2.65 (29) Walls Type 3 18.72 2 16.72 x 0.23 = 3.8 (29) Roof 25.4 0 25.4 x 0.18 = 4.57 (30) Total area of elements, m² 116.55 0 </td <td>(25)m= 0.51</td> <td>0.51 0.5</td> <td>0.46</td> <td>0.45</td> <td>0.42</td> <td>0.42</td> <td>0.41</td> <td>0.43</td> <td>0.45</td> <td>0.47</td> <td>0.48</td> <td></td> <td>(25)</td>	(25)m= 0.51	0.51 0.5	0.46	0.45	0.42	0.42	0.41	0.43	0.45	0.47	0.48		(25)
A m A m	3. Heat losse	s and heat loss	paramet	er:									
Windows Type 1 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Windows Type 2 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Windows Type 3 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Windows Type 4 2.66 x1/[1/(1.4) + 0.04] = 3.53 (27) Windows Type 5 0.72 x1/[1/(1.4) + 0.04] = 0.95 (27) Windows Type 6 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Walls Type 1 52.72 8.06 44.66 x 0.25 = 11.17 (29) Walls Type 2 19.71 2.07 17.64 x 0.15 = 2.65 (29) Walls Type 3 18.72 2 16.72 x 0.23 = 3.8 (29) Roof 25.4 0 25.4 x 0.18 = 4.57 (30) Total area of elements, m² 116.55 (31) (32) Party wall 30.66 x 0 = 0 (32) Party ceiling 56.82 (32) (32) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 38.61 (33)	ELEMENT									K)			
Windows Type 2 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Windows Type 3 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Windows Type 4 2.66 x1/[1/(1.4) + 0.04] = 3.53 (27) Windows Type 5 0.72 x1/[1/(1.4) + 0.04] = 0.95 (27) Windows Type 6 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Walls Type1 52.72 8.06 44.66 x 0.25 = 11.17 (29) Walls Type2 19.71 2.07 17.64 x 0.15 = 2.65 (29) Walls Type3 18.72 2 16.72 x 0.23 = 3.8 (29) Roof 25.4 0 25.4 x 0.18 = 4.57 (30) Total area of elements, m² 116.55 (31) Party wall 30.66 x 0 = 0 (32) Party ceiling 56.82 (32) (32a) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 (32a) *** include the areas on both sides of internal walls and partitions (26) (30) + (32) = (30) (32e) = (3861) (33)	Doors				2	х	1.5	=	3				(26)
Windows Type 3 1.35 x1/[1/(1.4) + 0.04] = 1.79 Windows Type 4 2.66 x1/[1/(1.4) + 0.04] = 3.53 (27) Windows Type 5 0.72 x1/[1/(1.4) + 0.04] = 0.95 (27) Windows Type 6 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27) Walls Type 1 52.72 8.06 44.66 x 0.25 = 11.17 (29) Walls Type 2 19.71 2.07 17.64 x 0.15 = 2.65 (29) Walls Type 3 18.72 2 16.72 x 0.23 = 3.8 (29) Roof 25.4 0 25.4 0 25.4 x 0.18 = 4.57 (30) Total area of elements, m² 116.55 (31) Party wall 30.66 x 0 = 0 (32) Party floor 82.21 Party ceiling **or windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ***include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 3.61 (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) (32e) (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) (32e) (33)	Windows Type	e 1			1.35	x1	/[1/(1.4)+	0.04] =	1.79				(27)
Windows Type 4 Windows Type 5 O.72 Windows Type 6 O.72 Wilf I/(1.4) + 0.04] = 0.95 (27) Windows Type 6 O.72 Wilf I/(1.4) + 0.04] = 0.95 (27) Walls Type 1 Solution 52.72 Solution 8.06 Walls Type 2 Internal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium O.95 (27) Windows Type 5 (27) Windows Type 6 (27) Windows Type 6 (27) Vindows Type 6 (28) Vindows Type 6 (29) Vindows Type 6 (29) Vindows Type 6 (29) Vindows Type 6 (20) Vindows Type 6 (20) Vindows Type 6 (20) Vindows Type 6 (21) Vindows Type 6 (22) Vindows Type 6 (23) Vindows Type 6 (24) Vindows Type 6 (25) Vindows Type 6 (26) Vindows Type 6 (27) Vindows Type 6 (28) Vindows Type 6 (29) Vindows Type 6 (29) Vindows Type 6 (29) Vindows Type 1 (29) Vindows And Code Information (All Code Information (All Code Information (All Code Information (All Code Information (All Code Informat	Windows Type	e 2			1.35	x1	/[1/(1.4)+	0.04] =	1.79				(27)
Windows Type 5	Windows Type	e 3			1.35	x1	/[1/(1.4)+	0.04] =	1.79	=			(27)
Windows Type 6 1.35	Windows Type	e 4			2.66	x1	/[1/(1.4)+	0.04] =	3.53	=			(27)
Windows Type 6 1.35 x1/[1/(1.4) + 0.04] = 1.79 (27)	Windows Type	e 5			0.72	x1	/[1/(1.4)+	0.04] =	0.95				(27)
Walls Type1 52.72 8.06 44.66 × 0.25 = 11.17 (29) Walls Type2 19.71 2.07 17.64 × 0.15 = 2.65 (29) Walls Type3 18.72 2 16.72 × 0.23 = 3.8 (29) Roof 25.4 0 25.4 × 0.18 = 4.57 (30) Total area of elements, m² (116.55) (31) Party wall 30.66 × 0 = 0 (32) Party floor 82.21 (32a) Party ceiling 56.82 (32b) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 38.61 (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm + TFA) in kJ/m²K Indicative Value: Medium 250 (35)	Windows Type	e 6				= ,	/[1/(1.4)+	0.04] =					
Walls Type2 19.71 2.07 17.64 x 0.15 = 2.65 (29) Walls Type3 18.72 2 16.72 x 0.23 = 3.8 (29) Roof 25.4 0 25.4 x 0.18 = 4.57 (30) Total area of elements, m² 116.55 (31) Party wall 30.66 x 0 = 0 (32) Party floor 82.21 (32a) Party ceiling 56.82 (32b) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 *** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 3.8 (32a) (32b) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)	Walls Type1	52.72	8.06		44.66) x	0.25	=	11.17	=			
Walls Type3 18.72 2 16.72 x 0.23 = 3.8 (29) Roof 25.4 0 25.4 x 0.18 = 4.57 (30) Total area of elements, m² 116.55 (31) Party wall 30.66 x 0 = 0 (32) Party floor 82.21 (32a) Party ceiling 56.82 (32b) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 38.61 (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm + TFA) in kJ/m²K Indicative Value: Medium 250 (35)	Walls Type2	19.71	2.07	=	17.64	x	0.15		2.65	≓ i			
Roof 25.4 0 25.4 x 0.18 = 4.57 (30) Total area of elements, m² 116.55 (31) Party wall 30.66 x 0 = 0 (32) Party floor 82.21 (32a) Party ceiling 56.82 (32b) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 38.61 (33) Heat capacity Cm = S(A x K) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)	Walls Type3	18.72	2	=	16.72	2 x			3.8	=		7	
Total area of elements, m²	•			=		=				=		7 F	
Party wall $30.66 \times 0 = 0 \qquad (32)$ Party floor $82.21 \qquad (32a)$ Party ceiling $56.82 \qquad (32b)$ * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) $(26) (30) + (32) = 38.61 \qquad (33)$ Heat capacity Cm = S(A x k) $((28) (30) + (32) + (32a) (32e) = 14861.9 \qquad (34)$ Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium $250 (35)$						=							
Party floor 82.21 (32a) Party ceiling 56.82 (32b) * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 38.61 (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)		,				=	0		0	[
Party ceiling 56.82 [32b] * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 *** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) [26] (30) + (32) = 38.61 [33] Heat capacity Cm = S(A x k) [(28) (30) + (32) + (32a) (32e) = 14861.9 [34] Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 [35]	•					=	<u>_</u>		<u>`</u> _	L		\dashv \vdash	
* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26) (30) + (32) = 38.61 (33) Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)	•					=						\dashv \vdash	
Fabric heat loss, W/K = S (A x U) (26) $(30) + (32) =$ 38.61 (33) Heat capacity Cm = S(A x k) ((28) $(30) + (32) + (32a)$ (32e) = 14861.9 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)	* for windows and				alue calcul		g formula 1	/[(1/U-valu	ue)+0.04] a	L as given in	paragraph		(323)
Heat capacity Cm = S(A x k) $ ((28) (30) + (32) + (32a) (32e) = 14861.9 $ Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 (35)				o anu pal	แนบกอ		(26) (30) + (32) =				39 61	(33)
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K Indicative Value: Medium 250 (35)		•	- - /						(30) + (32	2) + (32a)	(32e) =		==
		•	1P = Cm +	- TFA) ir	n kJ/m²K			** /		, , ,	(- - /		
		•		•			ecisely the				able 1f		(55)

		ta:la.d.a.d.											
can be used inste				usina Ar	nendix l	K						17.48	(36)
if details of therma	•	,		• .	•							17.40	(30)
Total fabric he	0 0		(00)		.,			(33) +	(36) =			56.1	(37)
Ventilation 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= 36.24	35.72	35.19	32.57	32.05	29.42	29.42	28.9	30.47	32.05	33.09	34.14		(38)
Heat transfer	coefficier	nt, W/K	-	-	-	-		(39)m	= (37) + (37)	38)m			
(39)m= 92.34	91.81	91.29	88.67	88.14	85.52	85.52	84.99	86.57	88.14	89.19	90.24		
Heat loss para	ameter (H	HLP), W/	/m²K						Average = = (39)m ÷	` '	12 /12=	88.53	(39)
(40)m= 1.12	1.12	1.11	1.08	1.07	1.04	1.04	1.03	1.05	1.07	1.08	1.1		
No make a medical and		-41- /T-1-	I- 4-\					,	Average =	Sum(40) ₁	12 /12=	1.08	(40)
Number of day Jan	Feb	Mar		May	Jun	Jul	L	Sep	Oct	Nov	Dec	1	
(41)m= 31	28	31	Apr 30	31	30	31	Aug 31	30 30	31	30	31		(41)
(11)		<u> </u>						00	<u> </u>			J	()
4. Water hea	ting once	rav roqui	iromont:								kWh/y	oor:	
4. Water fied	ung ener	igy requi	ilement.								KVVII/y	- -	
Assumed occu	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		2.5		(42)
if TFA £ 13. Annual average	•	ater usad	ge in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		93	3.66	1	(43)
Reduce the annua	al average	hot water	usage by	5% if the a	lwelling is	designed			se target o			J	(- /
not more that 125				ater use, i I	not ana co I		1		<u> </u>		1	1	
Jan Hot water usage i	Feb	Mar day for ea	Apr	May	Jun	Jul Table 10 v	Aug	Sep	Oct	Nov	Dec		
								04.70	05.50	00.00	102.02	1	
(44)m= 103.02	99.28	95.53	91.78	88.04	84.29	84.29	88.04	91.78	95.53 Total = Su	99.28	103.02	1122.80	(44)
Energy content of	f hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			()		1123.89	(++)
(45)m= 152.78	133.62	137.89	120.21	115.35	99.54	92.23	105.84	107.1	124.82	136.25	147.96]	
			l .	l .	l .				Total = Su	m(45) _{1 12} =		1473.59	(45)
If instantaneous v	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)				1	
(46)m= 22.92 Water storage	20.04	20.68	18.03	17.3	14.93	13.84	15.88	16.07	18.72	20.44	22.19		(46)
Storage volum) includin	ng anv so	olar or W	/WHRS	storage	within sa	me ves	sel		0	1	(47)
If community h	, ,		•			_						J	()
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWl	n/day):					0		(48)
Temperature f											0		(49)
Energy lost from b) If manufact		_	-		or is not	known:	(48) x (49)	=			0		(50)
Hot water stor			-								0	1	(51)
If community h	_			`									• ,
Volume factor	from Ta	L. I O											
	actor fro		01								0		(52) (53)

Enter (50) or (m water	-	kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54) (55)
Water storage	, ,	,	or each	month			((56)m = (55) × (41)r	m		U		(55)
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	dedicated	l solar stor	age, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	l ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (an	nual) fro	m Table	3							0		(58)
Primary circuit	loss cald	culated f	or each	month (59)m = ((58) ÷ 36	65 × (41)	m				•	
(modified by	factor from	om Tabl	e H5 if t	here is s	olar wat	ter heati	ng and a	cylinde	thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss cal	culated f	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m= 50.96	45.69	48.68	45.26	44.86	41.57	42.95	44.86	45.26	48.68	48.96	50.96		(61)
Total heat requ	ired 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= 203.74	179.32	186.57	165.48	160.21	141.1	135.19	150.7	152.37	173.5	185.21	198.92		(62)
Solar DHW input c	alculated ι	using Appe	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	er heating)	•	
(add additional	lines if F	GHRS	and/or V	WWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa	ater heat	er											
(64)m= 203.74	179.32	186.57	165.48	160.21	141.1	135.19	150.7	152.37	173.5	185.21	198.92		_
							Outp	out from wa	ater heater	r (annual) ₁	12	2032.3	(64)
Heat gains fror	n water l	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= 63.54	55.85	58.02	51.29	49.57	43.49	41.41	46.41	46.93	53.67	57.54	61.94		(65)
include (57)r	n in calc	ulation c	of (65)m	only if c	vlinder i	s in the <i>i</i>	ducilina	·					
5. Internal ga				,	<i>,</i>		aweiiing	or hot w	ater is fr	om com	munity h	eating	
	ins (see	Table 5	and 5a		yao	3 III tile t	aweiling	or hot w	ater is fr	om com	munity h	eating	
Metabolic gains					ya.c.	s in the v	aweiling	or hot w	ater is fr	om com	munity h	eating	
Metabolic gains					Jun	Jul	Aug	or hot w	ater is fr	om com	munity h	eating	
	s (Table	5), Watt	S):								eating	(66)
(66)m= Jan 125.17	s (Table Feb	5), Watt Mar 125.17	Apr 125.17	May	Jun 125.17	Jul 125.17	Aug 125.17	Sep 125.17	Oct	Nov	Dec	eating	(66)
Jan	s (Table Feb	5), Watt Mar 125.17	Apr 125.17	May	Jun 125.17	Jul 125.17	Aug 125.17	Sep 125.17	Oct	Nov	Dec	eating	(66) (67)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58	Feb 125.17 (calculat	5), Watt Mar 125.17 ed in Ap	Apr 125.17 pendix 11.8	May 125.17 L, equati	Jun 125.17 on L9 o	Jul 125.17 r L9a), a 8.05	Aug 125.17 Iso see	Sep 125.17 Table 5	Oct 125.17 17.82	Nov 125.17	Dec 125.17	eating	
Jan (66)m= 125.17 Lighting gains	Feb 125.17 (calculat	5), Watt Mar 125.17 ed in Ap	Apr 125.17 pendix 11.8	May 125.17 L, equati	Jun 125.17 on L9 o	Jul 125.17 r L9a), a 8.05	Aug 125.17 Iso see	Sep 125.17 Table 5	Oct 125.17 17.82	Nov 125.17	Dec 125.17	eating	
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224	s (Table Feb 125.17 (calculat 19.17 ns (calcu	5), Watt Mar 125.17 ed in Ap 15.59 ulated in 220.46	Apr 125.17 pendix 11.8 Append 207.99	May 125.17 L, equati 8.82 dix L, eq 192.25	Jun 125.17 on L9 of 7.45 uation L	Jul 125.17 r L9a), a 8.05 13 or L1	Aug 125.17 Iso see 10.46 3a), also	Sep 125.17 Table 5 14.04 o see Tal	Oct 125.17 17.82 ole 5 183.58	Nov 125.17 20.8	Dec 125.17	eating	(67)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224 Cooking gains	s (Table Feb 125.17 (calculat 19.17 ns (calcu	5), Watte Mar 125.17 ed in Ap 15.59 ulated in 220.46	Apr 125.17 pendix 11.8 Append 207.99	May 125.17 L, equati 8.82 dix L, eq 192.25 L, equat	Jun 125.17 on L9 or 7.45 uation L 177.46 ion L15	Jul 125.17 r L9a), a 8.05 13 or L1	Aug 125.17 Iso see 10.46 3a), also	Sep 125.17 Table 5 14.04 o see Tal 171.11	Oct 125.17 17.82 ole 5 183.58 5	Nov 125.17 20.8	Dec 125.17 22.18 214.11	eating	(67)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224 Cooking gains (69)m= 35.52	reb 125.17 (calculat 19.17 ns (calculat 226.32 (calculat 35.52	5), Watte Mar 125.17 ed in Ap 15.59 ulated in 220.46 ted in Ap 35.52	Apr 125.17 pendix 11.8 Append 207.99 opendix 35.52	May 125.17 L, equati 8.82 dix L, eq 192.25	Jun 125.17 on L9 of 7.45 uation L	Jul 125.17 r L9a), a 8.05 13 or L1 167.58 or L15a	Aug 125.17 Iso see 10.46 3a), also 165.25	Sep 125.17 Table 5 14.04 o see Tal	Oct 125.17 17.82 ole 5 183.58	Nov 125.17 20.8	Dec 125.17	eating	(67) (68)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fan	reb 125.17 (calculat 19.17 ns (calculat 226.32 (calculat 35.52	5), Watte Mar 125.17 ed in Ap 15.59 ulated in 220.46 ted in Ap 35.52	Apr 125.17 pendix 11.8 Append 207.99 opendix 35.52	May 125.17 L, equati 8.82 dix L, eq 192.25 L, equat	Jun 125.17 on L9 of 7.45 uation L 177.46 ion L15 35.52	Jul 125.17 r L9a), a 8.05 13 or L1 167.58 or L15a 35.52	Aug 125.17 Iso see 10.46 3a), also 165.25), also se 35.52	Sep 125.17 Table 5 14.04 o see Tal 171.11 ee Table 35.52	Oct 125.17 17.82 ble 5 183.58 5 35.52	Nov 125.17 20.8 199.32 35.52	Dec 125.17 22.18 214.11 35.52	eating	(67) (68) (69)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224 Cooking gains (69)m= 35.52 Pumps and far (70)m= 3	reb 125.17 (calculated 19.17 ns (calculated 226.32 (calculated 35.52 ns gains 3	5), Watte Mar 125.17 ed in Ap 15.59 ulated in 220.46 ted in Ap 35.52 (Table 5	Apr 125.17 pendix 11.8 Append 207.99 opendix 35.52 (a)	May 125.17 L, equati 8.82 dix L, equati 192.25 L, equati	Jun 125.17 fon L9 of 7.45 uation L 177.46 ion L15 35.52	Jul 125.17 r L9a), a 8.05 13 or L1 167.58 or L15a	Aug 125.17 Iso see 10.46 3a), also 165.25	Sep 125.17 Table 5 14.04 o see Tal 171.11	Oct 125.17 17.82 ole 5 183.58 5	Nov 125.17 20.8	Dec 125.17 22.18 214.11	eating	(67) (68)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224 Cooking gains (69)m= 35.52 Pumps and far (70)m= 3 Losses e.g. even	s (Table Feb 125.17 (calculat 19.17 ns (calculat 226.32 (calculat 35.52 ns gains 3 aporation	5), Watte Mar 125.17 ed in Ap 15.59 ulated in 220.46 ted in Ap 35.52 (Table 5	Apr 125.17 pendix 1 11.8 Append 207.99 ppendix 35.52 (a) 3	May 125.17 L, equati 8.82 dix L, equati 192.25 L, equati 35.52 3 es) (Tab	Jun 125.17 fon L9 of 7.45 uation L 177.46 ion L15 35.52 3 le 5)	Jul 125.17 r L9a), a 8.05 13 or L1 167.58 or L15a 35.52	Aug 125.17 Iso see 10.46 3a), also 165.25), also se 35.52	Sep 125.17 Table 5 14.04 See Tal 171.11 ee Table 35.52	Oct 125.17 17.82 ole 5 183.58 5 35.52	Nov 125.17 20.8 199.32 35.52	Dec 125.17 22.18 214.11 35.52 3	eating	(67) (68) (69) (70)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fan (70)m= 3 Losses e.g. ev: (71)m= -100.14	s (Table Feb 125.17 (calculat 19.17 ns (calculat 226.32 (calculat 35.52 ns gains 3 aporation -100.14	5), Watte Mar 125.17 ed in Ap 15.59 ulated in 220.46 ted in Ap 35.52 (Table 5 3 n (negat	Apr 125.17 pendix 11.8 Append 207.99 opendix 35.52 (a)	May 125.17 L, equati 8.82 dix L, equati 192.25 L, equati	Jun 125.17 fon L9 of 7.45 uation L 177.46 ion L15 35.52	Jul 125.17 r L9a), a 8.05 13 or L1 167.58 or L15a 35.52	Aug 125.17 Iso see 10.46 3a), also 165.25), also se 35.52	Sep 125.17 Table 5 14.04 o see Tal 171.11 ee Table 35.52	Oct 125.17 17.82 ble 5 183.58 5 35.52	Nov 125.17 20.8 199.32 35.52	Dec 125.17 22.18 214.11 35.52 3	eating	(67) (68) (69)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224 Cooking gains (69)m= 35.52 Pumps and far (70)m= 3 Losses e.g. evo (71)m= -100.14 Water heating	s (Table Feb 125.17 (calculated 19.17 ns (calculated 226.32) (calculated 35.52) ns gains 3 aporation -100.14 gains (Table	5), Watte Mar 125.17 ed in Ap 15.59 ulated in 220.46 ted in Ap 35.52 (Table 5 3 n (negat -100.14	Apr 125.17 pendix 11.8 Append 207.99 opendix 35.52 a) 3 ive valu -100.14	May 125.17 L, equati 8.82 dix L, equati 192.25 L, equati 35.52 3 es) (Tab	Jun 125.17 fon L9 of 7.45 uation L 177.46 ion L15 35.52 3 le 5) -100.14	Jul 125.17 r L9a), a 8.05 13 or L1 167.58 or L15a 35.52	Aug 125.17 Iso see 10.46 3a), also 165.25), also se 35.52	Sep 125.17 Table 5 14.04 see Tal 171.11 ee Table 35.52	Oct 125.17 17.82 ole 5 183.58 5 35.52 3	Nov 125.17 20.8 199.32 35.52 3	Dec 125.17 22.18 214.11 35.52 3	eating	(67) (68) (69) (70) (71)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fan (70)m= 3 Losses e.g. ev (71)m= -100.14 Water heating (72)m= 85.4	s (Table Feb 125.17 (calculat 19.17 ns (calculat 226.32 (calculat 35.52 ns gains 3 aporation -100.14 gains (Table	5), Watte Mar 125.17 ed in Ap 15.59 ulated in 220.46 ted in Ap 35.52 (Table 5 3 n (negat	Apr 125.17 pendix 1 11.8 Append 207.99 ppendix 35.52 (a) 3	May 125.17 L, equati 8.82 dix L, equati 192.25 L, equati 35.52 3 es) (Tab	Jun 125.17 fon L9 of 7.45 uation L 177.46 ion L15 35.52 3 le 5) -100.14	Jul 125.17 r L9a), a 8.05 13 or L1 167.58 or L15a 35.52 3	Aug 125.17 Iso see 10.46 3a), also 165.25), also se 35.52 3	Sep 125.17 Table 5 14.04 See Tal 171.11 ee Table 35.52 3	Oct 125.17 17.82 ole 5 183.58 5 35.52 3 -100.14	Nov 125.17 20.8 199.32 35.52 3 -100.14	Dec 125.17 22.18 214.11 35.52 3 -100.14	eating	(67) (68) (69) (70)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fan (70)m= 3 Losses e.g. ev (71)m= -100.14 Water heating (72)m= 85.4 Total internal	s (Table Feb 125.17 (calculate 19.17 ns (calculate 35.52 ns gains 3 aporation -100.14 gains (Table 83.11 gains =	5), Watte Mar 125.17 ed in Ap 15.59 ulated in 220.46 ted in Ap 35.52 (Table 5 3 n (negat -100.14 able 5) 77.98	Apr 125.17 pendix 11.8 Append 207.99 opendix 35.52 a) 3 ive valu -100.14	May 125.17 L, equati 8.82 dix L, equati 192.25 L, equati 35.52 3 es) (Tab -100.14	Jun 125.17 on L9 of 7.45 uation L 177.46 ion L15 35.52 3 le 5) -100.14 60.4 (66)	Jul 125.17 r L9a), a 8.05 13 or L1 167.58 or L15a 35.52 3 -100.14	Aug 125.17 Iso see 10.46 3a), also 165.25), also se 35.52 3	Sep 125.17 Table 5 14.04 o see Tal 171.11 ee Table 35.52 3 -100.14 65.18 + (69)m + (Oct 125.17 17.82 ble 5 183.58 5 35.52 3 -100.14 72.14 70)m + (7	Nov 125.17 20.8 199.32 35.52 3 -100.14 79.92 1)m + (72)	Dec 125.17 22.18 214.11 35.52 3 -100.14	eating	(67) (68) (69) (70) (71) (72)
Jan (66)m= 125.17 Lighting gains (67)m= 21.58 Appliances gai (68)m= 224 Cooking gains (69)m= 35.52 Pumps and fan (70)m= 3 Losses e.g. ev (71)m= -100.14 Water heating (72)m= 85.4	s (Table Feb 125.17 (calculat 19.17) ns (calculat 35.52) ns gains 3 aporation -100.14 gains (Table 83.11 gains = 392.15	5), Watte Mar 125.17 ed in Ap 15.59 ulated in 220.46 ted in Ap 35.52 (Table 5 3 n (negat -100.14	Apr 125.17 pendix 11.8 Append 207.99 opendix 35.52 a) 3 ive valu -100.14	May 125.17 L, equati 8.82 dix L, equati 192.25 L, equati 35.52 3 es) (Tab	Jun 125.17 fon L9 of 7.45 uation L 177.46 ion L15 35.52 3 le 5) -100.14	Jul 125.17 r L9a), a 8.05 13 or L1 167.58 or L15a 35.52 3	Aug 125.17 Iso see 10.46 3a), also 165.25), also se 35.52 3	Sep 125.17 Table 5 14.04 See Tal 171.11 ee Table 35.52 3	Oct 125.17 17.82 ole 5 183.58 5 35.52 3 -100.14	Nov 125.17 20.8 199.32 35.52 3 -100.14	Dec 125.17 22.18 214.11 35.52 3 -100.14	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	ctor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	X	1.35	x	11.28	x	0.57	x	0.7	=	4.21	(75)
Northeast 0.9x 0.77	X	1.35	x	22.97	x	0.57	x	0.7	=	8.57	(75)
Northeast 0.9x 0.77	X	1.35	x	41.38	x	0.57	x	0.7	=	15.45	(75)
Northeast 0.9x 0.77	X	1.35	x	67.96	x	0.57	x	0.7] =	25.37	(75)
Northeast 0.9x 0.77	X	1.35	x	91.35	x	0.57	x	0.7	=	34.1	(75)
Northeast 0.9x 0.77	x	1.35	x	97.38	x	0.57	X	0.7	=	36.35	(75)
Northeast 0.9x 0.77	X	1.35	X	91.1	X	0.57	X	0.7	=	34.01	(75)
Northeast 0.9x 0.77	X	1.35	x	72.63	x	0.57	X	0.7	=	27.11	(75)
Northeast 0.9x 0.77	x	1.35	x	50.42	x	0.57	X	0.7	=	18.82	(75)
Northeast 0.9x 0.77	X	1.35	x	28.07	x	0.57	x	0.7	=	10.48	(75)
Northeast 0.9x 0.77	X	1.35	x	14.2	x	0.57	x	0.7	=	5.3	(75)
Northeast 0.9x 0.77	X	1.35	x	9.21	x	0.57	x	0.7	=	3.44	(75)
Southeast 0.9x 0.77	X	1.35	x	36.79	x	0.57	X	0.7	=	13.73	(77)
Southeast 0.9x 0.77	X	1.35	x	36.79	x	0.57	x	0.7	=	27.47	(77)
Southeast 0.9x 0.77	X	2.66	x	36.79	x	0.57	x	0.7	=	27.06	(77)
Southeast 0.9x 0.77	X	0.72	x	36.79	x	0.57	X	0.7	=	7.33	(77)
Southeast 0.9x 0.77	X	1.35	x	36.79	x	0.57	x	0.7	=	13.73	(77)
Southeast 0.9x 0.77	X	1.35	x	62.67	x	0.57	x	0.7	=	23.4	(77)
Southeast 0.9x 0.77	X	1.35	x	62.67	X	0.57	X	0.7	=	46.79	(77)
Southeast 0.9x 0.77	x	2.66	x	62.67	X	0.57	X	0.7	=	46.1	(77)
Southeast 0.9x 0.77	x	0.72	x	62.67	x	0.57	x	0.7	=	12.48	(77)
Southeast 0.9x 0.77	X	1.35	x	62.67	x	0.57	X	0.7	=	23.4	(77)
Southeast 0.9x 0.77	X	1.35	x	85.75	x	0.57	x	0.7	=	32.01	(77)
Southeast 0.9x 0.77	X	1.35	x	85.75	x	0.57	x	0.7	=	64.02	(77)
Southeast 0.9x 0.77	X	2.66	x	85.75	X	0.57	X	0.7	=	63.07	(77)
Southeast 0.9x 0.77	X	0.72	X	85.75	X	0.57	X	0.7	=	17.07	(77)
Southeast 0.9x 0.77	X	1.35	x	85.75	x	0.57	x	0.7	=	32.01	(77)
Southeast 0.9x 0.77	X	1.35	X	106.25	X	0.57	X	0.7	=	39.66	(77)
Southeast 0.9x 0.77	X	1.35	X	106.25	X	0.57	X	0.7	=	79.32	(77)
Southeast 0.9x 0.77	X	2.66	X	106.25	X	0.57	X	0.7	=	78.15	(77)
Southeast 0.9x 0.77	X	0.72	X	106.25	X	0.57	X	0.7	=	21.15	(77)
Southeast 0.9x 0.77	X	1.35	x	106.25	X	0.57	X	0.7	=	39.66	(77)
Southeast 0.9x 0.77	X	1.35	X	119.01	X	0.57	X	0.7	=	44.42	(77)
Southeast 0.9x 0.77	X	1.35	X	119.01	X	0.57	X	0.7	=	88.85	(77)
Southeast 0.9x 0.77	X	2.66	x	119.01	x	0.57	x	0.7	=	87.53	(77)
Southeast 0.9x 0.77	X	0.72	x	119.01	x	0.57	x	0.7	=	23.69	(77)
Southeast 0.9x 0.77	X	1.35	x	119.01	x	0.57	x	0.7	=	44.42	(77)
Southeast 0.9x 0.77	X	1.35	x	118.15	x	0.57	x	0.7	=	44.1	(77)
Southeast 0.9x 0.77	X	1.35	×	118.15	x	0.57	x	0.7	=	88.21	(77)

Southeast 0.9x		٦				٦		г		_		— (77)
<u> </u>	0.77	X	2.66	×	118.15	_ ×	0.57	_	0.7	=	86.9	(77)
Southeast 0.9x	0.77	×	0.72	×	118.15	_ ×	0.57	_	0.7	=	23.52	(77)
Southeast 0.9x	0.77	×	1.35	X	118.15	_ ×	0.57	_	0.7	_ =	44.1	(77)
Southeast 0.9x	0.77	×	1.35	×	113.91	_ x	0.57	x	0.7	=	42.52	(77)
Southeast 0.9x	0.77	X	1.35	X	113.91	X	0.57	x	0.7	=	85.04	(77)
Southeast _{0.9x}	0.77	X	2.66	X	113.91	X	0.57	X	0.7	=	83.78	(77)
Southeast 0.9x	0.77	X	0.72	X	113.91	X	0.57	x	0.7	=	22.68	(77)
Southeast _{0.9x}	0.77	X	1.35	X	113.91	X	0.57	X	0.7	=	42.52	(77)
Southeast _{0.9x}	0.77	X	1.35	X	104.39	X	0.57	x	0.7	=	38.97	(77)
Southeast 0.9x	0.77	X	1.35	X	104.39	X	0.57	x	0.7	=	77.93	(77)
Southeast 0.9x	0.77	X	2.66	X	104.39	X	0.57	x [0.7	=	76.78	(77)
Southeast 0.9x	0.77	X	0.72	X	104.39	X	0.57	x [0.7	=	20.78	(77)
Southeast 0.9x	0.77	×	1.35	X	104.39	x	0.57	x [0.7	=	38.97	(77)
Southeast 0.9x	0.77	×	1.35	X	92.85	x	0.57	x	0.7	=	34.66	(77)
Southeast 0.9x	0.77	×	1.35	X	92.85	x	0.57	x	0.7		69.32	(77)
Southeast 0.9x	0.77	×	2.66	X	92.85	x	0.57	x	0.7	=	68.29	(77)
Southeast 0.9x	0.77	×	0.72	x	92.85	x	0.57	×	0.7	=	18.49	(77)
Southeast 0.9x	0.77	×	1.35	x	92.85	×	0.57	_ x [0.7		34.66	(77)
Southeast 0.9x	0.77	×	1.35	x	69.27	T x	0.57	_ x [0.7	=	25.86	(77)
Southeast 0.9x	0.77	×	1.35	X	69.27	X	0.57	_ x [0.7	=	51.71	(77)
Southeast 0.9x	0.77	×	2.66	x	69.27	i x	0.57		0.7	=	50.95	(77)
Southeast 0.9x	0.77	i x	0.72	×	69.27	i x	0.57		0.7		13.79	(77)
Southeast 0.9x	0.77	= x	1.35	x	69.27	i x	0.57	x	0.7	= =	25.86	(77)
Southeast 0.9x	0.77	= x	1.35	x	44.07	i x	0.57		0.7		16.45	(77)
Southeast 0.9x	0.77	i x	1.35	×	44.07	i x	0.57	i × i	0.7	= =	32.9	(77)
Southeast 0.9x	0.77	×	2.66	x	44.07	i x	0.57	x	0.7	=	32.41	(77)
Southeast 0.9x	0.77	۲ ×	0.72	x	44.07	i x	0.57	x	0.7	-	8.77	(77)
Southeast 0.9x	0.77	i x	1.35	X	44.07	x	0.57	x	0.7	= =	16.45	(77)
Southeast 0.9x	0.77	×	1.35	X	31.49	i x	0.57	x	0.7		11.75	(77)
Southeast 0.9x	0.77	i x	1.35	X	31.49	 x	0.57	x	0.7		23.51	(77)
Southeast 0.9x	0.77	d x	2.66	×	31.49	 	0.57	x	0.7	= =	23.16	(77)
Southeast 0.9x	0.77	ا x	0.72	x	31.49		0.57		0.7	=	6.27	(77)
Southeast 0.9x	0.77	X	1.35	×	31.49	_	0.57] × [0.7	╡ -	11.75	(77)
	0.11	」 ^	1.55	^^	31.49	J ^ I	0.51	」 ^ L	0.1		11.75	(,,,
Solar gains in	watts calcu	lated	for each m	onth		(83)m	= Sum(74)m	(82)m				
(83)m= 93.54	· 1	3.63	1		23.19 310.55	`		178.64	112.29	79.88		(83)
Total gains – ir	nternal and	solar	(84)m = (7)	3)m + (83)m , watts	_!]	
(84)m= 488.07	552.88 60	1.21	637.89 65	4.27 6	32.05 605.38	582.	18 558.12	515.74	475.89	462.97		(84)
7. Mean inter	nal tempera	ture (heating se	ason)								
Temperature	•	•		· · · · · ·	area from Ta	able 9	Th1 (°C)				21	(85)
Utilisation fac	•	•		_			(0)					
Jan	` _	Mar		May	Jun Jul	$\overline{}$	ıg Sep	Oct	Nov	Dec		
- Odii	. 55 1		י ן יקיי	∽,	2011 001		-9 000		1 1101	200	1	

(86)m=	1	1	0.99	0.97	0.92	0.78	0.6	0.64	0.87	0.98	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.79	19.93	20.16	20.48	20.75	20.94	20.99	20.98	20.87	20.52	20.11	19.78		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwellina	from Ta	ble 9, Ti	h2 (°C)					
(88)m=	19.98	19.99	19.99	20.02	20.02	20.05	20.05	20.06	20.04	20.02	20.01	20		(88)
l Itilio	etion fac	tor for a	aine for	rest of d	velling	n2 m (sc	L Tahla	() ()	<u> </u>	<u> </u>	<u> </u>		ı	
(89)m=	1	0.99	0.99	0.96	0.89	0.69	0.48	0.53	0.81	0.97	0.99	1		(89)
			<u> </u>				<u> </u>	<u> </u>	<u> </u>	<u> </u>			I	` ,
(90)m=	18.37	18.58	18.92	19.39	of dwelli	ng 12 (fo	20.04	20.05	/ in Tabi	e 9c) 19.46	18.86	18.37		(90)
(90)111–	10.37	10.30	10.92	19.39	19.70	20	20.04	20.05			g area ÷ (4		0.39	(91)
										L/C LIVIII	g area - (-	')	0.39	(31)
			· `				T	+ (1 – fL		Ι	ı	I	l	(22)
(92)m=		19.11	19.4	19.81	20.15	20.37	20.41	20.41	20.3	19.88	19.35	18.92		(92)
			r				r	4e, whe		·	40.0	40.77		(93)
(93)m=	18.77	18.96	19.25 uirement	19.66	20	20.22	20.26	20.26	20.15	19.73	19.2	18.77		(93)
					e obtain	ed at st	≏n 11 ∩f	Tahle 0	n so tha	t Ti m=/	76)m an	d re-calc	rulate	
				using Ta		cu ai si	с р 11 01	I able 31	J, 50 li la	it 11,111—(rojili ali	u ie-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm):					•	•				
(94)m=	1	0.99	0.98	0.96	0.88	0.71	0.51	0.55	0.82	0.96	0.99	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	486.28	548.83	591.5	610.65	578.77	449.25	308.99	321.88	455.13	497.21	472.31	461.68		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8	1		r	1	ı		•	
(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)
			ĭ				- ` ´ ´ 	x [(93)m	<u> </u>	ī —	ı	I	l	(0-)
` '	1336.25		1164.2	954.29	731.28	480.39	313.21	328.24	523.53	804.36	1079.41	1315.23		(97)
•			i e			Wh/mont	h = 0.02	24 x [(97])m – (95 0	ŕ	r ·	005.04		
(98)m=	632.38	498.61	426.09	247.43	113.47	U	0			228.52	437.12	635.04	2010.05	7(00)
								lota	ı per year	(kwn/year	r) = Sum(9	8)15,912 =	3218.65	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								39.15	(99)
9a. En	ergy rec	Juiremer	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatir	•										1		_
				econdar		mentary	•						0	(201)
Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.3	(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				alculate			!		<u>'</u>	<u>I</u>	<u> </u>		,	
•	632.38	498.61	426.09	247.43	113.47	0	0	0	0	228.52	437.12	635.04		
(211)m	 n = {[(98)m x (20	(4)] } x 1	00 ÷ (20	16)		•	•	•	•	•			(211)
` '	700.3	552.17	471.86	274	125.66	0	0	0	0	253.06	484.07	703.25		•
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,10. 12}	=	3564.39	(211)
														_

Space heating fuel (secondary), kWh/month $= \{[(98)m \times (201)]\} \times 100 \div (208)$ 0 0 0 (215)m 0 Total (kWh/year) =Sum(215)_{1...5,10. 12}= (215)0 Water heating Output from water heater (calculated above) 179.32 186.57 165.48 160.21 141.1 135.19 150.7 152.37 173.5 185.21 198.92 203.74 Efficiency of water heater (216)81 (217)m=87.84 87.64 87.25 84.61 81 81 86.04 87.32 (217)81 87.89 Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$ (219)m= 231.94 204.61 213.83 189.34 174.2 166.9 186.05 188.11 201.66 212.11 226.32 Total = Sum(219a),...12 2386.76 (219)**Annual totals** kWh/year kWh/year Space heating fuel used, main system 1 3564.39 Water heating fuel used 2386.76 Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or positive input from outside 231.43 (230a) central heating pump: (230c)30 Total electricity for the above, kWh/year sum of (230a) (230g) = (231)261.43 Electricity for lighting 381.08 (232)12a. CO2 emissions – Individual heating systems including micro-CHP **Energy Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year (211) x Space heating (main system 1) (261)0.216 769.91 (215) x Space heating (secondary) 0.519 0 (263)Water heating (219) x (264)0.216 515.54 Space and water heating (261) + (262) + (263) + (264) =(265)1285.45 Electricity for pumps, fans and electric keep-hot (231) x 135.68 (267)0.519 (232) x Electricity for lighting (268)0.519 197.78 sum of (265) (271) = Total CO2, kg/year 1618.91 (272) $(272) \div (4) =$ **Dwelling CO2 Emission Rate** (273)19.69

El rating (section 14)

(274)

83

		User E)etaile: -						
Access Names	Chris Hasknall	– USE IL		a Ni	ho=-		STD0	016262	
Assessor Name: Software Name:	Chris Hocknell Stroma FSAP 2012		Strom Softwa					016363 on: 1.0.4.10	
		roperty	Address			d-Lean			
Address :	Unit 6, 40-42 Mill Lane, Lon	don, NV	V6 1NR						
1. Overall dwelling dime	ensions:	_							
Ground floor			a(m²) 64.04	(1a) x		ight(m) 2.17	(2a) =	Volume(m ³	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1] •		17	(2a) -	130.97	(3a)
	a)+(1b)+(1c)+(1u)+(1e)+(1	1) [6	64.04	(4)	\\(\20\\\\20	4) . (20) .	(2n) -		_
Dwelling volume				(3a)+(3b)+(3C)+(3C	d)+(3e)+	.(3n) =	138.97	(5)
2. Ventilation rate:	main seconda	rv	other		total			m³ per hou	ır
Number of chimneys	heating heating	, 				x 4	40 =		(6a)
•		_ `	0]	0		20 =	0	=
Number of open flues			0	┙╶┟	0		10 =	0	(6b)
Number of intermittent fa				Ļ	0			0	(7a)
Number of passive vents				Ļ	0		10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+((7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	een carried out or is intended, procee	ed to (17),	otherwise o	continue fr	rom (9) to				
Number of storeys in the	he dwelling (ns)					.		0	(9)
Additional infiltration	.25 for steel or timber frame o	r 0 35 fo	r maconi	n, consti	ruction	[(9)	-1]x0.1 =	0	(10)
	resent, use the value corresponding to			•	uction			0	(11)
deducting areas of openii	•	4 (1)	1\ -1						_
If no draught lobby, en	floor, enter 0.2 (unsealed) or 0	.1 (seale	ea), eise	enter u				0	(12)
•	s and doors draught stripped							0	(13)
Window infiltration	o and doors dradgin surpped		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, expressed in cubic metre	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)
•	ity value, then $(18) = [(17) \div 20] + (18)$							0.15	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7
Number of sides sheltere Shelter factor	2 0		(20) = 1 -	[0.075 x (*	19)] =			0.85	(19) (20)
Infiltration rate incorporate	ting shelter factor		(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified f	•							00	` ′
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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 = (2.	2)m ÷ 4								
(22a)m = 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
` '	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1							J	

0.16 0.16 0.16 0.14 0.14 0.12 0.12 0.13 0.14 0.14 0.15 Calculate effective air change rate for the applicable case if mechanical ventilation:
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) [If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] (24a)m = 0.3
(24a)m=
(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² × 0.5] (24d)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m = 0.3 0.29 0.29 0.27 0.27 0.26 0.26 0.25 0.26 0.27 0.28 0.28 3. Heat losses and heat loss parameter: ELEMENT Gross Openings Net Area W/m2K (W/K) k-value k-value W/m2K (W/K) k-value W/m2K (W/K) k-value N/m²-K k-value N/m²-
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m= 0
(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] (24d)m=
ELEMENT Gross area (m²) Openings Net Area A, m² W/m2K (W/K) kJ/m²·K kJ/K Doors 2 x 1.5 = 3 Windows Type 1 0.99 x1/[1/(1.4)+0.04] = 1.31 Walls Type1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type2 4.78 2 2.78 x 0.14 = 0.39 Walls Type3 3.08 0 3.08 x 0.15 = 0.46
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.3 0.29 0.29 0.27 0.27 0.26 0.26 0.25 0.26 0.27 0.28 0.28 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A, m² U-value W/m2K (W/K) kJ/m²·K kJ/K Doors 2 x 1.5 = 3 Windows Type 1 0.99 x1/[1/(1.4)+0.04] = 1.31 Windows Type 2 0.99 x1/[1/(1.4)+0.04] = 1.31 Walls Type1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type2 4.78 2 2.78 x 0.14 = 0.39 Walls Type3 3.08 0 3.08 x 0.15 = 0.46
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A , m² U-value W/m2K (W/K) kJ/m²·K kJ/K Doors 2 x 1.5 = 3 Windows Type 1 0.99 x1/[1/(1.4)+0.04] = 1.31 Windows Type 1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type2 4.78 2 2.78 x 0.14 = 0.39 Walls Type3 3.08 0 3.08 x 0.15 = 0.46
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A ,m² W/m2K A ,m² W/m2K A ,m² W/m2K A ,M² A ,M
ELEMENT Gross area (m²) Openings m² Net Area A ,m² U-value W/m2K A X U (W/K) k-value kJ/m²-K A X I (W/K) Doors 2 x 1.5 = 3 Windows Type 1 0.99 x1/[1/(1.4) + 0.04] = 1.31 Windows Type 2 0.99 x1/[1/(1.4) + 0.04] = 1.31 Walls Type1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type2 4.78 2 2.78 x 0.14 = 0.39 Walls Type3 3.08 0 3.08 x 0.15 = 0.46
area (m²) m² A ,m² W/m2K (W/K) kJ/m²·K kJ/K Doors 2 x 1.5 = 3 Windows Type 1 0.99 x1/[1/(1.4)+0.04] = 1.31 Walls Type 1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type 2 4.78 2 2.78 x 0.14 = 0.39 Walls Type 3 3.08 0 3.08 x 0.15 = 0.46
Windows Type 1 0.99 x1/[1/(1.4)+0.04] = 1.31 Windows Type 2 0.99 x1/[1/(1.4)+0.04] = 1.31 Walls Type 1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type 2 4.78 2 2.78 x 0.14 = 0.39 Walls Type 3 3.08 0 3.08 x 0.15 = 0.46
Windows Type 2 0.99 x1/[1/(1.4)+0.04] = 1.31 Walls Type1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type2 4.78 2 2.78 x 0.14 = 0.39 Walls Type3 3.08 0 3.08 x 0.15 = 0.46
Walls Type1 26.8 3.96 22.84 x 0.15 = 3.43
Walls Type2 4.78 2 2.78 × 0.14 = 0.39 Walls Type3 3.08 0 3.08 × 0.15 = 0.46
Walls Type3 3.08 0 3.08 × 0.15 = 0.46
Walls Type4 19.58 0 19.58 x 0.15 = 2.94
Walls Type5 11.14 0 11.14 x 0.13 = 1.47
Roof Type1 54.83 0 54.83 × 0.1 = 5.48
Roof Type2 2.06 0 2.06 x 0.1 = 0.21
Fotal area of elements, m ²
Party wall 23.75 x 0 = 0
Party floor 64.04
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions
Fabric heat loss, W/K = S (A x U) (26) (30) + (32) =
Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 8139.05
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

if details of therm		are not kn	own (36) =	= 0.15 x (3	1)			(00)	(0.0)		Г		–
Total fabric he		alaulataa	l manthl					` '	(36) =	25\m v (5)	l	45.78	(37)
Ventilation he			T .		lun	ll	۸۰۰۰	` ,	`	25)m x (5)			
(38)m= 13.62	Feb 13.48	Mar 13.33	Apr 12.6	May 12.45	Jun 11.72	Jul 11.72	Aug 11.58	Sep 12.02	Oct 12.45	12.75	13.04		(38)
` '			12.0	12.43	11.72	11.72	11.50			<u> </u>	13.04		(00)
Heat transfer	1							` ,	= (37) + (3				
(39)m= 59.41	59.26	59.11	58.38	58.24	57.51	57.51	57.36	57.8	58.24	58.53	58.82	50.05	7(20)
Heat loss para	ameter (H	HLP), W/	′m²K						4verage = = (39)m ÷	Sum(39) ₁ (4)	12 / 12=	58.35	(39)
(40)m= 0.93	0.93	0.92	0.91	0.91	0.9	0.9	0.9	0.9	0.91	0.91	0.92		
								,	Average =	Sum(40) ₁	12 /12=	0.91	(40)
Number of da		nth (Tab	le 1a)			<u> </u>					i		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	iting ener	rgy requi	irement:								kWh/ye	ar:	
۸ · · · · · · · · · · · · · · · · ·		. 1											
Assumed occ if TFA > 13			[1 - exn	(-0.0003	49 y (TF	-Δ -13 9	12)1 + 0 (0013 x (ΓFΔ -13		09		(42)
if TFA £ 13.		· 1.70 X	. [1 - CXP	(-0.000	,45 X (11	A - 10.0	/2/] . 0.0) X 010 X (1174-10.	.0)			
Annual avera	ge hot wa	ater usaç	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		83	.91		(43)
Reduce the annu	_				_	_	o achieve	a water us	se target o	f			
not more that 12	itres per p	person per	day (all w	ater use, r	not and co	ia)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 92.31	88.95	85.59	82.24	78.88	75.52	75.52	78.88	82.24	85.59	88.95	92.31		_
Energy content o	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E)Tm / 3600			m(44) _{1 12} = ables 1b, 1	L	1006.98	(44)
(45)m= 136.89	119.72	123.54	107.71	103.35	89.18	82.64	94.83	95.96	111.84	122.08	132.57		
			<u>. </u>			<u>!</u>		-	Total = Su	m(45) _{1 12} =	=	1320.31	(45)
If instantaneous	water heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,) to (61)			-		
(46)m= 20.53	17.96	18.53	16.16	15.5	13.38	12.4	14.22	14.39	16.78	18.31	19.89		(46)
Water storage			-			-							
Storage volun	ne (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	_			-			` '						
Otherwise if n		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufac		oclared b	occ fact	or is kno	wp (k\\/k	n/day/):							(40)
,				JI IS KIIO	wii (Kvvi	i/uay).					0		(48)
Temperature											0		(49)
Energy lost from		•	-		or is not		(48) x (49)) =			0		(50)
n) It manutac			-								0		(51)
Hot water sto	_												
Hot water stor	heating s	ee secti											(50)
Hot water stoll for community Volume factor	heating s from Ta	ee section ble 2a	on 4.3								0		
b) If manufact Hot water storage of the community Volume factorage of the community Temperature	heating s from Tal factor fro	ee section ble 2a m Table	on 4.3 2b	205			(47) (54)	V (EQ) (5 2) –		0		(52) (53)
Hot water sto If community Volume factor	heating s from Tal factor fro om water	ee section ble 2a m Table storage	on 4.3 2b	ear			(47) x (51)	x (52) x (53) =				

Water	storage	loss cal	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)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	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)
	-	•	culated t			59)m = ((58) ÷ 36	55 × (41)	m				'	
(mod	dified by	factor fr	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss cal	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	47.04	40.94	43.62	40.56	40.2	37.24	38.49	40.2	40.56	43.62	43.87	47.04		(61)
Total h	eat requ	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=	183.93	160.66	167.16	148.26	143.54	126.43	121.13	135.03	136.52	155.45	165.94	179.61		(62)
Solar DH		calculated	using App	endix G or	Appendix	: H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	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 wa	ater hea	ter	•		•	•			•		•	'	
(64)m=	183.93	160.66	167.16	148.26	143.54	126.43	121.13	135.03	136.52	155.45	165.94	179.61		
								Outp	out from w	ater heate	r (annual) ₁	12	1823.66	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	1] + 0.8 ;	c [(46)m	+ (57)m	+ (59)m	1	
(65)m=	57.27	50.04	51.98	45.95	44.41	38.96	37.1	41.58	42.05	48.09	51.56	55.84	_	(65)
inclu		m in cald	culation o	of (65)m	only if c	vlinder i	s in the	dwellina	or hot w	ater is fr	om com	munity h	eating	
	` '		e Table 5		•	,		J				,	<u> </u>	
		·	: 5), Wat		/-									
MEtabl	Jan	Feb	J), vvai											
(66)m=		ı reb	Mar		Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
` '	104.66		Mar 104.66	Apr 104.66	May	Jun 104.66	Jul 104.66	Aug	Sep	Oct	Nov 104.66	Dec 104.66		(66)
Liahtin		104.66	104.66	Apr 104.66	104.66	104.66	104.66	104.66	104.66	-		Dec 104.66		(66)
•	g gains	104.66 (calcula	104.66 ted in Ap	Apr 104.66 opendix	104.66 L, equat	104.66	104.66	104.66 Iso see	104.66	-		104.66		` ,
(67)m=	g gains 20.58	104.66 (calcula 18.28	104.66 ted in Ap 14.86	Apr 104.66 opendix 11.25	104.66 L, equat 8.41	104.66 ion L9 o	104.66 r L9a), a 7.67	104.66 Iso see	104.66 Table 5	104.66	104.66			(66) (67)
(67)m= Appliar	g gains 20.58 nces gai	104.66 (calcula 18.28 ins (calc	104.66 ted in Ap 14.86 ulated in	Apr 104.66 opendix 11.25 Append	104.66 L, equat 8.41 dix L, eq	104.66 ion L9 o 7.1 uation L	104.66 r L9a), a 7.67 13 or L1	104.66 Iso see 9.97 3a), also	104.66 Table 5 13.39 see Ta	104.66 17 ble 5	19.84	104.66 21.15		(67)
(67)m= Appliar (68)m=	g gains 20.58 nces gai	104.66 (calcular 18.28 ins (calc 184.91	104.66 ted in Ap 14.86 ulated in 180.12	Apr 104.66 opendix 11.25 Appendix 169.93	104.66 L, equat 8.41 dix L, eq	104.66 ion L9 of 7.1 uation L	104.66 r L9a), a 7.67 13 or L1 136.91	104.66 Iso see 9.97 3a), also	104.66 Table 5 13.39 see Ta	104.66 17 ble 5 149.99	104.66	104.66		` ′
(67)m= Appliar (68)m= Cookin	g gains 20.58 nces gai 183.01 ng gains	104.66 (calcular 18.28 ins (calcular 184.91 (calcular	104.66 ted in Ap 14.86 ulated in 180.12 ted in A	Apr 104.66 opendix 11.25 Append 169.93 opendix	104.66 L, equat 8.41 dix L, eq 157.07 L, equat	104.66 ion L9 of 7.1 uation L 144.99 ion L15	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a	104.66 Iso see 9.97 3a), also 135.01	104.66 Table 5 13.39 see Ta 139.8 ee Table	104.66 17 ble 5 149.99	104.66 19.84 162.85	104.66 21.15 174.93		(67)
(67)m= Applian (68)m= Cookin (69)m=	g gains 20.58 nces gai 183.01 ng gains 33.47	104.66 (calcular 18.28 ins (calcular 184.91 (calcular 33.47	104.66 ted in Ap 14.86 ulated in 180.12 ted in A 33.47	Apr 104.66 opendix 11.25 Append 169.93 opendix 33.47	104.66 L, equat 8.41 dix L, eq	104.66 ion L9 of 7.1 uation L	104.66 r L9a), a 7.67 13 or L1 136.91	104.66 Iso see 9.97 3a), also	104.66 Table 5 13.39 see Ta	104.66 17 ble 5 149.99	19.84	104.66 21.15		(67) (68)
(67)m= Appliar (68)m= Cookin (69)m= Pumps	g gains 20.58 nces gai 183.01 ng gains 33.47	104.66 (calcular 18.28 ins (calcular 184.91 (calcular 33.47	104.66 ted in Ap 14.86 ulated in 180.12 ted in A	Apr 104.66 opendix 11.25 Append 169.93 opendix 33.47	104.66 L, equat 8.41 dix L, eq 157.07 L, equat	104.66 ion L9 of 7.1 uation L 144.99 ion L15	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a	104.66 Iso see 9.97 3a), also 135.01	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47	104.66 17 ble 5 149.99	104.66 19.84 162.85 33.47	104.66 21.15 174.93		(67) (68)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	g gains 20.58 nces gai 183.01 ng gains 33.47 s and far	104.66 (calcula 18.28 ins (calc 184.91 (calcula 33.47 ns gains	104.66 ted in Ap 14.86 ulated in 180.12 ted in A 33.47 (Table 5	Apr 104.66 opendix 11.25 Append 169.93 opendix 33.47 5a)	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47	104.66 ion L9 of 7.1 uation L 144.99 tion L15 33.47	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47	104.66 Iso see 9.97 3a), also 135.01), also se 33.47	104.66 Table 5 13.39 see Ta 139.8 ee Table	104.66 17 ble 5 149.99 5 33.47	104.66 19.84 162.85	104.66 21.15 174.93 33.47		(67) (68) (69)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses	g gains 20.58 nces gains 183.01 ng gains 33.47 s and far 3 s e.g. ev	104.66 (calcular 18.28) ins (calcular 184.91) (calcular 33.47) ns gains 3	104.66 ted in Ap 14.86 ulated in 180.12 ted in Ap 33.47 (Table 5	Apr 104.66 opendix 11.25 Appendix 169.93 opendix 33.47 5a) 3	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47	104.66 ion L9 of 7.1 uation L 144.99 ion L15 33.47 3	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47	104.66 Iso see 9.97 3a), also 135.01), also se 33.47	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47	104.66 17 ble 5 149.99 5 33.47	104.66 19.84 162.85 33.47	104.66 21.15 174.93 33.47		(67) (68) (69) (70)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	g gains 20.58 nces gai 183.01 ng gains 33.47 s and far 3 s e.g. ev -83.73	104.66 (calcula 18.28 ins (calc 184.91 (calcula 33.47 ns gains 3 aporatio -83.73	104.66 ted in Ap 14.86 ulated in 180.12 tted in A 33.47 (Table 5 3 on (negation)	Apr 104.66 opendix 11.25 Append 169.93 opendix 33.47 5a)	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47	104.66 ion L9 of 7.1 uation L 144.99 tion L15 33.47	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47	104.66 Iso see 9.97 3a), also 135.01), also se 33.47	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47	104.66 17 ble 5 149.99 5 33.47	104.66 19.84 162.85 33.47	104.66 21.15 174.93 33.47		(67) (68) (69)
(67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	g gains 20.58 nces gai 183.01 ng gains 33.47 s and far 3 s e.g. ev -83.73 heating	104.66 (calcula 18.28 ins (calcula 184.91) (calcula 33.47 ins gains 3 raporatio -83.73 gains (T	104.66 ted in Ap 14.86 ulated in 180.12 ted in Ap 33.47 (Table 5 3 on (negation 1.83.73) Table 5)	Apr 104.66 ppendix 11.25 Append 169.93 ppendix 33.47 5a) 3 tive valu -83.73	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47 3 es) (Tab	104.66 ion L9 of 7.1 uation L 144.99 ion L15 33.47 3 le 5) -83.73	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47	104.66 Iso see 9.97 3a), also 135.01), also se 33.47	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47 3 -83.73	104.66 17 ble 5 149.99 5 33.47 3	104.66 19.84 162.85 33.47 3	104.66 21.15 174.93 33.47 3		(67) (68) (69) (70)
(67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	g gains 20.58 nces gai 183.01 ng gains 33.47 and far 3 s e.g. ev -83.73 heating 76.98	104.66 (calcular 18.28) ins (calcular 184.91) (calcular 33.47) ns gains 3 raporation -83.73 gains (T	104.66 ted in Ap 14.86 ulated in 180.12 ted in Ap 33.47 (Table 5 3 in (negation -83.73) Table 5) 69.87	Apr 104.66 opendix 11.25 Appendix 169.93 opendix 33.47 5a) 3	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47	104.66 ion L9 of 7.1 uation L 144.99 ion L15 33.47 3 le 5) -83.73	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47 3	104.66 Iso see 9.97 3a), also 135.01 0, also se 33.47 3	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47 3 -83.73	104.66 17 ble 5 149.99 5 33.47 3 -83.73	104.66 19.84 162.85 33.47 3 -83.73	104.66 21.15 174.93 33.47 3 -83.73		(67) (68) (69) (70)
(67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	g gains 20.58 nces gai 183.01 ng gains 33.47 and far 3 s e.g. ev -83.73 heating 76.98	104.66 (calcula 18.28 ins (calcula 184.91) (calcula 33.47 ins gains 3 raporatio -83.73 gains (T	104.66 ted in Ap 14.86 ulated in 180.12 ted in Ap 33.47 (Table 5 3 in (negation -83.73) Table 5) 69.87	Apr 104.66 ppendix 11.25 Append 169.93 ppendix 33.47 5a) 3 tive valu -83.73	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47 3 es) (Tab	104.66 ion L9 of 7.1 uation L 144.99 ion L15 33.47 3 le 5) -83.73	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47 3	104.66 Iso see 9.97 3a), also 135.01 0, also se 33.47 3	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47 3 -83.73	104.66 17 ble 5 149.99 5 33.47 3	104.66 19.84 162.85 33.47 3 -83.73	104.66 21.15 174.93 33.47 3 -83.73		(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 Fa Table 6d	actor	Area m²	a		Flu Tal	x ole 6a		Т	g_ able 6b		FF Table 6c		Gains (W)	
Northeast 0.9	0.77	X	0	99	x	1	1.28	x		0.57	x	0.7	=	3.09	(75)
Northeast 0.9	0.77	X	0	99	X	2	2.97	X		0.57	x	0.7	_	6.29	(75)
Northeast 0.9	0.77	x	0	99	x	4	1.38	x		0.57	x	0.7		11.33	(75)
Northeast 0.9	0.77	х	0	99	X	6	7.96	x		0.57	x	0.7		18.6	(75)
Northeast 0.9	0.77	х	0	99	X	9	1.35	x		0.57	x	0.7		25.01	(75)
Northeast 0.9	0.77	x	0	99	x	9	7.38	x		0.57	x	0.7		26.66	(75)
Northeast 0.9	0.77	х	0	99	X	9	91.1	x		0.57	x	0.7		24.94	(75)
Northeast 0.9	0.77	x	0	99	X	7	2.63	x		0.57	×	0.7		19.88	(75)
Northeast 0.9	0.77	x	0	99	X	5	0.42	x		0.57	×	0.7	-	13.8	(75)
Northeast 0.9	0.77	x	0	99	X	2	8.07	x		0.57	x	0.7	-	7.68	(75)
Northeast 0.9	0.77	x	0	99	X	_	14.2	X		0.57	x	0.7	-	3.89	(75)
Northeast 0.9	0.77	x	0	99	x	9	9.21	x		0.57	×	0.7	-	2.52	(75)
Northwest 0.9	0.77	x	0.	99	x	1	1.28	x		0.57	×	0.7		9.27	(81)
Northwest 0.9	0.77	x	0.	99	x	2	2.97	X		0.57	×	0.7		18.86	(81)
Northwest 0.9	0.77	x	0	99	x	4	1.38	x		0.57	×	0.7	-	33.98	(81)
Northwest 0.9	0.77	x	0.	99	x	6	7.96	x		0.57	×	0.7		55.81	(81)
Northwest 0.9	0.77	x	0.	99	x	9	1.35	X		0.57	×	0.7		75.02	(81)
Northwest 0.9	0.77	x	0	99	x	9	7.38	x		0.57	×	0.7	<u> </u>	79.97	(81)
Northwest 0.9	0.77	x	0	99	x	9	91.1	x		0.57	×	0.7		74.81	(81)
Northwest 0.9	0.77	x	0	99	x	7	2.63	x		0.57	×	0.7		59.64	(81)
Northwest 0.9	0.77	×	0	99	×	5	0.42	j×		0.57	×	0.7		41.41	(81)
Northwest 0.9	0.77	x	0	99	x	2	8.07	X		0.57	×	0.7		23.05	(81)
Northwest 0.9	0.77	×	0	99	x	_	14.2	j×		0.57	×	0.7		11.66	(81)
Northwest 0.9	0.77	×	0	99	x		9.21	j×		0.57	×	0.7		7.57	(81)
0.1			16					-		(7.1)					
Solar gains i	- 1 - 1	45.31	74.41	100.0	\neg	06.63	99.75	`	n = S .52	um(74)m 55.21	(82)m 30.73		10.09	٦	(83)
Total gains -				1				1		00.2		1	10.00	_	` '
(84)m= 350.3		367.56	376.82	382.6	``	70.24	351.6	33	7.8	324.19	319.7	5 327.24	338.62		(84)
7. Mean int	ernal temn	erature	(heatin	n seaso	nn)					ļ			ı		
Temperatu			`			area f	rom Tal	hle 9	Th	1 (°C)				21	(85)
Utilisation f	•	٠.			_			0.00	,	. (0)					(00)
Jar	$\overline{}$	Mar	Apr	Ma	Ť	Jun	Jul	Га	ug	Sep	Oct	Nov	Dec		
(86)m= 1	1	1	0.99	0.96	—	0.86	0.69	+	74	0.93	0.99	1	1	┪	(86)
Mean interr	al tompor	aturo in	living o	1 T1	(follo	w oto	no 2 to 7	 7 in 7	l	. 00)				_	
(87)m= 20.02		20.25	20.49	20.73	`	20.92	20.98	1	.98	20.85	20.56	20.25	20	7	(87)
Temperatu	e durina h	eating r	eriods	n rest o	of dv	vellina	from Ta	able	9. TI	n2 (°C)			•	_	
(88)m= 20.14		20.15	20.16	20.16	_	20.17	20.17	1	.17	20.17	20.16	20.16	20.15	7	(88)
Utilisation f	actor for da	ains for	rest of a	lwelling	 ı h2	m (se	e Tahle	(20)		!				_	
(89)m= 1	1 1	1	0.99	0.94		0.79	0.57	0.0	63	0.89	0.99	1	1	٦	(89)
` ′				1			<u> </u>						1	_	•

Mean	internal	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.82	18.93	19.16	19.52	19.86	20.11	20.16	20.16	20.03	19.62	19.17	18.81		(90)
					<u> </u>		l		f	fLA = Livin	g area ÷ (4	1) =	0.31	(91)
Mean	internal	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	19.19	19.28	19.49	19.81	20.13	20.36	20.41	20.41	20.28	19.9	19.5	19.17		(92)
Apply	adjustn	nent to the	he mean	internal	l tempera	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.04	19.13	19.34	19.66	19.98	20.21	20.26	20.26	20.13	19.75	19.35	19.02		(93)
8. Sp	ace hea	ting requ	uirement											
			ernal ter or gains	•		ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:	•									
(94)m=	1	1	0.99	0.98	0.94	0.79	0.59	0.64	0.89	0.98	1	1		(94)
Usefu	ıl gains,	hmGm ,	, W = (94	4)m x (84	4)m									
(95)m=	349.45	358.95	365.13	369.89	358.64	294.11	206.95	215.45	288.13	313.91	325.71	337.94		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	x [(93)m	– (96)m	<u></u>				
(97)m=	875.41	843.43	759.17	628.36	482.13	322.4	210.65	221.36	348.44	533.09	717.15	871.86		(97)
Space	e heating	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	4 x [(97)m – (95)m] x (4	1)m			
(98)m=	391.32	325.57	293.17	186.1	91.88	0	0	0	0	163.07	281.84	397.24		
					•			Tota	l per vear	(kWh/year) = Sum(9	8) _{15.912} =	2130.18	(98)
-														
Space	e heating	a require	ement in	kWh/m²	²/vear					` •	`	,	33 26	(99)
		• •	ement in		•								33.26	(99)
9a. En	ergy req	uiremer	ement in nts – Indi		•	ystems i	ncluding						33.26	(99)
9a. En	ergy req e heatir	uiremer ng:	nts – Indi	vidual h	eating sy									
9a. En Spac Fracti	ergy req e heatir on of sp	uiremer ng: pace hea	nts – Indi at from se	vidual h	eating sy		system	micro-C	CHP)				0	(201)
9a. En Spac Fracti	ergy req e heatir on of sp on of sp	uiremerng: oace head	nts – Indi at from se at from m	vidual h econdary	eating sy y/supple em(s)		system	micro-C (202) = 1 -	CHP) - (201) =					(201)
9a. En Spac Fracti	ergy req e heatir on of sp on of sp	uiremerng: oace head	nts – Indi at from se	vidual h econdary	eating sy y/supple em(s)		system	micro-C (202) = 1 -	CHP)				0	(201)
9a. En Spac Fracti Fracti	ergy red e heatir on of sp on of sp	uiremer ng: pace hea pace hea tal heati	nts – Indi at from se at from m	vidual h econdary nain syst main sys	eating sy y/supple tem(s) stem 1		system	micro-C (202) = 1 -	CHP) - (201) =				0	(201)
9a. En Spac Fracti Fracti Fracti	ergy red e heatir ion of sp ion of to ency of r	uiremer ng: pace hea pace hea tal heatii main spa	nts – Indi at from se at from m	econdary nain syst main syst ing syste	eating sy y/supple rem(s) stem 1	mentary	system	micro-C (202) = 1 -	CHP) - (201) =				0 1 1	(201) (202) (204)
9a. En Spac Fracti Fracti Fracti	ergy red e heatir ion of sp ion of to ency of r	uiremer ng: pace hea pace hea tal heatii main spa	nts – Indi at from se at from m ng from a ace heat	econdary nain syst main syst ing syste	eating sy y/supple rem(s) stem 1	mentary	system	micro-C (202) = 1 -	CHP) - (201) =		Nov	Dec	0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Fracti Efficie	ergy red e heatir on of sp on of to ency of r ency of s	uiremenng: pace head pace head tal heating main space seconda	at from set from ming from mace heating	vidual h econdary nain syst main sys ing syste ementar Apr	eating sy y/supple rem(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =			0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Fracti Efficie	ergy red e heatir on of sp on of to ency of r ency of s	uiremenng: pace head pace head tal heating main space seconda	at from so at from m ag from a ace heati ry/supple Mar	vidual h econdary nain syst main sys ing syste ementar Apr	eating sy y/supple rem(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =			0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Efficie Efficie	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require	at from set from many from mace heating ry/supplement (co. 293.17	econdary nain systemain systementar Apr alculatee	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system 1, % Jul	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =	Nov	Dec	0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Efficie Efficie	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin 391.32	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require	at from so at from m ace heati ry/supple Mar ement (c 293.17	econdary nain systemain systementar Apr alculatee	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 91.88	mentary g system Jun	system 1, % Jul	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =	Nov 281.84	Dec	0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Efficie Efficie	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require 325.57	at from set from many from mace heating ry/supplement (co. 293.17	econdary nain systemain systementar Apr alculated 186.1 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0	Sep 0	(203)] = Oct 163.07	Nov 281.84	Dec 397.24	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Spac Fracti Fracti Efficie Efficie (211)m	ergy red e heatir on of sp on of tot ency of r ency of s Jan e heatin 391.32 n = {[(98) 433.35	uiremenng: pace head tal heating main spanseconda Feb grequire 325.57)m x (20 360.55	at from so at from m ace heati ry/supple Mar ement (c 293.17 4)] } x 1	econdary nain systemain systementar Apr alculatee 186.1 00 ÷ (20 206.09	eating sy y/supple rem(s) stem 1 em 1 y heating May d above; 91.88	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0	Sep 0	(203)] = Oct	Nov 281.84	Dec 397.24	0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Efficie Space (211)m	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin 391.32 n = {[(98) 433.35}	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require 325.57)m x (20 360.55	at from set from mace heating ry/supplement (c 293.17 4)] } x 1 324.66	econdary nain systemain systematrar Apr alculated 186.1 00 ÷ (20 206.09	eating sy y/supple rem(s) stem 1 em 1 y heating May d above; 91.88	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0	Sep 0	(203)] = Oct 163.07	Nov 281.84	Dec 397.24	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Space Fracti Fracti Efficie Efficie Space (211)m	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin 391.32 n = {[(98 433.35) e heatin)m x (20	uirement ng: pace heat tal heatin main spa seconda Feb g require 325.57)m x (20 360.55	at from so at from m ng from m ace heati ry/supple Mar ement (c 293.17 4)] } x 1 324.66	econdary nain systemain systematar Apr alculatee 186.1 00 ÷ (20 206.09	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 91.88 06) 101.75	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Spac Fracti Fracti Efficie Space (211)m	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin 391.32 n = {[(98 433.35) e heatin)m x (20	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require 325.57)m x (20 360.55	at from set from mace heating ry/supplement (c 293.17 4)] } x 1 324.66	econdary nain systemain systematrar Apr alculated 186.1 00 ÷ (20 206.09	eating sy y/supple rem(s) stem 1 em 1 y heating May d above; 91.88	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Space Fracti Fracti Efficie Efficie (211)m Space = {[(98 (215)m=	ergy requested enterprises on of spon of too ency of spon of spon of too ency of spon	uirement of the property of th	at from so at from m ng from m ace heati ry/supple Mar ement (c 293.17 4)] } x 1 324.66	econdary nain systemain systematar Apr alculatee 186.1 00 ÷ (20 206.09	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 91.88 06) 101.75	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Space Fracti Fracti Efficie Efficie Space (211)m Space = {[(98)(215)m=	ergy red e heating on of sp on of to ency of r ency of s Jan e heating 391.32 n = {[(98 433.35] e heating)m x (20 heating	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require 325.57)m x (20 360.55 g fuel (so 1)] } x 1	at from set from many from	econdary nain systemain systemain systementar Apr alculated 186.1 00 ÷ (20 206.09 y), kWh/8) 0	eating sy y/supple rem(s) stem 1 em 1 y heating May d above) 91.88 06) 101.75	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Space Fracti Fracti Efficie Efficie Space (211)m Space = {[(98)(215)m=	ergy red e heating on of sp on of to ency of r ency of s Jan e heating 391.32 n = {[(98 433.35] e heating)m x (20 heating	uirements pace head pace head tal heating main space seconda Feb g require 325.57)m x (20 360.55 g fuel (so 01)] } x 1 0	at from so at from m ng from m ace heati ry/supple Mar ement (c 293.17 4)] } x 1 324.66	econdary nain systemain systemater Apr alculater 186.1 00 ÷ (20 206.09 y), kWh/8) 0	eating sy y/supple rem(s) stem 1 em 1 y heating May d above) 91.88 06) 101.75	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Space Fracti Fracti Efficie Efficie Space (211)m Space = {[(98 (215)m=	ergy requested entering on of spon of too on on on on on on on on on on on on o	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require 325.57)m x (20 360.55 g fuel (so 1)] } x 1	at from so at from mage heating supplement (c 293.17 4)] } x 1 324.66 econdary 00 ÷ (20 0 ter (calculation)	econdary nain systemain systemater Apr alculatee 186.1 00 ÷ (20 206.09 y), kWh/ 8) 0	eating syly/supple tem(s) stem 1 lem 1 lem 1 lem May dabove ylong 101.75 lem 101.75 lem 101.75 lem 101.75 lem 10 l	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 1 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12} 0 215) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear

							i	
(217)m= 87.1 87 86.69 85.93 84.39	81 81	81	81	85.51	86.61	87.18		(217)
Fuel for water heating, kWh/month								
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 211.16 184.67 192.84 172.55 170.09 1 $	56.08 149.54	166.7	168.54	181.8	191.59	206.01		
		Tota	I = Sum(2	19a) ₁₁₂ =	<u> </u>		2151.57	(219)
Annual totals				k'	Wh/yea	r	kWh/year]
Space heating fuel used, main system 1							2359	
Water heating fuel used							2151.57	Ī
Electricity for pumps, fans and electric keep-hot								_
mechanical ventilation - balanced, extract or pos	sitive input fro	m outside	e			150.47		(230a)
central heating pump:						30		(230c)
Total electricity for the above, kWh/year		sum	of (230a)	(230g) =	ı		180.47	(231)
Electricity for lighting							363.41	(232)
12a. CO2 emissions – Individual heating system	s including m	icro-CHP)					
12a. CO2 emissions – Individual heating system		icro-CHP)	Emiss	ion fac	tor	Emissions	
12a. CO2 emissions – Individual heating system	Energy kWh/year)	Emiss kg CO	i on fac 2/kWh	tor	Emissions kg CO2/yea	ır
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy				2/kWh	tor =		ur (261)
	Energy kWh/year			kg CO	2/kWh		kg CO2/yea	_
Space heating (main system 1)	Energy kWh/year			kg CO	2/kWh	=	kg CO2/yea	(261)
Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x			0.2 0.5	2/kWh	=	kg CO2/yea	(261) (263)
Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x			0.2 0.5	2/kWh 16 19 16	=	kg CO2/yea 509.54 0 464.74	(261) (263) (264)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Energy kWh/year (211) x (215) x (219) x (261) + (262)			0.2 0.5 0.2	2/kWh 16 19 16 19	= = =	kg CO2/yea 509.54 0 464.74 974.28	(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-hot	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x		264) =	0.2 0.5 0.5	2/kWh 16 19 16 19 19	= = =	kg CO2/yea 509.54 0 464.74 974.28 93.66	(261) (263) (264) (265) (267)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x		264) = sum o	0.2 0.5 0.5 0.5	2/kWh 16 19 16 19 19	= = =	kg CO2/yea 509.54 0 464.74 974.28 93.66 188.61](261)](263)](264)](265)](267)](268)

			User D	etails: _						
Assessor Name:	Chris Hocknell			Strom:	a Nium	her:		STRO	0016363	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.10	
				Address			d-Lean			
Address :	Unit 7, 40-42 Mill L		•							
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			5	4.53	(1a) x	2	2.13	(2a) =	116.31	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1n) 5	4.53	(4)			_		
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	116.31	(5)
2. Ventilation rate:										
		secondary heating	у	other		total			m³ per hou	ır
Number of chimneys		0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	i + F	0] = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans					0	x	10 =	0	(7a)
					Ļ			10 =		=
Number of passive vents					Ļ	0			0	(7b)
Number of flueless gas f	ires				L	0	X 4	40 =	0	(7c)
								Air cl	hanges per ho	our
Infiltration due to chimne	ove fluge and fanc = (6a)+(6b)+(7	a)+(7h)+(7c) =	Г					(8)
If a pressurisation test has					ontinue fr	0 om (9) to		÷ (5) =	0	(0)
Number of storeys in t		.ou, p. 00000	(/ , .			o (o) to	()		0	(9)
Additional infiltration	3 ()						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (0.25 for steel or timber	frame or	0.35 for	r masonr	y constr	uction			0	(11)
	present, use the value corre	sponding to	the great	er wall are	a (after					
deducting areas of open If suspended wooden	• /	aled) or 0	1 (coale	ad) alsa	antar N					7(12)
If no draught lobby, er	,	aleu) oi o.	i (Seale	su), eise	enter o				0	(12)
Percentage of window		strinned							0	(14)
Window infiltration	o una acció araagini c	мірреа		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	- 12) + (13) ·	+ (15) =		0	(16)
Air permeability value	. a50. expressed in cu	bic metres	s per ho	our per s	uare m	etre of e	envelope	area	3	(17)
If based on air permeab	• •		•	•	•				0.15	(18)
Air permeability value appli	es if a pressurisation test ha	as been don	e or a deg	gree air pe	meability	is being u	sed			
Number of sides shelter	ed								2	(19)
Shelter factor				(20) = 1 -	•	19)] =			0.85	(20)
Infiltration rate incorpora	•			(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified	- 	1 1							7	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7								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	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	7	
` '		1							J	

Adjusted infiltra	tion rate (a	ıllowing f	for shelte	er and	wind s	peed) =	: (21a) x	(22a)m					
0.16			I -	14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effect		-	for the a	applica	able ca	se							— ,
If mechanical			/ N (23h) =	- (23a)	x Emy (e	aguation (N5)) othe	nvice (23k	n) = (23a)			0.5	(23a
If balanced with			,	` ,	`	. ,	,, .	`)) = (23a)			0.5	(23b
	_			_					Ob)ma i (00h) v [4 (00.0)	75.65	(230
a) If balanced (24a)m= 0.28				26	0.24	0.24	0.24	0.25	0.26	230) × [0.27	0.27	1 + 100j]	(24a
b) If balanced	l	!	<u> </u>			ļ	<u>!</u>	<u>l</u>	<u>l</u>	<u> </u>	0.21	J	(2 10
(24b)m= 0				0	0	0	0	0	0	0	0	1	(24t
c) If whole ho												J	(
,	0.5 × (23		•		•				.5 × (23b))			
(24c)m= 0	<u>_</u>		` 	0	0	0	0	0	0	0	0]	(240
d) If natural v	entilation o	r whole	house p	ositive	e input	ventilati	on from	loft	!	<u>I</u>	ļ.	J	
,	= 1, then (•		•				0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air of	change rate	e - enter	(24a) or	(24b)	or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.28	0.28 0	.28 0.	.26 0.	26	0.24	0.24	0.24	0.25	0.26	0.27	0.27		(25)
3. Heat losses	and heat I	oss para	ameter										
ELEMENT	Gross area (m²	Op	penings m²		Net Ar A ,r		U-val W/m2		A X U (W/I	〈)	k-value		A X k J/K
Doors	•	,		Γ	2	x	1.5	=	3	,			(26)
Windows Type	1			Ť	0.99	x1	/[1/(1.4)+	0.04] =	1.31	=			(27)
Windows Type	2			ř	0.99	= x1	/[1/(1.4)+	0.04] =	1.31	=			(27)
Windows Type	3			Ī	1.58	x1	/[1/(1.4)+	0.04] =	2.09	╡			(27)
Walls Type1	29.61	1 [6.53	ı i	23.08		0.15		3.46	=		-	(29)
Walls Type2	14.05	i	2	וֹ וֹ	12.05	=	0.14		1.7	=		-	(29)
Walls Type3	4.62	i	0	,	4.62	x	0.15	-	0.69	륵 ¦		╣	(29)
Walls Type4	24.69	┧┝	0] L] [24.69	_	0.15	= =	3.7	륵 ¦		╡	(29)
Roof Type1	42.66	╣	0]	42.66	=	0.13		4.27	믁 ¦		╡	(30)
Roof Type2		┧┝		J L 1 Г		=		= -		북 ¦		╡╠	= ' '
Total area of el	2.85 ements m²	」	0	J L	2.85	=	0.1		0.28				(30)
Party wall	emento, m			L	118.4	=							(31)
•				L	23.58	=	0	=	0			╡╠	(32)
Party floor * for windows and i	roof windows	usa offoat	tivo window		54.53		a formula :	1/[/1/ vali	ua) 10 041 a	e aiven in	naragrani		(32
** include the areas						aleu usii l	j iorriula i	7[(170-vai	1 0)+0.04j 8	is giveri iii	paragrapi	10.2	
Fabric heat loss	s, W/K = S	(A x U)					(26) (30) + (32) =				25.76	(33)
Heat capacity C	Cm = S(A x	k)						((28)	(30) + (32	2) + (32a)	(32e) =	7372.87	(34)
Thermal mass	parameter	(TMP =	Cm ÷ TF	A) in l	kJ/m²K			Indica	ative Value	Medium		250	(35)
For design assessr				structio	n are no	t known p	recisely the	e indicative	e values of	TMP in T	able 1f		
can be used instea													
Thermal bridge												25.98	(36)

1:1 _ 1: _		it loss			_				. ,	(36) =	(OE) (E)	L	51.74	(37
	. 1		lculated	· ·					` ,		25)m x (5)			
—	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20
	10.91	10.79	10.67	10.06	9.93	9.32	9.32	9.2	9.57	9.93	10.18	10.42		(38
eat tr <u>an</u>	nsfer co	pefficier	nt, W/K						(39)m	= (37) + (38)m			
9)m= 6	62.66	62.53	62.41	61.8	61.68	61.07	61.07	60.94	61.31	61.68	61.92	62.17		_
eat loss	s parar	neter (F	ILP), W/	m²K						Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	61.77	(39
_	1.15	1.15	1.14	1.13	1.13	1.12	1.12	1.12	1.12	1.13	1.14	1.14		
							Į		,	Average =	Sum(40) ₁	₁₂ /12=	1.13	(40
umber o	of days	s in mor	nth (Tabl	le 1a)										_
	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		(41
Wate	r heati	na ener	gy requi	rement:								kWh/ye	ar·	
· ···ato	rrioda	119 01101	<i>9)</i> 10qui	101110111.										
		oancy, N										82		(4
			+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (1	ΓFA -13.	.9)			
if TFA:			tor usoc	no in litro	se por de	w Vd av	orago =	(25 x N)	+ 36					
								(23 X IN) to achieve		se target o		.51		(4
					ater use, l	_	_			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
				_			Table 1c x		ОСР	001	1101	DCC		
			•					` ′						
1)m= [8	35.26 T	82 16	79.06	75 96	72.86	69.76	69.76	72.86	75.96	79.06	82 16	85.26		
4)m= 8	35.26	82.16	79.06	75.96	72.86	69.76	69.76	72.86	75.96	79.06	82.16	85.26	930.12	
´ L								72.86 Tm / 3600		Γotal = Su	m(44) _{1 12} =		930.12	(4
nergy con	ntent of I	not water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D)Tm / 3600	kWh/mon	Fotal = Su oth (see Ta	m(44) _{1 12} = ables 1b, 1	c, 1d)	930.12	(4
nergy con	ntent of I								88.64	Fotal = Su th (see Ta	m(44) _{1 12} = ables 1b, 1	c, 1d)		`
nergy con	26.44	not water 110.58	used - cald	culated mo	95.46	190 x Vd,r 82.37	76.33)Tm / 3600	88.64	Fotal = Su th (see Ta	m(44) _{1 12} = ables 1b, 1	c, 1d)	930.12	`
ergy con	26.44 eous wa	not water 110.58 ater heatin	used - calo	culated mo	onthly = 4. 95.46 hot water	190 x Vd,r 82.37 storage),	76.33 enter 0 in	27m / 3600 87.59 boxes (46,	88.64) to (61)	Fotal = Su th (see Ta 103.3	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} =	c, 1d)		(4
ergy con i)m= 1: instantantantantantantantantantantantantant	26.44 26.44	110.58 ater heatin	used - cald	culated mo	95.46	190 x Vd,r 82.37	76.33	9Tm / 3600 87.59	88.64	Fotal = Su th (see Ta	m(44) _{1 12} = ables 1b, 1	c, 1d)		(4
ergy conditions of the stantan	26.44 eous wa	110.58 ater heatin 16.59 OSS:	used - cale 114.11 ng at point 17.12	99.49 of use (no.	95.46 9 hot water	190 x Vd,r 82.37 storage),	76.33 enter 0 in	DTm / 3600 87.59 boxes (46)	88.64) to (61)	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37		(4
ergy con i)m= 1: instantant i)m= 1 ater sto orage v	26.44 26.44	110.58 ater heatin 16.59 OSS:	used - cald 114.11 ng at point 17.12 includin	99.49 of use (not) 14.92	95.46 95.46 9 hot water 14.32	190 x Vd,r 82.37 storage), 12.36	76.33 enter 0 in 11.45 storage	27m / 3600 87.59 boxes (46) 13.14 within sa	88.64) to (61)	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	c, 1d)		(4
ergy communications and the standard and the standard atterministrates are standard atterministrations.	26.44 26.44	110.58 ater heatin 16.59 OSS: e (litres) eating a	used - cale 114.11 ng at point 17.12 includin nd no ta	of use (no 14.92 g any so nk in dw	95.46 95.46 96.46 14.32 Olar or Water of Water or Wat	190 x Vd,r 82.37 storage), 12.36 /WHRS	n x nm x E 76.33 enter 0 in 11.45 storage	DTm / 3600 87.59 boxes (46) 13.14 within sa (47)	88.64 0 to (61) 13.3	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37		(4
nstantaniater stoorage v	26.44 26.44	110.58 ater heatin 16.59 oss: e (litres) eating a stored	used - cale 114.11 ng at point 17.12 includin nd no ta	of use (no 14.92 g any so nk in dw	95.46 95.46 96.46 14.32 Olar or Water of Water or Wat	190 x Vd,r 82.37 storage), 12.36 /WHRS	n x nm x E 76.33 enter 0 in 11.45 storage	27m / 3600 87.59 boxes (46) 13.14 within sa	88.64 0 to (61) 13.3	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37		(4
ergy con nstantant s)m= 1 ater sto commu herwis ater sto	26.44 26.44	110.58 ater heatin 16.59 oss: e (litres) eating a stored oss:	used - cale 114.11 ng at point 17.12 includin nd no ta hot wate	of use (no 14.92 ng any so nk in dw	95.46 95.46 95.46 14.32 Diar or Welling, encludes i	190 x Vd,r 82.37 storage), 12.36 /WHRS nter 110	76.33 enter 0 in 11.45 storage 0 litres in neous co	DTm / 3600 87.59 boxes (46) 13.14 within sa (47)	88.64 0 to (61) 13.3	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37		(4
ergy con instantant si)m= 1: ater sto orage v commu therwis ater sto of the storage v commu therwis ater storage v therwis therwis therwis therwis therwis therwis	26.44 26.44	110.58 ater heatin 16.59 OSS: e (litres) eating a stored oss: urer's de	used - cale 114.11 ng at point 17.12 includin nd no ta hot wate	of use (not) 14.92 Ing any so the in dweer (this in the coss factors)	95.46 95.46 96.46 14.32 Olar or Water of Water or Wat	190 x Vd,r 82.37 storage), 12.36 /WHRS nter 110	76.33 enter 0 in 11.45 storage 0 litres in neous co	DTm / 3600 87.59 boxes (46) 13.14 within sa (47)	88.64 0 to (61) 13.3	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91 47)	122.45 18.37		(4)
ergy constantantantantantantantantantantantantant	eous wa 18.97 orage l volume unity he e if no orage l nufactu	110.58 ater heatin 16.59 OSS: e (litres) eating a stored oss: urer's de	used - cale 114.11 ag at point 17.12 includin nd no ta hot wate eclared le	of use (not 14.92 and 14.9	95.46 95.46 95.46 14.32 Dlar or Water or Wat	190 x Vd,r 82.37 storage), 12.36 /WHRS nter 110	n x nm x E 76.33 enter 0 in 11.45 storage 0 litres in neous co	27m / 3600 87.59 boxes (46) 13.14 within sa (47) ombi boild	88.64 0 to (61) 13.3 ame vess	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4)
nstantanion instantanion ins	eous water to file the course of the cours water to file the cours water to file the cours water to file the cours water to file the course of	ater heatin 16.59 OSS: e (litres) eating a stored oss: urer's de actor from	used - cale 114.11 19 at point 17.12 includin nd no ta hot wate eclared le m Table storage	of use (not) 14.92 In any so nk in dwer (this in oss factor) 2b , kWh/ye	95.46 95.46 95.46 14.32 plar or Water velling, eacludes in the control of the	190 x Vd,r 82.37 12.36 1WHRS nter 110 nstantar	76.33 enter 0 in 11.45 storage 0 litres in neous co	DTm / 3600 87.59 boxes (46) 13.14 within sa (47)	88.64 0 to (61) 13.3 ame vess	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37		(44 (44 (44 (55 (45 (45 (45 (45 (45 (45
nstantaniater storoge vocame ster storoge st	26.44 26.44 26.44 26.44 27 28 28 29 20 20 20 20 20 20 20 20 20	ater heatin 16.59 oss: e (litres) eating a stored oss: urer's de actor from	used - calc 114.11 17.12 includin nd no ta hot wate eclared lo m Table storage eclared co	of use (not) 14.92 In any so onk in dwar (this in oss factor 2b, kWh/ye cylinder leading and the color of the cylinder leading and the cylinder l	95.46 95.46 95.46 14.32 Dlar or Water or Wat	190 x Vd,r 82.37 12.36 1WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage 0 litres in neous con/day): known:	27m / 3600 87.59 boxes (46) 13.14 within sa (47) ombi boild	88.64 0 to (61) 13.3 ame vess	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4)
nstantandos instantandos ins	eous wa 18.97 orage lands in the contract of	110.58 ater heatin 16.59 OSS: e (litres) eating a stored oss: urer's de actor from water urer's de ge loss	used - calc 114.11 17.12 includin nd no ta hot wate eclared lo m Table storage eclared co	of use (not) 14.92 If any so the control of the co	95.46 95.46 95.46 14.32 plar or Water relling, eacludes in the control of th	190 x Vd,r 82.37 12.36 1WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage 0 litres in neous con/day): known:	27m / 3600 87.59 boxes (46) 13.14 within sa (47) ombi boild	88.64 0 to (61) 13.3 ame vess	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37		(4)
ergy consistent and attention attent	eous water to a large la	110.58 ater heatin 16.59 OSS: e (litres) eating a stored oss: urer's de actor from water urer's de ge loss	including at point 17.12 including at point 1	of use (not) 14.92 If any so the control of the co	95.46 95.46 95.46 14.32 plar or Water relling, eacludes in the control of th	190 x Vd,r 82.37 12.36 1WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage 0 litres in neous con/day): known:	27m / 3600 87.59 boxes (46) 13.14 within sa (47) ombi boild	88.64 0 to (61) 13.3 ame vess	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37		(4) (4) (4) (4) (5) (5) (5) (5) (5)
nstantaniater storoge victoriater storoge vict	26.44 26.44 26.44 26.44 27 28 28 28 29 29 20 20 20 20 20 20 20 20	ater heating a stored oss: urer's de cutor from water urer's de ge loss eating s from Tal	including at point 17.12 including at point 1	of use (not) 14.92 og any sonk in dwer (this in oss factor) 2b , kWh/ye cylinder I om Tablon 4.3	95.46 95.46 95.46 14.32 plar or Water relling, eacludes in the control of th	190 x Vd,r 82.37 12.36 1WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage 0 litres in neous con/day): known:	27m / 3600 87.59 boxes (46) 13.14 within sa (47) ombi boild	88.64 0 to (61) 13.3 ame vess	Fotal = Su tth (see Ta 103.3 Fotal = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4)
nergy consistency community in the rwise comm	eous water to a large land to be	ater heating 16.59 OSS: e (litres) eating a stored loss: urer's defector from water urer's dege loss leating stored loss leati	including at point 17.12 including at point 17.12 including and no tale and the tale at tale at the tale at ta	of use (not) 14.92 Ig any so nk in dwer (this in oss factor) 2b , kWh/ye cylinder I om Tablon 4.3	95.46 95.46 95.46 14.32 plar or Water relling, eacludes in the control of th	190 x Vd,r 82.37 12.36 1WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage 0 litres in neous con/day): known: ay)	27m / 3600 87.59 boxes (46) 13.14 within sa (47) ombi boild	88.64 1 to (61) 13.3 ame vess ers) enter	Fotal = Su th (see Ta 103.3 Fotal = Su 15.49 sel er '0' in (m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4) (4) (4) (5) (5) (5) (5) (5)

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	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	ı ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Prima	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	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=	43.45	37.82	40.29	37.46	37.13	34.4	35.55	37.13	37.46	40.29	40.52	43.45		(61)
Total I	heat requ	uired for	water he	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	169.89	148.4	154.4	136.95	132.59	116.78	111.88	124.72	126.1	143.59	153.28	165.9		(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	additiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (€)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from wa	ater hea	ter											
(64)m=	169.89	148.4	154.4	136.95	132.59	116.78	111.88	124.72	126.1	143.59	153.28	165.9		
							•	Outp	out from wa	ater heate	r (annual) ₁	12	1684.46	(64)
Heat (gains froi	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m=	52.9	46.22	48.01	42.44	41.02	35.99	34.27	00.44	00.04	44.40	47.00			(65)
		l		72.77	71.02	33.33	34.27	38.41	38.84	44.42	47.62	51.58		(03)
incl	ude (57)ı		l .	<u> </u>	<u> </u>	<u> </u>		<u> </u>		<u> </u>			eating	(00)
	ude (57)ı ıternal ga	m in cald	culation (of (65)m	only if c	<u> </u>		<u> </u>		<u> </u>			eating	(03)
5. In	ternal ga	m in cald ains (see	culation of the Table 5	of (65)m and 5a	only if c	<u> </u>		<u> </u>		<u> </u>			eating	(03)
5. In	. , ,	m in cald ains (see	culation of the Table 5	of (65)m and 5a	only if c	<u> </u>		<u> </u>		<u> </u>			eating	(03)
5. In	ternal ga polic gain Jan	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	rom com	munity h	eating	(66)
5. In Metab	ternal ga polic gain Jan	m in calc ains (see as (Table Feb 91.18	ETable 5 5), Wat Mar 91.18	of (65)m 5 and 5a ts Apr 91.18	only if constant only i	Jun 91.18	Jul 91.18	Aug 91.18	or hot w Sep 91.18	ater is fr	om com	munity h	eating	
5. In Metab	ternal ga polic gain Jan 91.18 ng gains	m in calc ains (see as (Table Feb 91.18	ETable 5 5), Wat Mar 91.18	of (65)m 5 and 5a ts Apr 91.18	only if constant only i	Jun 91.18	Jul 91.18	Aug 91.18	or hot w Sep 91.18	ater is fr	om com	munity h	eating	
5. In Metab (66)m= Lightir (67)m=	Jan 91.18 ng gains	m in calcular in c	Table 5 5), Wat Mar 91.18 ted in Ap	of (65)m 6 and 5a tts Apr 91.18 ppendix 8.61	only if constraints only if constraints only if constraints on the constraint on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraint of the constraints on the constraint on the constraints on the constraint on the constraints on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint of the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the constraint on the	Jun 91.18 ion L9 o	Jul 91.18 r L9a), a	Aug 91.18 Iso see	Sep 91.18 Table 5	Oct 91.18	Nov 91.18	Dec 91.18	eating	(66)
5. In Metab (66)m= Lightir (67)m=	oolic gain Jan 91.18 ng gains 15.74	m in calcular in c	Table 5 5), Wat Mar 91.18 ted in Ap	of (65)m 6 and 5a tts Apr 91.18 ppendix 8.61	only if constraints only if constraints only if constraints on the constraint on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraints on the constraint of the constraints on the constraint on the constraints on the constraint on the constraints on the constraint on the constraint of the constraints on the constraint on th	Jun 91.18 ion L9 o	Jul 91.18 r L9a), a	Aug 91.18 Iso see	Sep 91.18 Table 5	Oct 91.18	Nov 91.18	Dec 91.18	eating	(66)
5. In Metab (66)m= Lightir (67)m= Applia (68)m=	oolic gain Jan 91.18 ng gains 15.74 nnces ga	m in calc ains (see s (Table Feb 91.18 (calcula 13.98 ins (calc	Table 5 2 5), Wat Mar 91.18 ted in Ap 11.37 ulated ir 156.47	of (65)m 5 and 5a ts Apr 91.18 ppendix 8.61 Appendix 147.62	only if construction only if c	Jun 91.18 ion L9 o 5.43 uation L	Jul 91.18 r L9a), a 5.87 13 or L1	Aug 91.18 lso see 7.63 3a), also	Sep 91.18 Table 5 10.24 see Ta 121.44	Oct 91.18 13 ble 5 130.29	Nov 91.18	Dec 91.18	eating	(66) (67)
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5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m=	Jan 91.18 ng gains 15.74 nnces gains 158.97 ng gains	m in calc ains (see s (Table Feb 91.18 (calcula 13.98 ins (calc 160.62 (calcula 32.12	Table 5 5), Wat Mar 91.18 ted in Ap 11.37 ulated ir 156.47 tted in A 32.12	of (65)m s and 5a ts Apr 91.18 ppendix 8.61 n Append 147.62 ppendix 32.12	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat	Jun 91.18 ion L9 o 5.43 uation L 125.95 tion L15	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a	Aug 91.18 Iso see 7.63 3a), also 117.28	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table	Oct 91.18 13 ble 5 130.29	Nov 91.18 15.17	Dec 91.18	eating	(66) (67) (68)
5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m=	Jan 91.18 ng gains 15.74 nnces gains 158.97 ng gains 32.12 s and far	m in calc ains (see s (Table Feb 91.18 (calcula 13.98 ins (calc 160.62 (calcula 32.12	Table 5 5), Wat Mar 91.18 ted in Ap 11.37 ulated ir 156.47 tted in A 32.12	of (65)m s and 5a ts Apr 91.18 ppendix 8.61 n Append 147.62 ppendix 32.12	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat	Jun 91.18 ion L9 o 5.43 uation L 125.95 tion L15	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a	Aug 91.18 Iso see 7.63 3a), also 117.28	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table	Oct 91.18 13 ble 5 130.29	Nov 91.18 15.17	Dec 91.18	eating	(66) (67) (68)
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5. In Metab (66)m= Lightir (67)m= Applia (68)m= Cooki (69)m= Pump (70)m=	oolic gain Jan 91.18 ng gains 15.74 nnces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev	m in calc ains (see s (Table Feb 91.18 (calcula 13.98 ins (calc 160.62 (calcula 32.12 ns gains 3	ted in Apulated in	of (65)m 5 and 5a ts Apr 91.18 ppendix 8.61 147.62 ppendix 32.12 5a) 3	only if construction only if c	Jun 91.18 ion L9 o 5.43 uation L 125.95 tion L15 32.12	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a)	Aug 91.18 lso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12	Oct 91.18 13 ble 5 130.29 5 32.12	Nov 91.18 15.17 141.46	Dec 91.18 16.18 151.96 32.12	eating	(66) (67) (68)
5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m=	oolic gain Jan 91.18 ng gains 15.74 nnces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev	m in calc ains (see s (Table Feb 91.18 (calcula 13.98 ins (calc 160.62 (calcula 32.12 ns gains 3 raporatio -72.94	ted in Apulated in	of (65)m 5 and 5a ts Apr 91.18 ppendix 8.61 Appendix 147.62 ppendix 32.12 5a) 3 tive value	only if control only if contro	Jun 91.18 ion L9 o 5.43 uation L 125.95 tion L15 32.12	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a; 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12	Oct 91.18 13 ble 5 130.29 5 32.12	Nov 91.18 15.17 141.46 32.12	Dec 91.18 16.18 151.96 32.12	eating	(66) (67) (68) (69) (70)
5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m=	oolic gain Jan 91.18 ng gains 15.74 nnces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev -72.94 heating	m in calc ains (see s (Table Feb 91.18 (calcula 13.98 ins (calc 160.62 (calcula 32.12 ns gains 3 raporatio -72.94	ted in Apulated in	of (65)m 5 and 5a ts Apr 91.18 ppendix 8.61 Appendix 147.62 ppendix 32.12 5a) 3 tive value	only if control only if contro	Jun 91.18 ion L9 o 5.43 uation L 125.95 tion L15 32.12	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a; 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12	Oct 91.18 13 ble 5 130.29 5 32.12	Nov 91.18 15.17 141.46 32.12	Dec 91.18 16.18 151.96 32.12	eating	(66) (67) (68) (69) (70)
5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m= Water (72)m=	oolic gain Jan 91.18 ng gains 15.74 nnces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev -72.94 heating	m in calc ains (see s (Table Feb 91.18 (calcula 13.98 ins (calc 160.62 (calcula 32.12 ns gains 3 raporatio -72.94 gains (T	ted in Apulated in	of (65)m 5 and 5a ts Apr 91.18 ppendix 8.61 147.62 ppendix 32.12 5a) 3 tive valu -72.94	only if construction only if c	Jun 91.18 ion L9 o 5.43 uation L 125.95 tion L15 32.12 3 ble 5) -72.94	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a) 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12 3	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12 3 -72.94	Ater is from Oct 91.18 13 ble 5 130.29 5 32.12 3 -72.94	Nov 91.18 15.17 141.46 32.12 3 -72.94	munity h Dec 91.18 16.18 151.96 32.12 3 -72.94	eating	(66) (67) (68) (69) (70) (71)
5. In Metab (66)m= Lightin (67)m= Applia (68)m= Cooki (69)m= Pump (70)m= Losse (71)m= Water (72)m=	oolic gain Jan 91.18 ng gains 15.74 nnces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev -72.94 heating 71.11 internal	m in calc ains (see s (Table Feb 91.18 (calcula 13.98 ins (calc 160.62 (calcula 32.12 ns gains 3 raporatio -72.94 gains (T	ted in Apulated in 156.47 tted in Apulated	of (65)m 5 and 5a ts Apr 91.18 ppendix 8.61 147.62 ppendix 32.12 5a) 3 tive valu -72.94	only if construction only if c	Jun 91.18 ion L9 o 5.43 uation L 125.95 tion L15 32.12 3 ble 5) -72.94	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a) 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12 3	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12 3 -72.94	Ater is from Oct 91.18 13 ble 5 130.29 5 32.12 3 -72.94	Nov 91.18 15.17 141.46 32.12 3 -72.94	munity h Dec 91.18 16.18 151.96 32.12 3 -72.94	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 Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b	-	FF Table 6c		Gains (W)	
Northeast _{0.9x} 0.77	X	0.99	x	11.28	x	0.57	x	0.7	=	6.18	(75)
Northeast _{0.9x} 0.77	X	0.99	x	22.97	x	0.57	x	0.7	=	12.57	(75)
Northeast 0.9x 0.77	X	0.99	x	41.38	x	0.57	x	0.7	=	22.65	(75)
Northeast 0.9x 0.77	X	0.99	x	67.96	x	0.57	x	0.7		37.2	(75)
Northeast _{0.9x} 0.77	X	0.99	x	91.35	x	0.57	x	0.7	=	50.01	(75)
Northeast 0.9x 0.77	X	0.99	x	97.38	x	0.57	x [0.7	=	53.32	(75)
Northeast _{0.9x} 0.77	X	0.99	x	91.1	x	0.57	x [0.7	=	49.88	(75)
Northeast _{0.9x} 0.77	X	0.99	x	72.63	x	0.57	x	0.7	=	39.76	(75)
Northeast _{0.9x} 0.77	X	0.99	x	50.42	x	0.57	x	0.7	=	27.6	(75)
Northeast _{0.9x} 0.77	X	0.99	x	28.07	x	0.57	x	0.7	=	15.37	(75)
Northeast _{0.9x} 0.77	X	0.99	X	14.2	x	0.57	x	0.7	_	7.77	(75)
Northeast _{0.9x} 0.77	X	0.99	x	9.21	x	0.57	x	0.7	=	5.04	(75)
Southeast 0.9x 0.77	X	0.99	x	36.79	x	0.57	x	0.7	=	30.22	(77)
Southeast 0.9x 0.77	X	1.58	x	36.79	X	0.57	x	0.7	=	16.07	(77)
Southeast 0.9x 0.77	X	0.99	x	62.67	x	0.57	x	0.7	=	51.47	(77)
Southeast 0.9x 0.77	X	1.58	x	62.67	х	0.57	x	0.7	=	27.38	(77)
Southeast 0.9x 0.77	X	0.99	x	85.75	x	0.57	x	0.7	=	70.42	(77)
Southeast 0.9x 0.77	X	1.58	x	85.75	x	0.57	x	0.7	=	37.46	(77)
Southeast 0.9x 0.77	X	0.99	x	106.25	х	0.57	x	0.7	=	87.26	(77)
Southeast 0.9x 0.77	X	1.58	x	106.25	X	0.57	x	0.7	=	46.42	(77)
Southeast 0.9x 0.77	X	0.99	x	119.01	x	0.57	x	0.7	=	97.73	(77)
Southeast 0.9x 0.77	X	1.58	x	119.01	x	0.57	x	0.7	=	51.99	(77)
Southeast 0.9x 0.77	X	0.99	x	118.15	x	0.57	x	0.7	=	97.03	(77)
Southeast 0.9x 0.77	X	1.58	x	118.15	x	0.57	x	0.7	=	51.62	(77)
Southeast 0.9x 0.77	X	0.99	X	113.91	x	0.57	x [0.7	_	93.55	(77)
Southeast 0.9x 0.77	X	1.58	x	113.91	x	0.57	x [0.7	=	49.76	(77)
Southeast 0.9x 0.77	X	0.99	x	104.39	x	0.57	x [0.7	=	85.73	(77)
Southeast 0.9x 0.77	X	1.58	x	104.39	X	0.57	x	0.7	=	45.61	(77)
Southeast 0.9x 0.77	X	0.99	x	92.85	x	0.57	x [0.7	=	76.25	(77)
Southeast 0.9x 0.77	X	1.58	x	92.85	x	0.57	x [0.7	=	40.57	(77)
Southeast 0.9x 0.77	X	0.99	x	69.27	x	0.57	x [0.7	=	56.88	(77)
Southeast 0.9x 0.77	X	1.58	x	69.27	x	0.57	x [0.7	=	30.26	(77)
Southeast 0.9x 0.77	X	0.99	x	44.07	x	0.57	x [0.7	=	36.19	(77)
Southeast 0.9x 0.77	X	1.58	x	44.07	x	0.57	x [0.7	=	19.25	(77)
Southeast 0.9x 0.77	X	0.99	x	31.49	x	0.57	x	0.7	=	25.86	(77)
Southeast 0.9x 0.77	X	1.58	X	31.49	x	0.57	x	0.7	_	13.76	(77)
Solar gains in watts, calcula	$\overline{}$	i	_	1	_	n = Sum(74)m	(82)m	_		ı	
(83)m= 52.47 91.42 130.5		170.88 199.74		01.96 193.19	171	1.1 144.42	102.51	63.22	44.66		(83)
Total gains – internal and so		` 	<u> </u>			00 000 00				I	(0.4)
(84)m= 351.64 388.16 416.2	26	439.41 451.1	1 4	36.68 417.4	400	.98 383.39	358.86	339.35	335.47		(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
(86)m= 1 0.99 0.99 0.97 0.92 0.79 0.62 0.66 0.87 0.98 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.8 19.93 20.15 20.45 20.72 20.92 20.98 20.97 20.85 20.5 20.1 19.78 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.96 19.96 19.97 19.98 19.98 19.99 19.98 19.97 19.97 19.97 (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 0.53 0.81 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.37 18.56 18.88 19.31 19.69 19.93 19.98 19.98 19.85 19.39 18.81 18.34 (90) <
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m=
(87)m= 19.8 19.93 20.15 20.45 20.72 20.92 20.98 20.97 20.85 20.5 20.1 19.78 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.96 19.96 19.96 19.97 19.98 19.98 19.99 19.98 19.98 19.97 19.97 (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 0.53 0.81 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.37 18.56 18.88 19.31 19.69 19.93 19.98 19.98 19.85 19.39 18.81 18.34 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)m= 18.98 19.14 19.42 19.79 20.13 20.35 20.41 20.4 20.28 19.86 <
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m=
(88)m=
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 0.53 0.81 0.96 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.37 18.56 18.88 19.31 19.69 19.93 19.98 19.98 19.85 19.39 18.81 18.34 (90) ### FLA = Living area + (4) = 0.43 (91) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 18.98 19.14 19.42 19.79 20.13 20.35 20.41 20.4 20.28 19.86 19.36 18.95 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.83 18.99 19.27 19.64 19.98 20.2 20.26 20.25 20.13 19.71 19.21 18.8 (93)
(89)m= 1 0.99 0.99 0.96 0.88 0.7 0.49 0.53 0.81 0.96 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.37 18.56 18.88 19.31 19.69 19.93 19.98 19.98 19.85 19.39 18.81 18.34 (90) ELA = Living area ÷ (4) = 0.43 (91) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 18.98 19.14 19.42 19.79 20.13 20.35 20.41 20.4 20.28 19.86 19.36 18.95 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.83 18.99 19.27 19.64 19.98 20.2 20.26 20.25 20.13 19.71 19.21 18.8 (93)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.37
(90)m= 18.37 18.56 18.88 19.31 19.69 19.93 19.98 19.98 19.85 19.39 18.81 18.34 (90) FLA = Living area ÷ (4) = 0.43 (91) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 18.98 19.14 19.42 19.79 20.13 20.35 20.41 20.4 20.28 19.86 19.36 18.95 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.83 18.99 19.27 19.64 19.98 20.2 20.26 20.25 20.13 19.71 19.21 18.8 (93)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 18.98 19.14 19.42 19.79 20.13 20.35 20.41 20.4 20.28 19.86 19.36 18.95 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.83 18.99 19.27 19.64 19.98 20.2 20.26 20.25 20.13 19.71 19.21 18.8 (93)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 18.98
(92)m= 18.98 19.14 19.42 19.79 20.13 20.35 20.41 20.4 20.28 19.86 19.36 18.95 Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.83 18.99 19.27 19.64 19.98 20.2 20.26 20.25 20.13 19.71 19.21 18.8 (93)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 18.83 18.99 19.27 19.64 19.98 20.2 20.26 20.25 20.13 19.71 19.21 18.8 (93)
(93)m= 18.83 18.99 19.27 19.64 19.98 20.2 20.26 20.25 20.13 19.71 19.21 18.8 (93)
8. Space heating requirement Set Ti to the magnitude laternal temperature obtained at step 11 of Table 0b, so that Ti m=(76)m and re-calculate
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 0.99 0.98 0.95 0.88 0.72 0.52 0.57 0.82 0.96 0.99 1 (94)
Useful gains, hmGm, W = (94)m x (84)m (95)m= 349.83 384.65 408.61 419.58 398.4 314.74 218.97 228.26 314.7 344.73 336 334.1 (95)
(95)m= 349.83 384.65 408.61 419.58 398.4 314.74 218.97 228.26 314.7 344.73 336 334.1 (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= 910.4 881.33 797.03 663.96 510.83 341.94 223.24 234.7 369.59 561.95 749.72 907.65 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m
(98)m= 417.07 333.77 288.98 175.95 83.65 0 0 0 161.61 297.88 426.72
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 2185.63 (98)
Space heating requirement in kWh/m²/year 40.08 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)
Space heating: Fraction of space heat from secondary/supplementary system 0 (201)
F (i) () (000) 4 (004)
Fraction of total heating from main system 1 $(204) = (202) \times 11 = (203) = 1$
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 1 $(204) = (202) \times [1 - (203)] = 1$ 2 $(202)
Efficiency of secondary/supplementary heating system, % (204) = (202) × [1 - (203)] = 1 (202) (204) = (202) × [1 - (202)] = 1 (202) (204) = (202) × [1 - (202)] = 1 (202) (204) = (202) × [1 - (202)] = 1 (202) (204) = (202) × [1 - (202)] = 1 (202) (204) = (202) × [1 - (202)] = 1 (202) (204) = (202) × [1 - (202)] = 1 (202) (204) = (202) × [1 - (202)] = 1 (202) (204) = (202) × [1 - (202)] = 1 (202)

												i	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating	<u> </u>		1	i i		Ι ,			404.04	007.00	400.70	Ī	
417.07	333.77	288.98	175.95	83.65	0	0	0	0	161.61	297.88	426.72		
(211)m = {[(98 461.87)m x (20 369.62	4)] } x 1	00 ÷ (20 194.85	92.63	0	0	0	0	178.97	329.88	472.56		(211)
401.87	309.02	320.03	194.03	92.03	0					211) _{15,10. 12}		2420.41	(211)
Space heating	a fuel (s	econdar	v) kWh/	month					, ,	/15,10. 12		2420.41	(= /
$= \{[(98)m \times (20)]\}$	•		• /										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
		-	-		-		Tota	l (kWh/yea	ar) =Sum(2	215) _{15,10. 12}	=	0	(215)
Water heating													
Output from wa	ater hea	ter (calc 154.4	ulated a	oove) 132.59	116.78	111.88	124.72	126.1	143.59	153.28	165.9		
Efficiency of w			130.93	132.39	110.70	111.00	124.72	120.1	143.39	133.20	103.9	81	(216)
(217)m= 87.4	87.22	86.83	85.98	84.36	81	81	81	81	85.67	86.91	87.49	01	(217)
Fuel for water		l											, ,
(219)m = (64)	•	÷ (217)	m									ı	
(219)m= 194.39	170.15	177.82	159.28	157.17	144.17	138.12	153.98	155.68	167.6	176.36	189.62		_
							lota	I = Sum(2				1984.34	(219)
Annual totals Space heating		ed main	system	1					K	Wh/year		kWh/yeai 2420.41	r ¬
Water heating			0,000										╡
-	iuei use	u										1984.34	
			ala atria	kaan ha	ı								_
Electricity for p	•										Г		
mechanical v	entilatio	n - balan				nput fron	n outside	e			94.01		(230a)
	entilatio	n - balan				nput fron	n outside	9			94.01		(230a) (230c)
mechanical v	entilation	n - balan :	iced, ext	ract or p		nput fron		of (230a)	(230g) =			124.01	, ,
mechanical vo	entilation g pump for the	n - balan :	iced, ext	ract or p		nput fron			(230g) =			124.01 277.94	(230c)
mechanical vocantral heating	entilation g pump y for the ghting	n - balan : above, I	ced, ext	ract or p	ositive ii		sum	of (230a)	(230g) =				(230c) (231)
mechanical vocations central heating Total electricity	entilation g pump y for the ghting	n - balan : above, I	ced, ext	ract or p	ositive ii	uding mi	sum	of (230a)			30	277.94	(230c) (231) (232)
mechanical vocations of the contral heating and the contral electricity for limits of the contract of the cont	entilation g pump y for the ghting	n - balan : above, I	ced, ext	ract or p	ositive in ems inclu		sum	of (230a)		ion fac	30		(230c) (231) (232)
mechanical vocations of the contral heating and the contral electricity for limits of the contract of the cont	entilation g pump y for the ghting issions	n - balan : above, l - Individ	iced, ext kWh/yea ual heati	ract or p	ems inclu En kW	uding mi	sum	of (230a)	Emiss	ion fac 2/kWh	30	277.94 Emissions	(230c) (231) (232)
mechanical vecentral heating Total electricity for li	entilation ag pump y for the aghting issions (main s	n - balan : above, l - Individ ystem 1	iced, ext kWh/yea ual heati	ract or p	ems inclu En kW	uding mi ergy /h/year	sum	of (230a)	Emiss kg CO	ion fac 2/kWh	30 tor	277.94 Emissions kg CO2/ye	(230c) (231) (232) (232)
mechanical vecentral heating Total electricity Electricity for li 12a. CO2 em	entilation ag pump y for the aghting issions (main s	n - balan : above, l - Individ ystem 1	iced, ext kWh/yea ual heati	ract or p	ems inclu En kW (21)	uding mi ergy /h/year	sum	of (230a)	Emiss kg CO	ion fac 2/kWh 16	30 tor	Emissions kg CO2/ye	(230c) (231) (232) (232) ar (261)
mechanical versions and the contral heating. Total electricity for literature in the contral heating. Electricity for literature in the contral heating. Space heating.	entilation or pump of for the or ghting or issions or (main s	n - balan : above, l - Individ ystem 1 dary)	iced, ext kWh/yea ual heati	ract or p	ems inclu En kW (21) (21)	uding mi ergy /h/year 1) x 5) x	sum	of (230a)	Emiss kg CO2	ion fac 2/kWh 16	30 tor = =	277.94 Emissions kg CO2/ye 522.81 0 428.62	(230c) (231) (232) (232) (261) (263)
mechanical vecentral heating Total electricity Electricity for li 12a. CO2 em Space heating Space heating Water heating Space and was	entilation or pump of for the or ghting issions (main s (second	n - balan : above, l - Individ ystem 1 dary)	ced, ext	ract or p	ems inclu En kW (211 (218 (26)	uding mi ergy /h/year 1) x 5) x	sum	of (230a)	Emiss kg CO: 0.2 0.5 0.2	ion fac 2/kWh 16 19	30 tor = =	277.94 Emissions kg CO2/ye 522.81 0 428.62 951.43	(230c) (231) (232) (232) ar (261) (263) (264) (265)
mechanical versions are central heating. Total electricity for limited to the central heating. Electricity for limited to the central heating. Space heating. Water heating. Space and was Electricity for personners.	entilation or pump or for the or ghting issions (main s (second ter heati	n - balan : above, l - Individ ystem 1 dary)	ced, ext	ract or p	ems incluents included the control of the control o	uding mi ergy /h/year 1) x 5) x 9) x	sum	of (230a)	Emiss kg CO: 0.2 0.5 0.5	ion fac 2/kWh 16 19	30 tor = = =	277.94 Emissions kg CO2/ye 522.81 0 428.62 951.43 64.36	(230c) (231) (232) (232) ar (261) (263) (264) (265) (267)
mechanical versions and the central heating. Total electricity for life the central heating. Electricity for life the central heating. Space heating. Water heating. Space and was Electricity for persions.	entilation of pump of for the of	n - balan : above, l - Individ ystem 1 dary)	ced, ext	ract or p	ems incluents included the control of the control o	uding mi ergy /h/year 1) x 5) x 9) x 1) + (262)	sum	of (230a)	Emiss kg CO: 0.2 0.5 0.2	ion fac 2/kWh 16 19 16	30 tor = = =	277.94 Emissions kg CO2/ye 522.81 0 428.62 951.43 64.36 144.25	(230c) (231) (232) (232) (232) (261) (263) (264) (265) (267) (268)
mechanical versions are central heating. Total electricity for limits are considered as a cons	entilation of pump of for the of ghting issions (main s (second ter heati oumps, for	n - balan : above, I - Individ ystem 1 dary) ng ans and	ual heati	ract or p	ems incluents included the control of the control o	uding mi ergy /h/year 1) x 5) x 9) x 1) + (262)	sum	of (230a)	Emiss kg CO2 0.5 0.5 0.5 0.5 (265) (2	ion fac 2/kWh 16 19 16	30 tor = = =	277.94 Emissions kg CO2/ye 522.81 0 428.62 951.43 64.36 144.25 1160.04	(230c) (231) (232) (232) (232) (261) (263) (264) (265) (267) (268) (272)
mechanical versions and the central heating. Total electricity for life the central heating. Electricity for life the central heating. Space heating. Water heating. Space and was Electricity for persions.	entilation of pump of for the oghting issions (main s (second ter heati bumps, for oumps, for oumps, for oumps, for oumps oump	n - balan : above, I - Individ ystem 1 dary) ng ans and	ual heati	ract or p	ems incluents included the control of the control o	uding mi ergy /h/year 1) x 5) x 9) x 1) + (262)	sum	of (230a)	Emiss kg CO: 0.2 0.5 0.5 0.5	ion fac 2/kWh 16 19 16	30 tor = = =	277.94 Emissions kg CO2/ye 522.81 0 428.62 951.43 64.36 144.25	(230c) (231) (232) (232) (232) (261) (263) (264) (265) (267) (268)

eight associates

Appendix Energy Assessment 40-42 Mill Lane

GREEN Scenario

			User D	etails: _						
Assessor Name:	Chris Hocknell			Strom	a Num	her:		STRO	0016363	
Software Name:	Stroma FSAP 20)12		Softwa					on: 1.0.4.10	
				Address			d-Green			
Address :	Unit 6, 40-42 Mill L					'				
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			6	4.04	(1a) x	2	.17	(2a) =	138.97	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	le)+(1r	n) 6	4.04	(4)			_		_
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	138.97	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	ī + F	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ins				, <u> </u>	0	x	10 =	0	
Number of passive vents	•				F	0	x	10 =	0	(7b)
·					Ļ			40 =		= ' '
Number of flueless gas f	ires				L	0	^	1 0 –	0	(7c)
								Air cl	hanges per ho	our
Infiltration due to chimne	vs. flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b					ontinue fr			(-)		(-/
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timbe	r frame or	0.35 for	r masonr	y constr	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corre	esponding to	the great	er wall are	a (after					
If suspended wooden	• /	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	•	,	`	,.					0	(13)
Percentage of window	s and doors draught	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, expressed in cu	ubic metre	s per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabi	lity value, then (18) = [(17) ÷ 20]+(8	B), otherwi	ise (18) = (16)				0.15	(18)
Air permeability value applie		as been dor	ne or a deg	gree air pe	meability	is being u	sed			_
Number of sides shelters Shelter factor	ed			(20) = 1 -	0 075 x (1	19)1 =			2	(19)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	•	. • /]			0.85	(20)
Infiltration rate modified f	•	ad		(21)	X (20)				0.13	(21)
Jan Feb	Mar Apr May		Jul	Aug	Sep	Oct	Nov	Dec	7	
Monthly average wind sp	1 ' 1	, our	<u> </u>	l rug	СОР	1 000	1 1101	1 200	_	
(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 1	1 5.5	L	I	•	I	I	I	J	
Wind Factor (22a)m = (2	2)m ÷ 4								-	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.16 0.16 0.16 0.14 0.14 0.12 0.12 0.13 0.14 0.14 0.15 Calculate effective air change rate for the applicable case if mechanical ventilation:
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) [If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] (24a)m = 0.3
(24a)m=
(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² × 0.5] (24d)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m = 0.3 0.29 0.29 0.27 0.27 0.26 0.26 0.25 0.26 0.27 0.28 0.28 3. Heat losses and heat loss parameter: ELEMENT Gross Openings Net Area W/m2K (W/K) k-value k-value W/m2K (W/K) k-value W/m2K (W/K) k-value N/m²-K k-value N/m²-
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m= 0
(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] (24d)m=
ELEMENT Gross area (m²) Openings Net Area A, m² W/m2K (W/K) kJ/m²·K kJ/K Doors 2 x 1.5 = 3 Windows Type 1 0.99 x1/[1/(1.4)+0.04] = 1.31 Walls Type1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type2 4.78 2 2.78 x 0.14 = 0.39 Walls Type3 3.08 0 3.08 x 0.15 = 0.46
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.3 0.29 0.29 0.27 0.27 0.26 0.26 0.25 0.26 0.27 0.28 0.28 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A, m² U-value W/m2K (W/K) kJ/m²·K kJ/K Doors 2 x 1.5 = 3 Windows Type 1 0.99 x1/[1/(1.4)+0.04] = 1.31 Windows Type 2 0.99 x1/[1/(1.4)+0.04] = 1.31 Walls Type1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type2 4.78 2 2.78 x 0.14 = 0.39 Walls Type3 3.08 0 3.08 x 0.15 = 0.46
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A , m² U-value W/m2K (W/K) kJ/m²·K kJ/K Doors 2 x 1.5 = 3 Windows Type 1 0.99 x1/[1/(1.4)+0.04] = 1.31 Windows Type 1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type2 4.78 2 2.78 x 0.14 = 0.39 Walls Type3 3.08 0 3.08 x 0.15 = 0.46
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A ,m² W/m2K A ,m² W/m2K A ,m² W/m2K A ,M² A ,M
ELEMENT Gross area (m²) Openings m² Net Area A ,m² U-value W/m2K A X U (W/K) k-value kJ/m²-K A X I (W/K) Doors 2 x 1.5 = 3 Windows Type 1 0.99 x1/[1/(1.4) + 0.04] = 1.31 Windows Type 2 0.99 x1/[1/(1.4) + 0.04] = 1.31 Walls Type1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type2 4.78 2 2.78 x 0.14 = 0.39 Walls Type3 3.08 0 3.08 x 0.15 = 0.46
area (m²) m² A ,m² W/m2K (W/K) kJ/m²·K kJ/K Doors 2 x 1.5 = 3 Windows Type 1 0.99 x1/[1/(1.4)+0.04] = 1.31 Walls Type 1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type 2 4.78 2 2.78 x 0.14 = 0.39 Walls Type 3 3.08 0 3.08 x 0.15 = 0.46
Windows Type 1 0.99 x1/[1/(1.4)+0.04] = 1.31 Windows Type 2 0.99 x1/[1/(1.4)+0.04] = 1.31 Walls Type 1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type 2 4.78 2 2.78 x 0.14 = 0.39 Walls Type 3 3.08 0 3.08 x 0.15 = 0.46
Windows Type 2 0.99 x1/[1/(1.4)+0.04] = 1.31 Walls Type1 26.8 3.96 22.84 x 0.15 = 3.43 Walls Type2 4.78 2 2.78 x 0.14 = 0.39 Walls Type3 3.08 0 3.08 x 0.15 = 0.46
Walls Type1 26.8 3.96 22.84 x 0.15 = 3.43
Walls Type2 4.78 2 2.78 × 0.14 = 0.39 Walls Type3 3.08 0 3.08 × 0.15 = 0.46
Walls Type3 3.08 0 3.08 × 0.15 = 0.46
Walls Type4 19.58 0 19.58 x 0.15 = 2.94
Walls Type5 11.14 0 11.14 x 0.13 = 1.47
Roof Type1 54.83 0 54.83 × 0.1 = 5.48
Roof Type2 2.06 0 2.06 x 0.1 = 0.21
Fotal area of elements, m ²
Party wall 23.75 x 0 = 0
Party floor 64.04
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions
Fabric heat loss, W/K = S (A x U) (26) (30) + (32) =
Heat capacity Cm = S(A x k) ((28) (30) + (32) + (32a) (32e) = 8139.05
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

if details of therm		are not kn	own (36) =	= 0.15 x (3	1)			(00)	(0.0)		Г		–
Total fabric he		alaulataa	l manthl					` '	(36) =	25\m v (5)	l	45.78	(37)
Ventilation he			T .		lun	ll	۸۰۰۰	` ,	`	25)m x (5)			
(38)m= 13.62	Feb 13.48	Mar 13.33	Apr 12.6	May 12.45	Jun 11.72	Jul 11.72	Aug 11.58	Sep 12.02	Oct 12.45	12.75	13.04		(38)
` '			12.0	12.43	11.72	11.72	11.50			<u> </u>	13.04		(00)
Heat transfer	1							` ,	= (37) + (3				
(39)m= 59.41	59.26	59.11	58.38	58.24	57.51	57.51	57.36	57.8	58.24	58.53	58.82	50.05	7(20)
Heat loss para	ameter (H	HLP), W/	′m²K						4verage = = (39)m ÷	Sum(39) ₁ (4)	12 / 12=	58.35	(39)
(40)m= 0.93	0.93	0.92	0.91	0.91	0.9	0.9	0.9	0.9	0.91	0.91	0.92		
								,	Average =	Sum(40) ₁	12 /12=	0.91	(40)
Number of da		nth (Tab	le 1a)			<u> </u>					i		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	iting ener	rgy requi	irement:								kWh/ye	ar:	
۸ · · · · · · · · · · · · · · · · ·		. 1											
Assumed occ if TFA > 13			[1 - exn	(-0.0003	49 y (TF	-Δ -13 9	12)1 + 0 (0013 x (ΓFΔ -13		09		(42)
if TFA £ 13.		· 1.70 X	. [1 - CXP	(-0.000	,45 X (11	A - 10.0	/2/] . 0.0) X 010 X (1174-10.	.0)			
Annual avera	ge hot wa	ater usaç	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		83	.91		(43)
Reduce the annu	_				_	_	o achieve	a water us	se target o	f			
not more that 12	itres per p	person per	day (all w	ater use, r	not and co	ia)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 92.31	88.95	85.59	82.24	78.88	75.52	75.52	78.88	82.24	85.59	88.95	92.31		_
Energy content o	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E)Tm / 3600			m(44) _{1 12} = ables 1b, 1	L	1006.98	(44)
(45)m= 136.89	119.72	123.54	107.71	103.35	89.18	82.64	94.83	95.96	111.84	122.08	132.57		
			<u> </u>			<u>. </u>		-	Total = Su	m(45) _{1 12} =	=	1320.31	(45)
If instantaneous	water heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,) to (61)			-		
(46)m= 20.53	17.96	18.53	16.16	15.5	13.38	12.4	14.22	14.39	16.78	18.31	19.89		(46)
Water storage			-			-							
Storage volun	ne (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	_			-			` '						
Otherwise if n		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufac		oclared b	occ fact	or is kno	wp (k\\/k	n/day/):							(40)
,				JI IS KIIO	wii (Kvvi	i/uay).					0		(48)
Temperature											0		(49)
Energy lost from		•	-		or is not		(48) x (49)) =			0		(50)
n) It manutac			-								0		(51)
Hot water sto	_												
Hot water stor	heating s	ee secti											(50)
Hot water stoll for community Volume factor	heating s from Ta	ee section ble 2a	on 4.3								0		
b) If manufact Hot water storage of the community Volume factorage of the community Temperature	heating s from Tal factor fro	ee section ble 2a m Table	on 4.3 2b	205			(47) (54)	V (EQ) (5 2) –		0		(52) (53)
Hot water sto If community Volume factor	heating s from Tal factor fro om water	ee section ble 2a m Table storage	on 4.3 2b	ear			(47) x (51)	x (52) x (53) =				

Water	storage	loss cal	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)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	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)
	-	•	culated t			59)m = ((58) ÷ 36	55 × (41)	m				'	
(mod	dified by	factor fr	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss cal	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	47.04	40.94	43.62	40.56	40.2	37.24	38.49	40.2	40.56	43.62	43.87	47.04		(61)
Total h	eat requ	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=	183.93	160.66	167.16	148.26	143.54	126.43	121.13	135.03	136.52	155.45	165.94	179.61		(62)
Solar DH		calculated	using App	endix G or	Appendix	: H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	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 wa	ater hea	ter	•		•	•			•		•	'	
(64)m=	183.93	160.66	167.16	148.26	143.54	126.43	121.13	135.03	136.52	155.45	165.94	179.61		
								Outp	out from w	ater heate	r (annual) ₁	12	1823.66	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	1] + 0.8 ;	c [(46)m	+ (57)m	+ (59)m	1	
(65)m=	57.27	50.04	51.98	45.95	44.41	38.96	37.1	41.58	42.05	48.09	51.56	55.84	_	(65)
inclu		m in cald	culation o	of (65)m	only if c	vlinder i	s in the	dwellina	or hot w	ater is fr	om com	munity h	eating	
	` '		e Table 5		•	,		J				,	<u> </u>	
		·	: 5), Wat		/-									
MEtabl	Jan	Feb	J), vvai											
(66)m=		ı reb	Mar		Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
` '	104.66		Mar 104.66	Apr 104.66	May	Jun 104.66	Jul 104.66	Aug	Sep	Oct	Nov 104.66	Dec 104.66		(66)
Liahtin		104.66	104.66	Apr 104.66	104.66	104.66	104.66	104.66	104.66	-		Dec 104.66		(66)
•	g gains	104.66 (calcula	104.66 ted in Ap	Apr 104.66 opendix	104.66 L, equat	104.66	104.66	104.66 Iso see	104.66	-		104.66		` ,
(67)m=	g gains 20.58	104.66 (calcula 18.28	104.66 ted in Ap 14.86	Apr 104.66 opendix 11.25	104.66 L, equat 8.41	104.66 ion L9 o	104.66 r L9a), a 7.67	104.66 Iso see	104.66 Table 5	104.66	104.66			(66) (67)
(67)m= Appliar	g gains 20.58 nces gai	104.66 (calcula 18.28 ins (calc	104.66 ted in Ap 14.86 ulated in	Apr 104.66 opendix 11.25 Append	104.66 L, equat 8.41 dix L, eq	104.66 ion L9 o 7.1 uation L	104.66 r L9a), a 7.67 13 or L1	104.66 Iso see 9.97 3a), also	104.66 Table 5 13.39 see Ta	104.66 17 ble 5	19.84	104.66 21.15		(67)
(67)m= Appliar (68)m=	g gains 20.58 nces gai	104.66 (calcular 18.28 ins (calc 184.91	104.66 ted in Ap 14.86 ulated in 180.12	Apr 104.66 opendix 11.25 Appendix 169.93	104.66 L, equat 8.41 dix L, eq	104.66 ion L9 of 7.1 uation L	104.66 r L9a), a 7.67 13 or L1 136.91	104.66 Iso see 9.97 3a), also	104.66 Table 5 13.39 see Ta	104.66 17 ble 5 149.99	104.66	104.66		` ′
(67)m= Appliar (68)m= Cookin	g gains 20.58 nces gai 183.01 ng gains	104.66 (calcular 18.28 ins (calcular 184.91 (calcular	104.66 ted in Ap 14.86 ulated in 180.12 ted in A	Apr 104.66 opendix 11.25 Append 169.93 opendix	104.66 L, equat 8.41 dix L, eq 157.07 L, equat	104.66 ion L9 of 7.1 uation L 144.99 ion L15	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a	104.66 Iso see 9.97 3a), also 135.01	104.66 Table 5 13.39 see Ta 139.8 ee Table	104.66 17 ble 5 149.99	104.66 19.84 162.85	104.66 21.15 174.93		(67)
(67)m= Applian (68)m= Cookin (69)m=	g gains 20.58 nces gai 183.01 ng gains 33.47	104.66 (calcular 18.28 ins (calcular 184.91 (calcular 33.47	104.66 ted in Ap 14.86 ulated in 180.12 ted in A 33.47	Apr 104.66 opendix 11.25 Append 169.93 opendix 33.47	104.66 L, equat 8.41 dix L, eq	104.66 ion L9 of 7.1 uation L	104.66 r L9a), a 7.67 13 or L1 136.91	104.66 Iso see 9.97 3a), also	104.66 Table 5 13.39 see Ta	104.66 17 ble 5 149.99	19.84	104.66 21.15		(67) (68)
(67)m= Appliar (68)m= Cookin (69)m= Pumps	g gains 20.58 nces gai 183.01 ng gains 33.47	104.66 (calcular 18.28 ins (calcular 184.91 (calcular 33.47	104.66 ted in Ap 14.86 ulated in 180.12 ted in A	Apr 104.66 opendix 11.25 Append 169.93 opendix 33.47	104.66 L, equat 8.41 dix L, eq 157.07 L, equat	104.66 ion L9 of 7.1 uation L 144.99 ion L15	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a	104.66 Iso see 9.97 3a), also 135.01	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47	104.66 17 ble 5 149.99	104.66 19.84 162.85 33.47	104.66 21.15 174.93		(67) (68)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m=	g gains 20.58 nces gai 183.01 ng gains 33.47 s and far	104.66 (calcula 18.28 ins (calc 184.91 (calcula 33.47 ns gains	104.66 ted in Ap 14.86 ulated in 180.12 ted in A 33.47 (Table 5	Apr 104.66 opendix 11.25 Append 169.93 opendix 33.47 5a)	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47	104.66 ion L9 of 7.1 uation L 144.99 tion L15 33.47	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47	104.66 Iso see 9.97 3a), also 135.01), also se 33.47	104.66 Table 5 13.39 see Ta 139.8 ee Table	104.66 17 ble 5 149.99 5 33.47	104.66 19.84 162.85	104.66 21.15 174.93 33.47		(67) (68) (69)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses	g gains 20.58 nces gains 183.01 ng gains 33.47 s and far 3 s e.g. ev	104.66 (calcular 18.28) ins (calcular 184.91) (calcular 33.47) ns gains 3	104.66 ted in Ap 14.86 ulated in 180.12 ted in Ap 33.47 (Table 5	Apr 104.66 opendix 11.25 Appendix 169.93 opendix 33.47 5a) 3	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47	104.66 ion L9 of 7.1 uation L 144.99 ion L15 33.47 3	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47	104.66 Iso see 9.97 3a), also 135.01), also se 33.47	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47	104.66 17 ble 5 149.99 5 33.47	104.66 19.84 162.85 33.47	104.66 21.15 174.93 33.47		(67) (68) (69) (70)
(67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	g gains 20.58 nces gai 183.01 ng gains 33.47 s and far 3 s e.g. ev -83.73	104.66 (calcula 18.28 ins (calc 184.91 (calcula 33.47 ns gains 3 aporatio -83.73	104.66 ted in Ap 14.86 ulated in 180.12 tted in A 33.47 (Table 5 3 on (negation)	Apr 104.66 opendix 11.25 Append 169.93 opendix 33.47 5a)	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47	104.66 ion L9 of 7.1 uation L 144.99 tion L15 33.47	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47	104.66 Iso see 9.97 3a), also 135.01), also se 33.47	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47	104.66 17 ble 5 149.99 5 33.47	104.66 19.84 162.85 33.47	104.66 21.15 174.93 33.47		(67) (68) (69)
(67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	g gains 20.58 nces gai 183.01 ng gains 33.47 s and far 3 s e.g. ev -83.73 heating	104.66 (calcula 18.28 ins (calcula 184.91) (calcula 33.47 ins gains 3 raporatio -83.73 gains (T	104.66 ted in Ap 14.86 ulated in 180.12 ted in Ap 33.47 (Table 5 3 on (negation 1.83.73) Table 5)	Apr 104.66 ppendix 11.25 Append 169.93 ppendix 33.47 5a) 3 tive valu -83.73	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47 3 es) (Tab	104.66 ion L9 of 7.1 uation L 144.99 ion L15 33.47 3 le 5) -83.73	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47	104.66 Iso see 9.97 3a), also 135.01), also se 33.47	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47 3 -83.73	104.66 17 ble 5 149.99 5 33.47 3	104.66 19.84 162.85 33.47 3	104.66 21.15 174.93 33.47 3		(67) (68) (69) (70)
(67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	g gains 20.58 nces gai 183.01 ng gains 33.47 and far 3 s e.g. ev -83.73 heating 76.98	104.66 (calcular 18.28) ins (calcular 184.91) (calcular 33.47) ns gains 3 raporation -83.73 gains (T	104.66 ted in Ap 14.86 ulated in 180.12 ted in Ap 33.47 (Table 5 3 in (negation -83.73) Table 5) 69.87	Apr 104.66 opendix 11.25 Appendix 169.93 opendix 33.47 5a) 3	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47	104.66 ion L9 of 7.1 uation L 144.99 ion L15 33.47 3 le 5) -83.73	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47 3	104.66 Iso see 9.97 3a), also 135.01 0, also se 33.47 3	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47 3 -83.73	104.66 17 ble 5 149.99 5 33.47 3 -83.73	104.66 19.84 162.85 33.47 3 -83.73	104.66 21.15 174.93 33.47 3 -83.73		(67) (68) (69) (70)
(67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	g gains 20.58 nces gai 183.01 ng gains 33.47 and far 3 s e.g. ev -83.73 heating 76.98	104.66 (calcula 18.28 ins (calcula 184.91) (calcula 33.47 ins gains 3 raporatio -83.73 gains (T	104.66 ted in Ap 14.86 ulated in 180.12 ted in Ap 33.47 (Table 5 3 in (negation -83.73) Table 5) 69.87	Apr 104.66 ppendix 11.25 Append 169.93 ppendix 33.47 5a) 3 tive valu -83.73	104.66 L, equat 8.41 dix L, eq 157.07 L, equat 33.47 3 es) (Tab	104.66 ion L9 of 7.1 uation L 144.99 ion L15 33.47 3 le 5) -83.73	104.66 r L9a), a 7.67 13 or L1 136.91 or L15a) 33.47 3	104.66 Iso see 9.97 3a), also 135.01 0, also se 33.47 3	104.66 Table 5 13.39 see Ta 139.8 ee Table 33.47 3 -83.73	104.66 17 ble 5 149.99 5 33.47 3	104.66 19.84 162.85 33.47 3 -83.73	104.66 21.15 174.93 33.47 3 -83.73		(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 Fa Table 6d	actor	Area m²	a		Flu Tal	x ole 6a		Т	g_ able 6b		FF Table 6c		Gains (W)	
Northeast 0.9	0.77	X	0	99	x	1	1.28	x		0.57	x	0.7	=	3.09	(75)
Northeast 0.9	0.77	X	0	99	X	2	2.97	X		0.57	x	0.7	_	6.29	(75)
Northeast 0.9	0.77	x	0	99	X	4	1.38	x		0.57	x	0.7		11.33	(75)
Northeast 0.9	0.77	х	0	99	X	6	7.96	x		0.57	x	0.7		18.6	(75)
Northeast 0.9	0.77	х	0	99	X	9	1.35	x		0.57	x	0.7		25.01	(75)
Northeast 0.9	0.77	х	0	99	x	9	7.38	x		0.57	x	0.7		26.66	(75)
Northeast 0.9	0.77	х	0	99	X	9	91.1	x		0.57	x	0.7		24.94	(75)
Northeast 0.9	0.77	x	0	99	X	7	2.63	x		0.57	×	0.7		19.88	(75)
Northeast 0.9	0.77	x	0	99	X	5	0.42	x		0.57	×	0.7	-	13.8	(75)
Northeast 0.9	0.77	x	0	99	X	2	8.07	x		0.57	x	0.7	-	7.68	(75)
Northeast 0.9	0.77	x	0	99	X	_	14.2	X		0.57	x	0.7	-	3.89	(75)
Northeast 0.9	0.77	x	0	99	x	9	9.21	x		0.57	×	0.7	-	2.52	(75)
Northwest 0.9	0.77	x	0.	99	x	1	1.28	x		0.57	×	0.7		9.27	(81)
Northwest 0.9	0.77	x	0.	99	x	2	2.97	X		0.57	×	0.7		18.86	(81)
Northwest 0.9	0.77	x	0	99	x	4	1.38	x		0.57	×	0.7	-	33.98	(81)
Northwest 0.9	0.77	x	0.	99	x	6	7.96	x		0.57	×	0.7		55.81	(81)
Northwest 0.9	0.77	x	0.	99	x	9	1.35	X		0.57	×	0.7		75.02	(81)
Northwest 0.9	0.77	x	0	99	x	9	7.38	x		0.57	×	0.7	<u> </u>	79.97	(81)
Northwest 0.9	0.77	x	0	99	x	9	91.1	x		0.57	×	0.7		74.81	(81)
Northwest 0.9	0.77	x	0	99	x	7	2.63	x		0.57	×	0.7		59.64	(81)
Northwest 0.9	0.77	×	0	99	×	5	0.42	j×		0.57	×	0.7		41.41	(81)
Northwest 0.9	0.77	x	0	99	x	2	8.07	X		0.57	×	0.7		23.05	(81)
Northwest 0.9	0.77	×	0	99	x	_	14.2	j×		0.57	×	0.7		11.66	(81)
Northwest 0.9	0.77	×	0	99	x		9.21	j×		0.57	×	0.7		7.57	(81)
0.1			16					-		(7.1)					
Solar gains i	- 1 - 1	45.31	74.41	100.0	\neg	06.63	99.75	`	n = S .52	um(74)m 55.21	(82)m 30.73		10.09	٦	(83)
Total gains -				1				1		00.2		1	10.00	_	` '
(84)m= 350.3		367.56	376.82	382.6	``	70.24	351.6	33	7.8	324.19	319.7	5 327.24	338.62		(84)
7. Mean int	ernal temn	erature	(heatin	n seaso	nn)								ı		
Temperatu			`			area f	rom Tal	hle 9	Th	1 (°C)				21	(85)
Utilisation f	•	٠.			_			0.00	,	. (0)					(00)
Jar	$\overline{}$	Mar	Apr	Ma	Ť	Jun	Jul	Га	ug	Sep	Oct	Nov	Dec		
(86)m= 1	1	1	0.99	0.96	—	0.86	0.69	+	74	0.93	0.99	1	1	┪	(86)
Mean interr	al tompor	aturo in	living o	1 T1	(follo	w oto	no 2 to 7	 7 in 7	l	. 00)				_	
(87)m= 20.02		20.25	20.49	20.73	`	20.92	20.98	1	.98	20.85	20.56	20.25	20	7	(87)
Temperatu	e durina h	eating r	eriods	n rest o	of dv	vellina	from Ta	able	9. TI	n2 (°C)			•	_	
(88)m= 20.14		20.15	20.16	20.16	_	20.17	20.17	1	.17	20.17	20.16	20.16	20.15	7	(88)
Utilisation f	actor for da	ains for	rest of a	lwelling	 ı h2	m (se	e Tahle	(20)		!				_	
(89)m= 1	1 1	1	0.99	0.94		0.79	0.57	0.0	63	0.89	0.99	1	1	٦	(89)
` ′				1			<u> </u>						1	_	•

Mean	internal	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.82	18.93	19.16	19.52	19.86	20.11	20.16	20.16	20.03	19.62	19.17	18.81		(90)
					<u> </u>		l		f	fLA = Livin	g area ÷ (4	1) =	0.31	(91)
Mean	internal	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	19.19	19.28	19.49	19.81	20.13	20.36	20.41	20.41	20.28	19.9	19.5	19.17		(92)
Apply	adjustn	nent to the	he mean	internal	l tempera	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.04	19.13	19.34	19.66	19.98	20.21	20.26	20.26	20.13	19.75	19.35	19.02		(93)
8. Sp	ace hea	ting requ	uirement											
			ernal ter or gains	•		ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:	•									
(94)m=	1	1	0.99	0.98	0.94	0.79	0.59	0.64	0.89	0.98	1	1		(94)
Usefu	ıl gains,	hmGm ,	, W = (94	4)m x (84	4)m									
(95)m=	349.45	358.95	365.13	369.89	358.64	294.11	206.95	215.45	288.13	313.91	325.71	337.94		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	x [(93)m	– (96)m	<u></u>				
(97)m=	875.41	843.43	759.17	628.36	482.13	322.4	210.65	221.36	348.44	533.09	717.15	871.86		(97)
Space	e heating	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	4 x [(97)m – (95)m] x (4	1)m			
(98)m=	391.32	325.57	293.17	186.1	91.88	0	0	0	0	163.07	281.84	397.24		
					•			Tota	l per vear	(kWh/year) = Sum(9	8) _{15.912} =	2130.18	(98)
-														
Space	e heating	a require	ement in	kWh/m²	²/vear					` •	`	,	33 26	(99)
		• •	ement in		•								33.26	(99)
9a. En	ergy req	uiremer	ement in nts – Indi		•	ystems i	ncluding						33.26	(99)
9a. En	ergy req e heatir	uiremer ng:	nts – Indi	vidual h	eating sy									
9a. En Spac Fracti	ergy req e heatir on of sp	uiremer ng: pace hea	nts – Indi at from se	vidual h	eating sy		system	micro-C	CHP)				0	(201)
9a. En Spac Fracti	ergy req e heatir on of sp on of sp	uiremerng: oace head	nts – Indi at from se at from m	vidual h econdary	eating sy y/supple em(s)		system	micro-C (202) = 1 -	CHP) - (201) =					(201)
9a. En Spac Fracti	ergy req e heatir on of sp on of sp	uiremer ig: bace hea bace hea	nts – Indi at from se	vidual h econdary	eating sy y/supple em(s)		system	micro-C (202) = 1 -	CHP)				0	(201)
9a. En Spac Fracti Fracti	ergy red e heatir on of sp on of sp	uiremer ng: pace hea pace hea tal heati	nts – Indi at from se at from m	vidual h econdary nain syst main sys	eating sy y/supple tem(s) stem 1		system	micro-C (202) = 1 -	CHP) - (201) =				0	(201)
9a. En Spac Fracti Fracti Fracti	ergy red e heatir ion of sp ion of to ency of r	uiremer ng: pace hea pace hea tal heatii main spa	nts – Indi at from se at from m	econdary nain syst main syst ing syste	eating sy y/supple rem(s) stem 1	mentary	system	micro-C (202) = 1 -	CHP) - (201) =				0 1 1	(201) (202) (204)
9a. En Spac Fracti Fracti Fracti	ergy red e heatir ion of sp ion of to ency of r	uiremer ng: pace hea pace hea tal heatii main spa	nts – Indi at from se at from m ng from a ace heat	econdary nain syst main syst ing syste	eating sy y/supple rem(s) stem 1	mentary	system	micro-C (202) = 1 -	CHP) - (201) =		Nov	Dec	0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Fracti Efficie	ergy red e heatir ion of sp ion of to ency of r ency of s	uiremenng: pace head pace head tal heating main space seconda	at from set from ming from mace heating	vidual h econdary nain syst main sys ing syste ementar Apr	eating sy y/supple rem(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =			0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Fracti Efficie	ergy red e heatir ion of sp ion of to ency of r ency of s	uiremenng: pace head pace head tal heating main space seconda	at from so at from m ag from a ace heati ry/supple Mar	vidual h econdary nain syst main sys ing syste ementar Apr	eating sy y/supple rem(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =			0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Efficie Efficie	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require	at from set from many from mace heating ry/supplement (co. 293.17	econdary nain systemain systementar Apr alculatee	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system 1, % Jul	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =	Nov	Dec	0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Efficie Efficie	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin 391.32	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require	at from so at from m ace heati ry/supple Mar ement (c 293.17	econdary nain systemain systementar Apr alculatee	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 91.88	mentary g system Jun	system 1, % Jul	micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 - ((203)] =	Nov 281.84	Dec	0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Efficie Efficie	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require 325.57	at from set from mace heating ry/supplement (co. 293.17	econdary nain systemain systementar Apr alculated 186.1 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above)	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0	Sep 0	(203)] = Oct 163.07	Nov 281.84	Dec 397.24	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Spac Fracti Fracti Efficie Efficie (211)m	ergy red e heatir on of sp on of tot ency of r ency of s Jan e heatin 391.32 n = {[(98) 433.35	uiremenng: pace head tal heating main spanseconda Feb grequire 325.57)m x (20 360.55	at from so at from m ace heati ry/supple Mar ement (c 293.17 4)] } x 1	econdary nain systemain systementar Apr alculatee 186.1 00 ÷ (20 206.09	eating sy y/supple rem(s) stem 1 em 1 y heating May d above; 91.88	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0	Sep 0	(203)] = Oct	Nov 281.84	Dec 397.24	0 1 1 90.3	(201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Efficie Space (211)m	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin 391.32 n = {[(98) 433.35}	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require 325.57)m x (20 360.55	at from set from mace heating ry/supplement (c 293.17 4)] } x 1 324.66	econdary nain systemain systematrar Apr alculated 186.1 00 ÷ (20 206.09	eating sy y/supple rem(s) stem 1 em 1 y heating May d above; 91.88	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0	Sep 0	(203)] = Oct 163.07	Nov 281.84	Dec 397.24	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Space Fracti Fracti Efficie Efficie Space (211)m	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin 391.32 n = {[(98 433.35) e heatin)m x (20	uirement ng: pace heat tal heatin main spa seconda Feb g require 325.57)m x (20 360.55	at from so at from m ng from m ace heati ry/supple Mar ement (c 293.17 4)] } x 1 324.66	econdary nain systemain systematar Apr alculatee 186.1 00 ÷ (20 206.09	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 91.88 06) 101.75	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Spac Fracti Fracti Efficie Space (211)m	ergy red e heatir on of sp on of to ency of r ency of s Jan e heatin 391.32 n = {[(98 433.35) e heatin)m x (20	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require 325.57)m x (20 360.55	at from set from mace heating ry/supplement (c 293.17 4)] } x 1 324.66	econdary nain systemain systematrar Apr alculated 186.1 00 ÷ (20 206.09	eating sy y/supple rem(s) stem 1 em 1 y heating May d above; 91.88	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Space Fracti Fracti Efficie Efficie (211)m Space = {[(98 (215)m=	ergy requested enterprises on of spon of too ency of spon of spon of too ency of spon	uirement of the property of th	at from so at from m ng from m ace heati ry/supple Mar ement (c 293.17 4)] } x 1 324.66	econdary nain systemain systematar Apr alculatee 186.1 00 ÷ (20 206.09	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 91.88 06) 101.75	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Space Fracti Fracti Efficie Efficie Space (211)m Space = {[(98)(215)m=	ergy red e heating on of sp on of to ency of r ency of s Jan e heating 391.32 n = {[(98 433.35] e heating)m x (20 heating	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require 325.57)m x (20 360.55 g fuel (so 1)] } x 1	at from set from many from	econdary nain systemain systemater Apr alculater 186.1 00 ÷ (20 206.09 y), kWh/8) 0	eating sy y/supple rem(s) stem 1 em 1 y heating May d above) 91.88 06) 101.75	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Space Fracti Fracti Efficie Efficie Space (211)m Space = {[(98)(215)m=	ergy red e heating on of sp on of to ency of r ency of s Jan e heating 391.32 n = {[(98 433.35] e heating)m x (20 heating	uirements pace head pace head tal heating main space seconda Feb g require 325.57)m x (20 360.55 g fuel (so 01)] } x 1 0	at from so at from m ng from m ace heati ry/supple Mar ement (c 293.17 4)] } x 1 324.66	econdary nain systemain systemater Apr alculater 186.1 00 ÷ (20 206.09 y), kWh/8) 0	eating sy y/supple rem(s) stem 1 em 1 y heating May d above) 91.88 06) 101.75	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 0 0 0 0 0 0 0 0 1 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear
9a. En Space Fracti Fracti Efficie Efficie Space (211)m Space = {[(98 (215)m=	ergy requested entering on of spon of too on on on on on on on on on on on on o	uiremer ng: pace hea pace hea tal heatin main spa seconda Feb g require 325.57)m x (20 360.55 g fuel (so 1)] } x 1	at from so at from mage heating supplement (c 293.17 4)] } x 1 324.66 econdary 00 ÷ (20 0 ter (calculation)	econdary nain systemain systemater Apr alculatee 186.1 00 ÷ (20 206.09 y), kWh/ 8) 0	eating syly/supple tem(s) stem 1 lem 1 lem 1 lem May dabove ylong 101.75 lem 101.75 lem 101.75 lem 101.75 lem 10 l	g system Jun 0	system 1, % Jul 0	micro-C (202) = 1 - (204) = (204) Aug 0 Tota	Sep 0 1 (kWh/yea	Oct 163.07 180.58 ar) = Sum(2	Nov 281.84 312.11 211) _{15,10. 12} 0 215) _{15,10. 12}	Dec 397.24 439.91	0 1 1 90.3 0 kWh/ye	(201) (202) (204) (206) (208) ear

								1	
(217)m= 87.1 87 86.69 85.93	84.39 81	81	81	81	85.51	86.61	87.18		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)m= 211.16 184.67 192.84 172.55	170.09 156.08	149.54	166.7	168.54	181.8	191.59	206.01		
	!	- I	Tota	al = Sum(2	19a) ₁₁₂ =		l	2151.57	(219)
Annual totals					k	Wh/year	•	kWh/year	_
Space heating fuel used, main system 1	1							2359	
Water heating fuel used								2151.57]
Electricity for pumps, fans and electric k	eep-hot								
mechanical ventilation - balanced, extr	act or positive	input from	n outsid	е			150.47		(230a)
central heating pump:							30		(230c)
Total electricity for the above, kWh/year			sum	of (230a)	(230g) =	:		180.47	(231)
Electricity for lighting								363.41	(232)
Electricity generated by PVs								-1381.79	(233)
12a. CO2 emissions – Individual heating	ng systems inc	luding m	cro-CHF)					
12a. CO2 emissions – Individual heating			cro-CHF)	Emice	ion fac	tor	Emissions	
12a. CO2 emissions – Individual heating	E	luding m nergy Wh/year	cro-CHF)	Emiss kg CO	i on fac 2/kWh	tor	Emissions kg CO2/yea	ır
12a. CO2 emissions – Individual heating Space heating (main system 1)	E k¹	nergy	cro-CHF	0		2/kWh	tor =		ır (261)
	E k\ (2	nergy Wh/year	cro-CHF		kg CO	2/kWh		kg CO2/yea	_
Space heating (main system 1)	E k\((2	nergy Wh/year	cro-CHF		kg CO	2/kWh	=	kg CO2/yea	(261)
Space heating (main system 1) Space heating (secondary)	E k\((2 (2 (2	nergy Wh/year			0.2 0.5	2/kWh	=	kg CO2/yea	(261) (263)
Space heating (main system 1) Space heating (secondary) Water heating	E k\((2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2	nergy Wh/year 11) x 15) x			0.2 0.5	2/kWh 16 19 16	=	kg CO2/yea 509.54 0 464.74	(261) (263) (264)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	(2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	nergy Wh/year 11) x 15) x 19) x			0.2 0.5 0.2	2/kWh 16 19 16 19	= = =	kg CO2/yea 509.54 0 464.74 974.28	(261) (263) (264) (265)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric k	(2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	nergy Wh/year 11) x 15) x 19) x 61) + (262) 31) x			0.2 0.5 0.5	2/kWh 16 19 16 19	= = =	kg CO2/yea 509.54 0 464.74 974.28	(261) (263) (264) (265) (267)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keeps to be a simple of the secondary to be a simple of	(2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	nergy Wh/year 11) x 15) x 19) x 61) + (262) 31) x			0.2 0.5 0.5	2/kWh 16 19 16 19 19	= = =	kg CO2/yea 509.54 0 464.74 974.28	(261) (263) (264) (265) (267)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric k Electricity for lighting Energy saving/generation technologies	(2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	nergy Wh/year 11) x 15) x 19) x 61) + (262) 31) x		(264) =	0.2 0.5 0.5 0.5	2/kWh 16 19 16 19 19 19	= = = = = = = = = = = = = = = = = = = =	kg CO2/yea 509.54 0 464.74 974.28 93.66 188.61	(261) (263) (264) (265) (267) (268)

El rating (section 14)

(274)

			User D	etails: _						
Assessor Name:	Chris Hocknell			Strom	a Num	her:		STRC	0016363	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.10	
		Pi					d-Green			
Address :	Unit 7, 40-42 Mill L	ane, Lond	don, NW	/6 1NR						
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			5	4.53	(1a) x	2	.13	(2a) =	116.31	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	e)+(1n	1) 5	4.53	(4)			_		
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	116.31	(5)
2. Ventilation rate:										
		secondar heating	У	other		total			m³ per hou	r
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0		0	i - F	0	x	20 =	0	(6b)
Number of intermittent fa	ans				_ -	0	x	10 =	0	(7a)
Number of passive vents					L	0	x	10 =	0	(7b)
•					Ļ			40 =		=
Number of flueless gas f	nres					0	^,	+0 -	0	(7c)
								Air cl	hanges per ho	our
Infiltration due to chimne	evs_flues and fans = (6a)+(6b)+(7	a)+(7b)+(7c) =	Г	0		÷ (5) =		(8)
If a pressurisation test has					ontinue fr			- (0)		
Number of storeys in t			• •			. ,	,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber	frame or	0.35 for	masonr	y constr	ruction			0	(11)
	oresent, use the value corre	sponding to	the great	er wall are	a (after					
deducting areas of open If suspended wooden	• /	aled) or 0	1 (seale	d) else	enter ()				0	(12)
If no draught lobby, er	•	alca) or o.	i (ocaic	,a), cioc	Cittor o				0	(13)
Percentage of window		stripped							0	(14)
Window infiltration	3			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, expressed in cu	bic metre	s per ho	our per so	quare m	etre of e	envelope	area	3	(17)
If based on air permeab	ility value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.15	(18)
Air permeability value appli	es if a pressurisation test ha	as been don	e or a deg	gree air pe	meability	is being u	sed			
Number of sides shelter	ed			(00)		10)1			2	(19)
Shelter factor				(20) = 1 -		19)] =			0.85	(20)
Infiltration rate incorpora	-			(21) = (18)) x (20) =				0.13	(21)
Infiltration rate modified		1 1					<u> </u>		7	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s		, ,							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	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		
								L	_	

Adjusted infiltra	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	1	
Calculate effec						1	0.12	0.10	0.14	0.14	0.10	J	
If mechanica	al ventilat	tion:										0.5	(23
If exhaust air he	eat pump u	sing Appe	endix N, (2	3b) = (23a	a) × Fmv (equation (N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat recov	very: effic	iency in %	allowing f	for in-use f	actor (fror	n Table 4h) =				75.65	(2:
a) If balance						- 	- ^ ` -	í `	 		- ` ` `) ÷ 100]	
24a)m= 0.28	0.28	0.28	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.27	0.27		(24
b) If balance					1		, 	ŕ	· ` `		ı	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole he if (22b)m	ouse ext n < 0.5 ×			•	•				.5 × (23b))			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)m	ventilation n = 1, the								0.5]			_	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
Effective air	change r	rate - er	nter (24a) or (24b	b) or (24	c) or (24	ld) in bo	x (25)	•	•	•	•	
25)m= 0.28	0.28	0.28	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.27	0.27		(2
3. Heat losses	s and he	at loss r	paramete	er:									
LEMENT	Gros area (S	Openin	gs	Net Ar	ea	U-val	ue	AXU		k-value		AXk
		([[]	m) ^	1. A	n²	W/m2	2K	(W/I	〈)	kJ/m²·	K	kJ/K
oors	aica ((111-)	m) *	A ,ı	m² x	W/m2	2K =	(W/l	<) 	kJ/m²·	K	kJ/K
		(111-)	m	l *		x	W/m2 1.5 /[1/(1.4)+	=	(W/F 3	<) 	kJ/m²·∣	K	(2
Vindows Type	: 1	(m-)	m	14	2	x x1	1.5	0.04] =	3	<) 	kJ/m²·	K	(2
Vindows Type Vindows Type	e 1 e 2	(111-)	m	14	0.99	x x1 x1	1.5 /[1/(1.4)+	0.04] = 0.04] =	3 1.31	<) 	kJ/m²·∣	K	(2 (2
Vindows Type Vindows Type Vindows Type	e 1 e 2		6.53		0.99 0.99 1.58	x1 x1 x1	1.5 /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] =	3 1.31 1.31	<>	kJ/m²·∣	к —	(2 (2 (2
Doors Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2	29.6	1	6.53		2 0.99 0.99 1.58 23.08	x1 x1 x1 x1 x1 x1	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	3 1.31 1.31 2.09 3.46	<)	kJ/m²·	K	(2 (2 (2 (2
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2	29.6	1 5	6.53		2 0.99 0.99 1.58 23.08	x1 x1 x1 x1 3 x	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.15 0.14	0.04] = 0.04] = 0.04] =	3 1.31 1.31 2.09 3.46 1.7	<)	kJ/m²·	к] [(2) (2) (2) (2) (2) (2)
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3	29.6° 14.05 4.62	1 5	6.53		2 0.99 0.99 1.58 23.08 12.09 4.62	x1 x1 x1 x1 3 x x x x x x	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.15 0.14 0.15	= 0.04] = 0.04] = 0.04] = = = = = = =	3 1.31 1.31 2.09 3.46 1.7 0.69	<)	kJ/m²·	к] [(2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Valls Type4	29.6° 29.6° 14.05 4.62 24.66	1 5	6.53 2 0		2 0.99 0.99 1.58 23.08 12.09 4.62 24.69	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.15 0.14 0.15	= 0.04] = 0.04] = 0.04] = = = = = = = = =	3 1.31 1.31 2.09 3.46 1.7 0.69 3.7	<)	kJ/m²·	K	(2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Valls Type4 Roof Type1	29.6° 29.6° 14.05 4.62 24.66	1 5 9	6.53 2 0 0		2 0.99 0.99 1.58 23.08 12.09 4.62 24.69	x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.15 0.14 0.15 0.15	= 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	3 1.31 1.31 2.09 3.46 1.7 0.69 3.7 4.27	<)	kJ/m²·	K	(2 (2 (2 (2 (2 (2 (2 (3 (3
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Valls Type4 Roof Type1	29.6° 29.6° 4.62 24.69 42.66 2.85	1 5 9 6	6.53 2 0		2 0.99 0.99 1.58 23.08 12.09 4.62 24.69 42.66	x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.15 0.14 0.15	= 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	3 1.31 1.31 2.09 3.46 1.7 0.69 3.7		kJ/m²·		(2 (2 (2 (2 (2 (2 (2 (3 (3 (3
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Valls Type4 Roof Type1 Roof Type2	29.6° 29.6° 4.62 24.69 42.66 2.85	1 5 9 6	6.53 2 0 0		2 0.99 0.99 1.58 23.08 12.09 4.62 24.69 42.66 2.85	x x1 x1 x1 x1 33 x x 55 x x x 55 x x x 88	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.15 0.14 0.15 0.15 0.11 0.15	= 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	3 1.31 2.09 3.46 1.7 0.69 3.7 4.27		kJ/m²·	K	(2 (2 (2 (2 (2 (2 (3 (3 (3 (3
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Valls Type4 Roof Type1 Coof Type2 Total area of e	29.6° 29.6° 4.62 24.69 42.66 2.85	1 5 9 6	6.53 2 0 0		2 0.99 0.99 1.58 23.08 12.09 4.62 24.69 42.66 2.85 118.4	x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.15 0.14 0.15 0.15	= 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	3 1.31 1.31 2.09 3.46 1.7 0.69 3.7 4.27		kJ/m²·	K	(2 (2 (2 (2 (2 (2 (3 (3 (3 (3
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Valls Type4 Roof Type1 Cotal area of e Party wall Party floor for windows and	29.6° 29.6° 14.05 4.62 24.66 42.66 2.85	1 5 9 6 m²	6.53 2 0 0 0	indow U-va	2 0.99 0.99 1.58 23.08 12.09 4.62 24.68 42.66 2.85 118.4 23.58 54.53 alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	3 1.31 2.09 3.46 1.7 0.69 3.7 4.27 0.28				(2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Valls Type4 Roof Type1 Roof Type2 Total area of e Party wall Party floor for windows and	29.6° 29.6° 14.05 4.62 24.66 2.85 elements,	1 5 9 6 m² ws, use e	6.53 2 0 0 0 0	indow U-va	2 0.99 0.99 1.58 23.08 12.09 4.62 24.68 42.66 2.85 118.4 23.58 54.53 alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	3 1.31 2.09 3.46 1.7 0.69 3.7 4.27 0.28				(2 (2 (2 (2 (2 (3 (3 (3 (3 (3
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Valls Type4	29.6° 29.6° 14.05 4.62 24.66 2.85 2.85 2.85 2.85 2.85 2.85 2.85 2.85	1 5 6 m ² ws, use esides of ir: S (A x	6.53 2 0 0 0 0	indow U-va	2 0.99 0.99 1.58 23.08 12.09 4.62 24.68 42.66 2.85 118.4 23.58 54.53 alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04	3 1.31 2.09 3.46 1.7 0.69 3.7 4.27 0.28	as given in	paragraph		(2 (2 (2 (2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Vindows Type Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Valls Type4 Roof Type1 Coof Type2 Total area of e Party wall Party floor for windows and Tinclude the area Fabric heat los	29.67 14.05 4.62 24.66 2.85 Llements, roof windo as on both ses, W/K = Cm = S(A)	m ² Single Market Mar	6.53 2 0 0 0 0 stiffective winternal walk	ndow U-va	2 0.99 0.99 1.58 23.08 12.09 4.62 24.69 42.66 2.85 118.4 23.58 54.50 alue calculatitions	x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	1.5 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	= 0.04] = 0.04	3 1.31 1.31 2.09 3.46 1.7 0.69 3.7 4.27 0.28	as given in	paragraph	13.2	(2 (2 (2 (2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3

	at loss							• •	(36) =		l	51.74	(3
entilation hea	at loss ca	alculated	monthly			ı		· , ,	= 0.33 × (25)m x (5)	· · · · · · · · · · · · · · · · · · ·		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 10.91	10.79	10.67	10.06	9.93	9.32	9.32	9.2	9.57	9.93	10.18	10.42		(38
eat transfer	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
9)m= 62.66	62.53	62.41	61.8	61.68	61.07	61.07	60.94	61.31	61.68	61.92	62.17		
					=		=		_	Sum(39) ₁	₁₂ /12=	61.77	(3
eat loss para	`								= (39)m ÷	` '	1		
0)m= 1.15	1.15	1.14	1.13	1.13	1.12	1.12	1.12	1.12	1.13	1.14	1.14		–
umber of day	s in mor	nth (Tabl	e 1a)					,	Average =	Sum(40) ₁	12 /12=	1.13	(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 10/242 12 22	tion and										Lal A II a Iv		
I. Water hea	ting ener	gy requi	rement:								kWh/ye	ear:	
ssumed occi											82		(4
if TFA > 13.		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)			
if TFA £ 13.	•		.a.ia.litua		\/al a		(05 × NI)	. 26					
nnual averageduce the annual									se target o		.51		(4
t more that 125	_				_	_							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage i		-	-										
Nm= 85.26	82.16	79.06	75.96	72.86	69.76	69.76	72.86	75.96	79.06	82.16	85.26		
4)m= 85.26	82.16	79.06	75.96	72.86	69.76	69.76	72.86					930.12	(<u>/</u>
4)m= 85.26 nergy content of								•	Total = Su	m(44) _{1 12} =		930.12	(4
ergy content of								•	Total = Su	m(44) _{1 12} =		930.12	(4
nergy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E)Tm / 3600	88.64	Total = Sunth (see Ta	m(44) _{1 12} = ables 1b, 1	c, 1d)	930.12	
pergy content of 126.44	hot water	used - cald	culated mo	95.46	190 x Vd,r	76.33	9Tm / 3600 87.59	88.64	Total = Sunth (see Ta	m(44) _{1 12} = ables 1b, 1	c, 1d)		
nergy content of 126.44	hot water	used - cald	culated mo	95.46	190 x Vd,r	76.33	9Tm / 3600 87.59	88.64	Total = Sunth (see Ta	m(44) _{1 12} = ables 1b, 1	c, 1d)		(4
nergy content of 126.44 instantaneous v 18.97	110.58 vater heatin 16.59	used - cald	99.49 of use (no	onthly = 4. 95.46 hot water	190 x Vd,r 82.37 storage),	76.33 enter 0 in	07m / 3600 87.59 boxes (46)	88.64) to (61)	Total = Sunth (see Tail 103.3	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} =	c, 1d)		(4
ergy content of 126.44 nstantaneous v i)m= 18.97 ater storage	110.58 vater heatin 16.59 loss:	used - cale 114.11 ng at point 17.12	of use (no.	95.46 9 hot water	190 x Vd,rd 82.37 storage),	76.33 enter 0 in	97m / 3600 87.59 boxes (46) 13.14	88.64) to (61)	Total = Su tth (see Ta 103.3 Total = Su 15.49	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} =	c, 1d)		(4
ergy content of 126.44 Instantaneous v S)m= 18.97 ater storage volum	110.58 110.58 vater heatin 16.59 loss: ne (litres)	used - cald 114.11 ng at point 17.12 includin	99.49 of use (not) 14.92 g any so	95.46 95.46 9 hot water 14.32	190 x Vd,rd 82.37 storage), 12.36	76.33 enter 0 in 11.45 storage	27m / 3600 87.59 boxes (46) 13.14 within sa	88.64) to (61)	Total = Su tth (see Ta 103.3 Total = Su 15.49	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} =	122.45 18.37		(4
nergy content of 126.44 nstantaneous v 3)m= 18.97 ater storage orage volum community hetherwise if nerminers.	110.58 110.58 16.59 10ss: ne (litres) neating a	used - cale 114.11 ng at point 17.12 includin nd no ta	of use (no 14.92 g any so nk in dw	95.46 95.46 96.46 14.32 Olar or W	190 x Vd,rd 82.37 storage), 12.36 /WHRS nter 110	76.33 enter 0 in 11.45 storage	27m / 3600 87.59 boxes (46) 13.14 within sa	88.64 0 to (61) 13.3	Total = Su tth (see Ta 103.3 Total = Su 15.49 sel	m(44) _{1 12} = m(44) _{1 12} = 112.76 m(45) _{1 12} = 16.91	122.45 18.37		(4
nstantaneous volumers storage volumers if negative storage is a storage storage is a storage storage if negative storage is a storage i	110.58 vater heatin 16.59 loss: ne (litres) neating a p stored loss:	used - cale 114.11 ng at point 17.12 includin nd no ta hot wate	of use (no 14.92 g any so nk in dw	95.46 95.46 95.46 14.32 Dlar or Welling, encludes i	190 x Vd,rd 82.37 storage), 12.36 /WHRS nter 110	76.33 enter 0 in 11.45 storage litres in neous co	27m / 3600 87.59 boxes (46) 13.14 within sa	88.64 0 to (61) 13.3	Total = Su tth (see Ta 103.3 Total = Su 15.49 sel	m(44) _{1 12} = 112.76 m(45) _{1 12} = 16.91	c, 1d) 122.45 18.37		(4)
ergy content of instantaneous v Sim= 18.97 ater storage orage volum community heherwise if neater storage of the instantaneous v therwise if neater storage of the instantaneous v	110.58 vater heatin 16.59 loss: ne (litres) neating a p stored loss: turer's de	used - cale 114.11 ng at point 17.12 includin nd no ta hot wate	of use (no 14.92 g any so nk in dw er (this in	95.46 95.46 95.46 14.32 Dlar or Welling, encludes i	190 x Vd,rd 82.37 storage), 12.36 /WHRS nter 110	76.33 enter 0 in 11.45 storage litres in neous co	27m / 3600 87.59 boxes (46) 13.14 within sa	88.64 0 to (61) 13.3	Total = Su tth (see Ta 103.3 Total = Su 15.49 sel	m(44) _{1 12} = 112.76 m(45) _{1 12} = 16.91	122.45 18.37		(4)
ergy content of signal and stantaneous volume atter storage orage volume community is therwise if no atter storage of financial and stantaneous volume atter storage of financial and stantaneous volume atter storage of financial and stantaneous volume atter storage of financial and stantaneous volume atter storage of financial and stantaneous volume atterise atterise and stantaneous volume atterise and stantaneous volume atterise atterise and stantaneous volume atterise atterise atterise and stantaneous volume atteris	110.58 vater heatin 16.59 loss: ne (litres) neating a costored loss: turer's defactor from	used - cale 114.11 ng at point 17.12 includin nd no ta hot wate eclared le	of use (not 14.92) g any sonk in dwer (this in coss factor 2b	95.46 95.46 95.46 14.32 Dlar or Water or Wat	190 x Vd,rd 82.37 storage), 12.36 /WHRS nter 110	76.33 enter 0 in 11.45 storage litres in neous co	97m / 3600 87.59 boxes (46) 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	Total = Su tth (see Ta 103.3 Total = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	c, 1d) 122.45 18.37		(4)
nergy content of 126.44 nstantaneous v S)m= 18.97 ater storage orage volum community heterwise if ne ater storage of the manufacter storage or storage of the manufacter sto	110.58 vater heatin 16.59 loss: ne (litres) neating a p stored loss: turer's de factor from	used - cale 114.11 ng at point 17.12 includin nd no ta hot wate eclared le m Table storage	of use (not) 14.92 g any sonk in dwer (this in) coss factor 2b , kWh/ye	95.46 95.46 95.46 14.32 plar or Water velling, ended in the control of the co	190 x Vd,n 82.37 storage), 12.36 /WHRS nter 110 nstantar	76.33 enter 0 in 11.45 storage litres in neous co	27m / 3600 87.59 boxes (46) 13.14 within sa	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	Total = Su tth (see Ta 103.3 Total = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	122.45 18.37		(4)
ergy content of instantaneous via the storage orage volum community heterotrage of the storage o	110.58 110.58 16.59 10ss: ne (litres) neating a costored loss: turer's defactor from water turer's defactor from water	used - cale 114.11 ng at point 17.12 includin nd no ta hot wate eclared le m Table storage eclared c	of use (not) 14.92 g any sonk in dwer (this in) coss factor 2b , kWh/ye	95.46 95.46 95.46 14.32 plar or Water relling, eacludes in the control of th	190 x Vd,r. 82.37 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous con/day):	97m / 3600 87.59 boxes (46) 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	Total = Su tth (see Ta 103.3 Total = Su 15.49 sel	m(44) _{1 12} = m(45) _{1 12} = 16.91	c, 1d) 122.45 18.37 0 0 0		(4)
ergy content of the property of the property lost from the property	110.58 vater heatin 16.59 loss: ne (litres) neating a costored loss: turer's defactor from water turer's defage loss	used - calc 114.11 ng at point 17.12 includin nd no ta hot wate eclared lo m Table storage eclared of	of use (not) 14.92 g any sonk in dwer (this in) coss factor 2b , kWh/ye	95.46 95.46 95.46 14.32 plar or Water relling, eacludes in the control of th	190 x Vd,r. 82.37 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous con/day):	97m / 3600 87.59 boxes (46) 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	Total = Su tth (see Ta 103.3 Total = Su 15.49 sel	m(44) _{1 12} = m(45) _{1 12} = 16.91	122.45 18.37		(4)
ergy content of si)m= 126.44 Instantaneous v Si)m= 18.97 atter storage orage volume community herwise if neater storage amperature for the storage of the	thot water 110.58 vater heatin 16.59 loss: ne (litres) neating a control stored loss: turer's defactor from water turer's defage loss neating s	used - cale 114.11 Ing at point 17.12 includin nd no ta hot wate eclared le m Table storage eclared of	of use (not) 14.92 g any sonk in dwer (this in) coss factor 2b , kWh/ye	95.46 95.46 95.46 14.32 plar or Water relling, eacludes in the control of th	190 x Vd,r. 82.37 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous con/day):	97m / 3600 87.59 boxes (46) 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	Total = Su tth (see Ta 103.3 Total = Su 15.49 sel	m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	c, 1d) 122.45 18.37 0 0 0		(4)
ergy content of si)m= 126.44 instantaneous v is)m= 18.97 ater storage orage volum community heherwise if neater storage in the storage of t	110.58 110.58 110.58 16.59 10ss: ne (litres) neating a constored loss: turer's defactor from water turer's defage loss neating s from Tal	used - cale 114.11 17.12 includin nd no ta hot wate eclared le m Table storage eclared of factor fr ee section ble 2a	of use (not) 14.92 g any sonk in dw. er (this in) coss factor 2b , kWh/ye cylinder I om Tabl on 4.3	95.46 95.46 95.46 14.32 plar or Water relling, eacludes in the control of th	190 x Vd,r. 82.37 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous con/day):	97m / 3600 87.59 boxes (46) 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 13.3 13.3	Total = Su tth (see Ta 103.3 Total = Su 15.49 sel	m(44) _{1 12} = m(45) _{1 12} = 16.91	c, 1d) 122.45 18.37 0 0 0 0 0		(4) (4) (4) (5) (5) (5) (5) (5) (5)
nergy content of 126.44 instantaneous v	thot water 110.58 16.59 16.59 10ss: ne (litres) neating a control of the stored actor from the stored age loss and actor from the stored age loss are also actor from the stored age loss and actor from the stored age loss a	used - cale 114.11 17.12 includin nd no ta hot wate eclared le m Table storage eclared of factor fr ee section ble 2a m Table	of use (not) 14.92 g any so nk in dw er (this in) css facto 2b , kWh/ye eylinder I om Tabl on 4.3	95.46 95.46 95.46 14.32 Dlar or Water relling, eacludes in the control of th	190 x Vd,r. 82.37 12.36 /WHRS nter 110 nstantar wn (kWh	76.33 enter 0 in 11.45 storage litres in neous con/day): known:	97m / 3600 87.59 boxes (46) 13.14 within sa (47) mbi boil	88.64 10 to (61) 13.3 13.3 13.3 13.3 14.5 15.5 16.5	Total = Su th (see Ta 103.3 Total = Su 15.49 sel er '0' in (m(44) _{1 12} = ables 1b, 1 112.76 m(45) _{1 12} = 16.91	c, 1d) 122.45 18.37 0 0 0		(4 (4 (4 (4 (4 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5

	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 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)
Primar	v circuit	loss (an	nual) fro	m Table	e 3							0		(58)
	-	•	,			59)m = ((58) ÷ 36	65 × (41)	m				'	
(mod	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)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	43.45	37.82	40.29	37.46	37.13	34.4	35.55	37.13	37.46	40.29	40.52	43.45		(61)
Total h	eat requ	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=	169.89	148.4	154.4	136.95	132.59	116.78	111.88	124.72	126.1	143.59	153.28	165.9		(62)
Solar DF	-IW input o	calculated	using App	endix G or	· Appendix	r H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter			•						•	•	
(64)m=	169.89	148.4	154.4	136.95	132.59	116.78	111.88	124.72	126.1	143.59	153.28	165.9		
								Outp	out from w	ater heate	r (annual) ₁	12	1684.46	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	_
(65)m=	52.9	46.22	48.01	42.44	41.02	35.99	34.27	38.41	38.84	44.42	47.62	51.58		(65)
inclu	ıde (57)ı	m in calc	culation of	of (65)m	only if c	ylinder i	s in the o	lwelling	or hot w	ator ic fr	om com	munity h	ı Leating	
5 Int								2 VV C IIII 19	OI HOLW	alei is ii	OIII COIII	mumity i	Calling	
-Э. ПІ	ernal da	ains (see	Table 5	and 5a);	•		awog	OI HOLW	alei is ii	OIII COIII	indinity i	leating	
	Ĭ	ains (see):	-		awoming	or not w	alei is ii	om com	munity n	Calling	
	olic gain	s (Table	5), Wat	ts	·		ı							
	Ĭ	·): May	Jun 91.18	Jul 91.18	Aug 91.18	Sep	Oct 91.18	Nov 91.18	Dec 91.18		(66)
Metabo (66)m=	olic gain Jan 91.18	s (Table Feb	5), Wat Mar 91.18	ts Apr 91.18	May 91.18	Jun 91.18	Jul 91.18	Aug 91.18	Sep 91.18	Oct	Nov	Dec		(66)
Metabo (66)m= Lightin	olic gain Jan 91.18	s (Table Feb	5), Wat Mar 91.18	ts Apr 91.18	May 91.18	Jun	Jul 91.18	Aug 91.18	Sep 91.18	Oct	Nov	Dec		(66)
Metabo (66)m= Lightin (67)m=	Jan 91.18 g gains	s (Table Feb 91.18 (calculation)	91.18 ted in Ap	Apr 91.18 opendix 8.61	May 91.18 L, equat 6.43	Jun 91.18 ion L9 o	Jul 91.18 r L9a), a 5.87	Aug 91.18 Iso see	Sep 91.18 Table 5	Oct 91.18	Nov 91.18	Dec 91.18		` ′
Metabo (66)m= Lightin (67)m= Appliar	Jan 91.18 g gains 15.74	s (Table Feb 91.18 (calculat 13.98 ins (calc	91.18 ted in Ap	Apr 91.18 opendix 8.61 Append	May 91.18 L, equat 6.43 dix L, eq	Jun 91.18 ion L9 o 5.43 uation L	Jul 91.18 r L9a), a 5.87 13 or L1	Aug 91.18 Iso see 7.63 3a), also	Sep 91.18 Table 5 10.24 see Ta	Oct 91.18	Nov 91.18	Dec 91.18		(67)
Metabo (66)m= Lightin (67)m= Appliar (68)m=	Jan 91.18 g gains 15.74 nces ga	s (Table Feb 91.18 (calculat 13.98 ins (calc 160.62	91.18 ted in Ap 11.37 ulated in	Apr 91.18 ppendix 8.61 Appendix 147.62	May 91.18 L, equat 6.43 dix L, eq	Jun 91.18 ion L9 of 5.43 uation L	Jul 91.18 r L9a), a 5.87 13 or L1	Aug 91.18 Iso see 7.63 3a), also	Sep 91.18 Table 5 10.24 see Ta	Oct 91.18 13 ble 5 130.29	Nov 91.18	Dec 91.18		` ′
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin	Jan 91.18 g gains 15.74 nces gains 158.97	s (Table Feb 91.18 (calcular 13.98 ins (calcular 160.62 (calcular	91.18 ted in Ap 11.37 ulated in 156.47	Apr 91.18 ppendix 8.61 Appendix 147.62	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a	Aug 91.18 Iso see 7.63 3a), also 117.28	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table	Oct 91.18 13 ble 5 130.29	Nov 91.18 15.17	Dec 91.18 16.18 151.96		(67)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m=	Jan 91.18 g gains 15.74 nces ga 158.97 ng gains 32.12	s (Table Feb 91.18 (calcular 13.98 ins (calcular 160.62 (calcular 32.12	91.18 ted in Ap 11.37 ulated in 156.47 ted in A	Apr 91.18 opendix 8.61 Append 147.62 opendix 32.12	May 91.18 L, equat 6.43 dix L, eq	Jun 91.18 ion L9 of 5.43 uation L	Jul 91.18 r L9a), a 5.87 13 or L1	Aug 91.18 Iso see 7.63 3a), also	Sep 91.18 Table 5 10.24 see Ta	Oct 91.18 13 ble 5 130.29	Nov 91.18	Dec 91.18		(67) (68)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps	Jan 91.18 g gains 15.74 nces ga 158.97 ng gains 32.12	s (Table Feb 91.18 (calcular 13.98 ins (calcular 160.62 (calcular	91.18 ted in Ap 11.37 ulated in 156.47 ted in A	Apr 91.18 opendix 8.61 Append 147.62 opendix 32.12	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a	Aug 91.18 Iso see 7.63 3a), also 117.28	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12	Oct 91.18 13 ble 5 130.29	Nov 91.18 15.17 141.46	Dec 91.18 16.18 151.96		(67) (68)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m=	g gains 15.74 nces gains 158.97 ng gains 32.12 and far	s (Table Feb 91.18 (calculat 13.98 ins (calc 160.62 (calculat 32.12 ns gains	91.18 ted in Ap 11.37 ulated in 156.47 ted in Ap 32.12 (Table 5	Apr 91.18 ppendix 8.61 Append 147.62 ppendix 32.12 5a) 3	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table	Oct 91.18 13 ble 5 130.29 5 32.12	Nov 91.18 15.17	Dec 91.18 16.18 151.96		(67) (68) (69)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses	Jan 91.18 g gains 15.74 nces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev	s (Table Feb 91.18 (calculat 13.98 ins (calc 160.62 (calculat 32.12 ns gains 3	91.18 ted in Ap 11.37 ulated in 156.47 ted in Ap 32.12 (Table 5	Apr 91.18 ppendix 8.61 Appendix 147.62 ppendix 32.12 5a) 3 tive valu	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12 3 es) (Tab	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12	Oct 91.18 13 ble 5 130.29 5 32.12	Nov 91.18 15.17 141.46 32.12	Dec 91.18 16.18 151.96 32.12		(67) (68) (69) (70)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m=	Jan 91.18 g gains 15.74 nces gains 158.97 ng gains 32.12 s and far 3 s e.g. ev	s (Table Feb 91.18 (calculat 13.98 ins (calc 160.62 (calculat 32.12 ns gains 3 aporatio -72.94	91.18 ted in Ap 11.37 ulated in 156.47 ted in A 32.12 (Table 5 3 on (negat	Apr 91.18 opendix 8.61 Append 147.62 opendix 32.12 5a)	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12	Oct 91.18 13 ble 5 130.29 5 32.12	Nov 91.18 15.17 141.46	Dec 91.18 16.18 151.96		(67) (68) (69)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water	g gains 15.74 nces gains 158.97 ng gains 32.12 s and far 3 s e.g. ev -72.94 heating	s (Table Feb 91.18 (calculat 13.98 ins (calculat 160.62 (calculat 32.12 ns gains 3 raporatio -72.94 gains (T	91.18 ted in Ap 11.37 ulated in 156.47 ted in Ap 32.12 (Table 5 3 n (negat	Apr 91.18 ppendix 8.61 Appendix 147.62 ppendix 32.12 5a) 3 tive valu -72.94	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12 3 es) (Tab	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12 3 ole 5) -72.94	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12 3	Oct 91.18 13 ble 5 130.29 5 32.12 3	Nov 91.18 15.17 141.46 32.12 3	Dec 91.18 16.18 151.96 32.12 3		(67) (68) (69) (70)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	olic gain Jan 91.18 g gains 15.74 nces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev -72.94 heating 71.11	s (Table Feb 91.18 (calculat 13.98 ins (calc 160.62 (calculat 32.12 ns gains 3 raporatio -72.94 gains (T 68.78	91.18 ted in Ap 11.37 ulated in 156.47 ted in Ap 32.12 (Table 5 3 In (negation of the context) -72.94 Table 5) 64.54	Apr 91.18 ppendix 8.61 Appendix 147.62 ppendix 32.12 5a) 3 tive valu	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12 3 es) (Tab	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12 3 ole 5) -72.94	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12 3	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12 3	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12 3	Oct 91.18 13 ble 5 130.29 5 32.12 3 -72.94	Nov 91.18 15.17 141.46 32.12 3 -72.94	Dec 91.18 16.18 151.96 32.12 3 -72.94		(67) (68) (69) (70)
Metabo (66)m= Lightin (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	olic gain Jan 91.18 g gains 15.74 nces ga 158.97 ng gains 32.12 s and far 3 s e.g. ev -72.94 heating 71.11	s (Table Feb 91.18 (calculat 13.98 ins (calculat 160.62 (calculat 32.12 ns gains 3 raporatio -72.94 gains (T	91.18 ted in Ap 11.37 ulated in 156.47 ted in Ap 32.12 (Table 5 3 In (negation of the context) -72.94 Table 5) 64.54	Apr 91.18 ppendix 8.61 Appendix 147.62 ppendix 32.12 5a) 3 tive valu -72.94	May 91.18 L, equat 6.43 dix L, eq 136.44 L, equat 32.12 3 es) (Tab	Jun 91.18 ion L9 of 5.43 uation L 125.95 tion L15 32.12 3 ole 5) -72.94	Jul 91.18 r L9a), a 5.87 13 or L1 118.93 or L15a 32.12 3	Aug 91.18 Iso see 7.63 3a), also 117.28), also se 32.12 3	Sep 91.18 Table 5 10.24 see Ta 121.44 ee Table 32.12 3	Oct 91.18 13 ble 5 130.29 5 32.12 3	Nov 91.18 15.17 141.46 32.12 3 -72.94	Dec 91.18 16.18 151.96 32.12 3 -72.94		(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	0.99	x	11.28	x	0.57	x	0.7	=	6.18	(75)
Northeast _{0.9x} 0.77	X	0.99	x	22.97	x	0.57	x	0.7	=	12.57	(75)
Northeast 0.9x 0.77	X	0.99	x	41.38	x	0.57	x	0.7	=	22.65	(75)
Northeast 0.9x 0.77	X	0.99	x	67.96	x	0.57	x	0.7		37.2	(75)
Northeast _{0.9x} 0.77	X	0.99	x	91.35	x	0.57	x	0.7	=	50.01	(75)
Northeast 0.9x 0.77	X	0.99	x	97.38	x	0.57	x	0.7	=	53.32	(75)
Northeast 0.9x 0.77	X	0.99	x	91.1	x	0.57	x [0.7	=	49.88	(75)
Northeast _{0.9x} 0.77	X	0.99	x	72.63	x	0.57	x	0.7	=	39.76	(75)
Northeast _{0.9x} 0.77	X	0.99	x	50.42	x	0.57	x	0.7	=	27.6	(75)
Northeast _{0.9x} 0.77	X	0.99	x	28.07	x	0.57	x	0.7	=	15.37	(75)
Northeast _{0.9x} 0.77	X	0.99	X	14.2	x	0.57	x	0.7	_	7.77	(75)
Northeast _{0.9x} 0.77	X	0.99	x	9.21	x	0.57	x	0.7	=	5.04	(75)
Southeast 0.9x 0.77	X	0.99	x	36.79	x	0.57	x	0.7	=	30.22	(77)
Southeast 0.9x 0.77	X	1.58	x	36.79	X	0.57	x	0.7	=	16.07	(77)
Southeast 0.9x 0.77	X	0.99	x	62.67	x	0.57	x	0.7	=	51.47	(77)
Southeast 0.9x 0.77	X	1.58	x	62.67	x	0.57	x	0.7	=	27.38	(77)
Southeast 0.9x 0.77	X	0.99	x	85.75	x	0.57	x	0.7	=	70.42	(77)
Southeast 0.9x 0.77	X	1.58	x	85.75	x	0.57	x	0.7	=	37.46	(77)
Southeast 0.9x 0.77	X	0.99	x	106.25	х	0.57	x	0.7	=	87.26	(77)
Southeast 0.9x 0.77	X	1.58	x	106.25	X	0.57	x	0.7	=	46.42	(77)
Southeast 0.9x 0.77	X	0.99	x	119.01	x	0.57	x	0.7	=	97.73	(77)
Southeast 0.9x 0.77	X	1.58	x	119.01	х	0.57	x	0.7	=	51.99	(77)
Southeast 0.9x 0.77	X	0.99	x	118.15	x	0.57	x	0.7	=	97.03	(77)
Southeast 0.9x 0.77	X	1.58	x	118.15	х	0.57	x	0.7	=	51.62	(77)
Southeast 0.9x 0.77	X	0.99	X	113.91	x	0.57	x [0.7	_	93.55	(77)
Southeast 0.9x 0.77	X	1.58	x	113.91	x	0.57	x [0.7	=	49.76	(77)
Southeast 0.9x 0.77	X	0.99	x	104.39	x	0.57	x [0.7	=	85.73	(77)
Southeast 0.9x 0.77	X	1.58	x	104.39	X	0.57	x	0.7	=	45.61	(77)
Southeast 0.9x 0.77	X	0.99	x	92.85	x	0.57	x [0.7	=	76.25	(77)
Southeast 0.9x 0.77	X	1.58	x	92.85	x	0.57	x [0.7	=	40.57	(77)
Southeast 0.9x 0.77	X	0.99	x	69.27	x	0.57	x [0.7	=	56.88	(77)
Southeast 0.9x 0.77	X	1.58	x	69.27	x	0.57	x [0.7	=	30.26	(77)
Southeast 0.9x 0.77	X	0.99	x	44.07	x	0.57	x [0.7	=	36.19	(77)
Southeast 0.9x 0.77	X	1.58	x	44.07	x	0.57	x [0.7	=	19.25	(77)
Southeast 0.9x 0.77	X	0.99	x	31.49	x	0.57	x	0.7	=	25.86	(77)
Southeast 0.9x 0.77	X	1.58	X	31.49	x	0.57	x	0.7	_	13.76	(77)
Solar gains in watts, calcula	$\overline{}$	i	_	1	_	n = Sum(74)m	(82)m	_		ı	
(83)m= 52.47 91.42 130.5		170.88 199.74		01.96 193.19	171	1.1 144.42	102.51	63.22	44.66		(83)
Total gains – internal and so		` 	<u> </u>			00 000 00				I	(0.4)
(84)m= 351.64 388.16 416.2	26	439.41 451.1	1 4	36.68 417.4	400	.98 383.39	358.86	339.35	335.47		(84)

7. Me	an inter	nal temp	erature	(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	ble 9a)		, ,					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.99	0.97	0.92	0.79	0.62	0.66	0.87	0.98	0.99	1		(86)
Mean	interna	I temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.8	19.93	20.15	20.45	20.72	20.92	20.98	20.97	20.85	20.5	20.1	19.78		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.96	19.96	19.96	19.97	19.98	19.98	19.98	19.99	19.98	19.98	19.97	19.97		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)						
(89)m=	1	0.99	0.99	0.96	0.88	0.7	0.49	0.53	0.81	0.96	0.99	1		(89)
Mean	interna	I temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	18.37	18.56	18.88	19.31	19.69	19.93	19.98	19.98	19.85	19.39	18.81	18.34		(90)
									f	fLA = Livin	g area ÷ (4	1) =	0.43	(91)
Mean	interna	I temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m=	18.98	19.14	19.42	19.79	20.13	20.35	20.41	20.4	20.28	19.86	19.36	18.95		(92)
			he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate			· I	
(93)m=	18.83	18.99	19.27	19.64	19.98	20.2	20.26	20.25	20.13	19.71	19.21	18.8		(93)
•		iting requ								. —.				
		mean int factor fo		•		ned at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:		•	•	•	•		•			
(94)m=	0.99	0.99	0.98	0.95	0.88	0.72	0.52	0.57	0.82	0.96	0.99	1		(94)
		hmGm				l	l	T					ı	(0-1)
(95)m=	349.83	384.65	408.61	419.58	398.4	314.74	218.97	228.26	314.7	344.73	336	334.1		(95)
(96)m=	4.3	age exte	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
				l				Į	_ (96)m	ļ	1.1	7.2		(00)
(97)m=	910.4	881.33	797.03	663.96	510.83	341.94	223.24	234.7	369.59	561.95	749.72	907.65		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		l	
(98)m=	417.07	333.77	288.98	175.95	83.65	0	0	0	0	161.61	297.88	426.72		
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2185.63	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								40.08	(99)
9a. En	ergy red	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	e heatii	•												7,004
		oace hea				ementary	system		(204) -				0	(201)
		oace hea		•	` ,			(202) = 1	` ,	(000)1			1	(202)
		tal heati	-	•				(204) = (2	02) × [1 –	(203)] =			1	(204)
	-	main spa		•			•						90.3	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heatin	g systen	1, %						0	(208)

								•	
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above) 417.07 333.77 288.98 175.95 83.65		0	0		404.04	297.88	400.70	1	
	0	0	0	0	161.61	297.88	426.72		(044)
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ 461.87 369.62 320.03 194.85 92.63 $	0	0	0	0	178.97	329.88	472.56		(211)
02.00	, i	Ţ,				211),5,10. 12		2420.41	(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	i (kwn/yea	ar) =Sum(2	215) _{15,10. 12}	=	0	(215)
Water heating Output from water heater (calculated above)									
169.89 148.4 154.4 136.95 132.59	116.78	111.88	124.72	126.1	143.59	153.28	165.9		
Efficiency of water heater								81	(216)
(217)m= 87.4 87.22 86.83 85.98 84.36	81	81	81	81	85.67	86.91	87.49		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)m= 194.39 170.15 177.82 159.28 157.17	144.17	138.12	153.98	155.68	167.6	176.36	189.62		
			Tota	I = Sum(2	19a) ₁₁₂ =			1984.34	(219)
Annual totals					k'	Wh/year		kWh/year	_
Space heating fuel used, main system 1								2420.41	_
Water heating fuel used								1984.34	
ŭ								1904.54	
Electricity for pumps, fans and electric keep-hot	t							1304.04	
-		nput fron	n outside	e			94.01	1304.54	(230a)
Electricity for pumps, fans and electric keep-hot		nput fron	n outside	e			94.01	1304.54	(230a) (230c)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or p		nput fron		e of (230a)	(230g) =			124.01	
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or p central heating pump:		nput fron			(230g) =				(230c)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or p central heating pump: Total electricity for the above, kWh/year		nput fron			(230g) =			124.01	(230c) (231)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting	ositive ir		sum	of (230a)	(230g) =			124.01 277.94	(230c) (231) (232)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs	ositive ir	uding mid	sum	of (230a)			30	124.01 277.94 -1381.79	(230c) (231) (232) (233)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs	ems inclu		sum	of (230a)		ion fac	30	124.01 277.94	(230c) (231) (232) (233)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs	ems inclu Enc kW	uding mid	sum	of (230a)	Emiss	ion fac 2/kWh	30	124.01 277.94 -1381.79 Emissions	(230c) (231) (232) (233)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs 12a. CO2 emissions – Individual heating systems	ems inclu EnckW	uding mid ergy /h/year	sum	of (230a)	Emiss kg CO	ion fac 2/kWh	30 tor	124.01 277.94 -1381.79 Emissions kg CO2/yea	(230c) (231) (232) (233)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs 12a. CO2 emissions – Individual heating systems Space heating (main system 1)	ems inclu EnckW (211	uding mid ergy /h/year	sum	of (230a)	Emiss kg CO	ion fac 2/kWh 16	30 tor =	124.01 277.94 -1381.79 Emissions kg CO2/yea	(230c) (231) (232) (233) (233)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	ems inclu EnckW (211 (215	ergy /h/year l) ×	sum	of (230a)	Emiss kg CO2 0.2 0.5	ion fac 2/kWh 16	30 tor = =	124.01 277.94 -1381.79 Emissions kg CO2/yea 522.81	(230c) (231) (232) (233) (233) (261) (263) (264)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	ems inclu EnckW (211 (215 (219 (261	ergy /h/year l) × 5) ×	sum	of (230a)	Emiss kg CO: 0.2 0.5 0.2	ion fac 2/kWh 16 19 16	30 tor = =	124.01 277.94 -1381.79 Emissions kg CO2/yea 522.81 0 428.62	(230c) (231) (232) (233) (233) (261) (263) (264) (265)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs 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	ems inclu EnckW (211 (215 (219 (261)	ergy /h/year 1) × 5) × 9) ×	sum	of (230a)	Emiss kg CO: 0.2 0.5 0.5	ion fac 2/kWh 16 19	30 tor = = =	124.01 277.94 -1381.79 Emissions kg CO2/yea 522.81 0 428.62 951.43 64.36	(230c) (231) (232) (233) (233) (261) (263) (264) (265) (267)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs 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 electricity for lighting	ems inclu EnckW (211 (215 (219 (261)	ergy /h/year I) x 5) x 9) x I) + (262) ·	sum	of (230a)	Emiss kg CO: 0.2 0.5 0.2	ion fac 2/kWh 16 19	30 tor = = =	124.01 277.94 -1381.79 Emissions kg CO2/yea 522.81 0 428.62 951.43	(230c) (231) (232) (233) (233) (261) (263) (264) (265)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs 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	ems inclu EnckW (211 (215 (219 (261)	ergy /h/year I) x 5) x 9) x I) + (262) ·	sum	of (230a)	Emiss kg CO: 0.2 0.5 0.5	ion fac 2/kWh 16 19 16	30 tor = = =	124.01 277.94 -1381.79 Emissions kg CO2/yea 522.81 0 428.62 951.43 64.36	(230c) (231) (232) (233) (233) (261) (263) (264) (265) (267)
Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or procentral heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs 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 electricity for lighting Energy saving/generation technologies	ems inclu EnckW (211 (215 (219 (261)	ergy /h/year I) x 5) x 9) x I) + (262) ·	sum	of (230a)	Emiss kg CO: 0.2 0.5 0.5 0.5	ion fac 2/kWh 16 19 16	30 tor = = = =	124.01 277.94 -1381.79 Emissions kg CO2/yea 522.81 0 428.62 951.43 64.36 144.25	(230c) (231) (232) (233) (233) (261) (263) (264) (265) (267) (268)

Dwelling CO2 Emission Rate

 $(272) \div (4) =$

8.12 (273)

El rating (section 14)

94 (274)