Eight Associates Fifth Floor 57a Great Suffolk Street London SE1 0BB

+44 (0) 20 7043 0418

www.eightassociates.co.uk info@eightassociates.co.uk

Planning Statement Energy Assessment Barrie House

Prepared for: Tori MacCabe Marek Wojciechowski Architects	Date of current issue: 21/09/2018 Issue number: 2			
	Our reference: 3045-Barrie House-Energy Assessment-1809- 21ell.docx			
Prepared by: Eduard Lloret	Quality assured by: Yiota Paraskeva			
Signature:	Signature:			
Eduard Lloret	Yiota Paraskeva			
	Associates. By receiving the report and acting on it, the accepts that no individual is personally liable in contract, ing negligence).			
Executive Summary	1			
'Be Lean': Demand Reduction Measures				
	HP8			
'Be Clean': Connection to Existing and	I Planned Networks9			
'Be Clean': Site Wide Networks and C	HP10			
9	11			
	15			
•	echnologies22			
Be Green: Photovoltaic	23			
0	25			
	Prepared by: Eduard Lloret Signature: Eduard Lloret This report is made on behalf of Eight client - or any third party relying on it tort or breach of statutory duty (including large) Executive Summary			

eight

Executive Summary Energy Assessment Barrie House

About the Scheme:

The proposed scheme is an extension of an existing development, which is located at 29 St. Edmund's Terrace in the London Borough of Camden. The new part of the development will contain 9 residential units and have approximately a total net internal area of 750 m².

Planning Policy

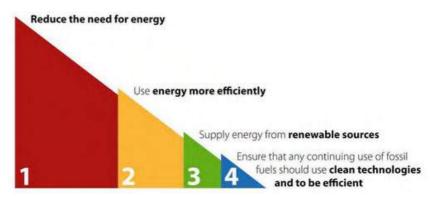
In accordance with the Sustainable, Design and Construction SPG, as not a major development the scheme is required to achieve a 19% carbon reduction target (beyond Part L 2013) as set out in The London Plan Policy 5.2.

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) – The actual dwelling CO₂ emissions rate (DER) is no greater than the notional building CO₂ target emissions rate.

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)	13.50	12.28	-	10.59	
CO ₂ emissions saving (Tonnes CO ₂ /yr)	-	1.22	-	1.69	
Saving from each stage (%)	-	9.0	-	12.5	
Total CO ₂ emissions saving (Tonnes CO ₂ /yr)	2.91				

21.6% Total carbon emissions savings over Part L of the Building Regulations 2013 achieved

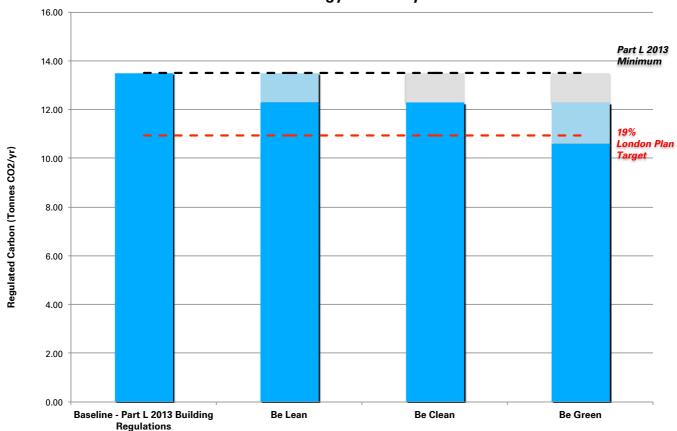
Executive Summary Energy Assessment Barrie House

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 9.0% from the fabric energy efficiency measures described in the 'Be Lean' section, and will reduce total carbon emissions by 21.6% over Building Regulations with the further inclusion of low and zero carbon technologies (photovoltaic panel system).

Executive Summary Energy Assessment

Energy Assessment Barrie House

Shortfall in Emissions:

The proposed scheme is not a major development and therefore it is not required to achieve the 35% improvement in carbon dioxide emissions and no carbon-offset payment is required.

Carbon Dioxide Emissions – Regulated (Tonnes CO ₂ /yr)						
	(Tonnes CO ₂ /yr)	%				
Savings from 'Be Lean'-After energy demand reduction	1.22	9.0%				
Savings from 'Be Clean'-After CHP	0.00	0.0%				
Savings from 'Be Green'-After renewable energy	1.69	12.5%				
Total Cumulative Savings	2.91	21.6%				
Total Target Savings	2.57	19%				
Annual Surplus	0.34	2.8%				

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 Unregulated To Emissions Emissions Emissions							
Baseline: Part L 2013	13.50	10.27	23.77				
Be Lean: After demand reduction	12.28	10.27	22.55				
Be Clean: After CHP	-	-	-				
Be Green: After Renewable energy	10.59	10.27	20.86				

Introduction Energy Assessment Barrie House

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, applications for major developments should be accompanied by an energy statement. 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 L 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.

eight

Establishing Emissions: The Carbon Profile

Energy Assessment Barrie House

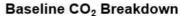
Building Regulations Part L 2013 Minimum Compliance:

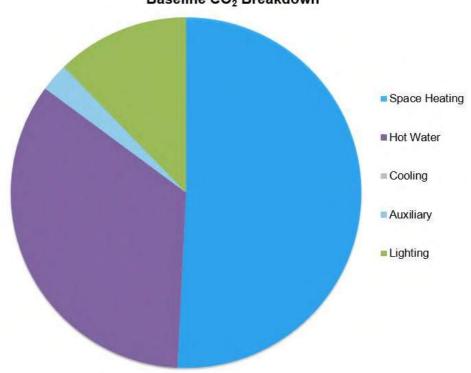
The 'baseline' carbon emissions for the development are 13.50 Tonnes CO₂/yr.

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 CO₂/yr	
13.50	

Heating	Hot Water	Cooling	Auxiliary	Lighting
6.88	4.62	0.00	0.35	1.65





Overview:

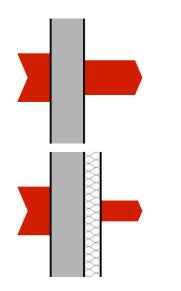
The chart above shows that heating is the primary source of carbon emissions, and hot water is the second largest, across the scheme as a whole.

'Be Lean': Demand Reduction Measures Energy Assessment Barrie House

Be Lean - Summary:

Demand reduction measures have reduced the scheme's carbon emissions by 9.0% over the minimum Part L 2013 Building Regulations baseline.

Building Fabric Passive Design measures:



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

U Values:

Element	Minimum Building Regulations U value	Proposed U value
	W/m²K	W/m²K
External walls	0.30	0.16
Basement walls	0.30	0.16
Semi exposed walls	0.30	0.16
Party walls	0.20	0.00
Basement floor	0.25	0.10
Ground floor	0.25	0.10
Semi exposed floors	0.25	0.10
Roofs	0.25	0.12
Windows (g-value 0.55)	2.20	1.20

The scheme has an average window to wall ratio of 28.8%.

Airtightness:

The target air permeability for the scheme has been modelled as 3 m³/(hr.m²) @ 50 pa. An air permeability test should be undertaken to verify this value has been achieved at the completion of the project.

This will require careful attention to two key areas:

- Structural leakage
- Services leakage

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

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

Thermal Bridging:

The scheme has been indicatively modelled with the accredited thermal bridge Psi-values (ACD) for lintels, sill, jamb, party floor, corner and inverted corner. Balcony details should be designed with a thermal break connector in order to achieve a Psi-value of less than 0.6W/mK. The ACD checklist should be completed for the above junctions at the end of the project to confirm that all targeted values have been achieved.

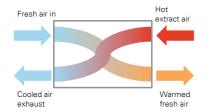
Thermal Mass:

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

eight

'Be Lean': Demand Reduction Measures Energy Assessment Barrie House

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 will be provided by a gas boiler, featuring time and temperature zone control by suitable arrangement of plumbing and electrical services, delayed thermostat and a weather compensator. The heat will be distributed via radiators. The gas boiler will have a minimum efficiency of 89.5.

Hot Water:

Hot water will be provided by the main heating system.

Ventilation:

Balanced mechanical ventilation with heat recovery (87% efficiency) will be provided to dwellings and wet rooms with a specific fan power of 0.54 W/l/s.

Air Conditioning:

No cooling has been specified for the dwellings.

Lighting:

High efficiency lighting has been specified for the development with a lumen efficacy of more than 70 lumens/W.

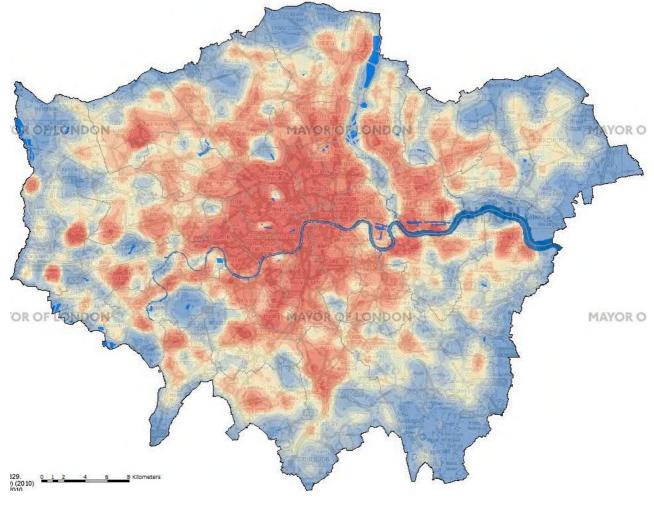
'Be Clean': Heating Infrastructure & CHP Energy Assessment Barrie House

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.



'Be Clean': Connection to Existing and Planned Networks

Energy Assessment Barrie House

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.

'Be Clean': Site Wide Networks and CHP Energy Assessment Barrie House

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)

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 Barrie House

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)
- 3) Manage the heat within the building through thermal mass, room height and green roofs
- 4) Passive ventilation
- 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:

I) Minimise internal heat generation through energy efficient design

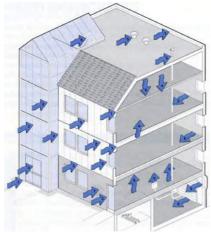
Internal heat gains have been minimised where possible. Energy Efficient appliances will help reduce internal heat gain and reduce the cooling requirement.

Energy efficient lighting will also be specified (>70 lumens per circuit watt).

'Be Clean': Cooling

Energy Assessment Barrie House

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 all methods controlling solar gain to within tolerable limits have been considered. The location, size, design and type of window openings and glazing have been optimised, and reduced solar gain factors from low emissivity windows with a g-value of 0.55 have been specified.
- Dark-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 to minimise uncontrolled air infiltration. This will require attention to detailing and sealing. See 'Be Lean' section of this report for details of how this will be achieved.

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 – exposed building fabric materials such as masonry or concrete have been utilised in the form of concrete floors and dense masonry external walls. These materials act as 'thermal batteries'; they absorb heat gains during the day when the building is occupied and 'store' it for an extended period, thereby helping to stabilise daytime temperatures. At night this heat can be dissipated, which 'resets' the heating cycle. Ventilation will also be used at night to purge the stored heat within the structure.

'Be Clean': Cooling

Energy Assessment Barrie House

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 2.5-2.8-m. As the roof will be well insulated to achieve a U-value of 0.12 W/m²K, there will be minimal penetration of heat through the roof.
- Extensive green roof has been specified for the scheme. This will act as
 an insulation barrier and the ecological processes will reduce the amount
 of solar energy absorbed by the roof membrane, so will reduce
 temperatures below the surface and cool the building areas directly
 below.

4) Passive ventilation

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

- Openable windows are specified on all facades of the building. Cross ventilation will be achieved by opening windows on two facades and ensuring there is a clear path for airflow.
- Night time cooling will also be utilised. This will work in tandem with high
 thermal mass materials specified. The larger temperature differential that
 exists between internal and external temperatures at night will allow
 effective stack ventilation and purging of heat accumulated within the
 structure during the day.



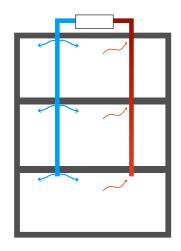
Typical building section demonstrating passive cross ventilation.

eight

'Be Clean': Cooling

Energy Assessment Barrie House

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.
- Fan powered ventilation: 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:
 - ✓ Specific fan power of 0.54 W/l/s for whole ventilation systems
 with heat recovery
 - ✓ Heat recovery efficiency of 87%

Overheating Risk:

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

Dwellings	Overheating risk according to SAP
Flat 1	Not significant
Flat 2	Slight
Flat 3	Slight
Flat 4	Not significant
Flat 5	Medium
Flat 6	Slight
Flat 7	Medium
Flat 8	Slight
Flat 9	Slight

According to the GLA guidance a dynamic modelling to assess the risk of overheating should be carried out. The overheating risk assessment according to the dynamic thermal modelling confirms that there is no risk of overheating. Please, see overheating report for further details.

'Be Green': Renewable Energy

Energy Assessment Barrie House

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)
 - o 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 = ✓ ✓
 - ⊙ 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) = 🗸 🗸
 - o Local air quality/pollution = ✓ ✓
 - Resource use of installation = ✓ ✓

Key comments on each of the criteria and the corresponding score will be provided in a table (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	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 V

'Be Green': Renewable Energy

Energy Assessment Barrie House

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. In order to meet the 19X% CO_2 emissions reduction a biomass boiler would need to be installed. The likely installed cost would be circa £100,000. The additional cost of providing and storing the bio-fuel also needs to be accounted for. The site is likely to be unsuitable for biomass boilers due to site constraints such as limited transport/access issues, and storage of the biomass fuel. 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	CO₂ and sustainability
Biomass Boiler	V V V V	V V V V	VVVV	VVV	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 8 years	Increased maintenance relative to gas boiler, resource use not significantly increased if well serviced.	Very low carbon intensity of feedstock if properly procured. Decarbonisation impact not applicable, air quality issues.

'Be Green': Renewable Energy Energy Assessment Barrie House

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 total potential useable roof area of approximately 140 m^2 (40 m^2 on the third floor and 100 m^2 on the top floor).

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO₂ and sustainability
Photovoltaic	VV V	/// /	/// ///	VVV	V V V V V V V V V V V V V V V V V V V
	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 wiring and metering.	Increased capital costs of installation, typical payback of 8 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 Assessment

Energy Assessment Barrie House

Solar Thermal:

Rejected



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

Like photovoltaic panels the most suitable location for mounting solar hot water panels is on roofs as they usually have the greatest exposure to the sun The proposed site has a total potential useable roof area of approximately 140 m^2 (40 m^2 on the third floor and 100 m^2 on the top floor).

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	///	VVVV	VVV	V V V V V
	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 Barrie House

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 approximately 1 turbine 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 £3,000.

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.

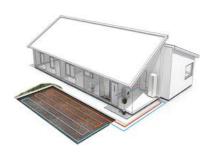
Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO ₂ and sustainability
Wind Energy	No local air quality impacts, use of unutilised roof space, conservation officer will have concerns for the site, minor noise issues.	Can be 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 Barrie House

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 £200,000 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 Barrie House

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 £150,000.

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 Barrie House

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	VVV	VVV V	V V V	V V V V V	15 out of 26
Photovoltaic	V V V V	V V V V	VVVVV	V V V	V V V V V	17 out of 26
Solar Thermal	VVV	V V V V	<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	VVV	VVVV	16 out of 26
Wind Energy	V V V V	VV V	<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	V V V	V V V V V	17 out of 26
GSHP	/ / / / /	V V V V	V V V V V	V V V	VVVVV VVVVV	15 out of 26
ASHP	V V V V	V V V V	V V V V	V V V	V V V V V	16 out of 26

Renewable Technology Conclusion & Specification:

Photovoltaic panels and wind energy 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. Therefore, photovoltaic panels have been considered to be the optimum balance of sustainable and economic objectives.

'Be Green': Photovoltaic

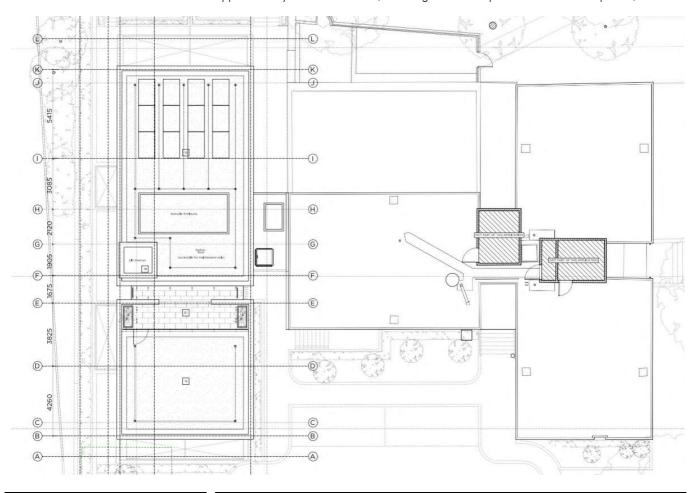
Energy Assessment Barrie House

Summary:

A photovoltaic panel system of 3.96 kWp (12 panels of 330 W nominal output) 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 a potential PV panel layout. PV panels will be oriented south west, tilted 30 degrees, with a panel size of approximately 1.6m² and covering approximately 20m² of the roof (excluding the access path between the PV panels).



'Be Green': Photovoltaic

Energy Assessment Barrie House

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 = £4,900
- Maintenance Cost = £2,000
- Operation Cost = £1,800 (replacement inverters etc.)
- Total Costs = £8,700

Revenue and Payback Parameters:

- The cost of electricity to be displaced is 14p/kWh.
- The 3.96 kWp system is estimated to generate 3,261 kWh/yr. Based on the assumption that 50% of the electricity will be used on site, an offset saving of £228/yr will be achieved.
- With the current Feed in Tariff, a tariff of 4.0 p/kWh will be received for generation, and 4.39 p/kWh will be received for export, which gives an additional saving of approximately £200.

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)	3.261
Annual Carbon Emissions Reductions (kg CO ₂ /year)	1,692
CO ₂ Emissions Reduction (%)	12.5

Cost Performance Criteria	Value
Total Cost Over Life Cycle (£)	8,700
Predicted Annual Savings (£)	428
Payback Period (yeas)	20.3

Conclusion Energy Assessment Barrie House

Summary

The baseline carbon emissions for the scheme are 13.50 Tonnes CO₂/yr.

As demonstrated, the development will reduce carbon emissions by 9.0% from the fabric energy efficiency measures described in the "Be Lean" section, and will reduce total carbon emissions by 21.6% over Building Regulations with the further inclusion of low and zero carbon technologies (photovoltaic panel system).

GLA's Energy Hierarchy – Regulated Carbon Emissions						
	Baseline:	Be Lean:	Be Clean:	Be Green:		
CO ₂ emissions (Tonnes CO ₂ /yr)	13.50	12.28	-	10.59		
CO ₂ emissions saving (Tonnes CO ₂ /yr)	-	1.22	-	1.69		
Saving from each stage (%)	-	9.0	-	12.5		
Total CO ₂ emissions saving (Tonnes CO ₂ /yr) 2.91						

21.6% Total carbon emissions savings over Part L of the Building Regulations 2013 achieved

Appendix Energy Assessment Barrie House

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:

Block compliance Baseline and Lean Block compliance Green

Baseline –TER from the Lean SAP TER Worksheets Lean –DER from the Lean SAP DER Worksheets

Clean -No Clean scenario

Green -DER from the Green SAP DER Worksheets

Appendix Energy Assessment Barrie House

Block compliance - Baseline and Lean

Block Compliance WorkSheet: Lean

User Details

Assessor Name: Stroma Number:

Software Name: Stroma FSAP Software Version: 1.0.4.16

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
Flat 01	16.46	18.91	49.2	60.2	96.821
Flat 02	18.47	20.01	56.5	62.9	84.432
Flat 03	15.42	17.74	47.3	56.6	103.011
Flat 04	13.43	15.93	38.5	48.1	106.54
Flat 05	15.26	16.57	38.9	41.5	71.924
Flat 06	17.87	18.48	48.3	48.6	65.098
Flat 07	15.26	16.57	38.9	41.5	71.924
Flat 08	19.37	20.15	54.8	57.1	65.098
Flat 09	16.85	17.62	50	51.6	88.5

Calculation Summary

Total Floor Area	753.35
Average TER	17.92
Average DER	16.30
Average DFEE	46.78
Average TFEE	52.45
Compliance	Pass
% Improvement DER TER	9.04
% Improvement DFEE TFEE	10.81

Appendix Energy Assessment Barrie House

Block compliance - Green

Block Compliance WorkSheet: Barrie House-Green

User Details

Assessor Name: Stroma Number:

Software Name: Stroma FSAP Software Version: 1.0.4.16

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
Flat 01	15.01	18.91	49.2	60.2	96.821
Flat 02	16.8	20.01	56.5	62.9	84.432
Flat 03	14.05	17.74	47.3	56.6	103.011
Flat 04	12.11	15.93	38.5	48.1	106.54
Flat 05	13.3	16.57	38.9	41.5	71.924
Flat 06	15.7	18.48	48.3	48.6	65.098
Flat 07	13.3	16.57	38.9	41.5	71.924
Flat 08	17.2	20.15	54.8	57.1	65.098
Flat 09	10.47	17.62	50	51.6	88.5

Calculation Summary

753.35
17.92
14.06
46.78
52.45
Pass
21.54
10.81

Appendix Energy Assessment Barrie House

Baseline Scenario

		User Details:				
Assessor Name:		Stroma No				
Software Name:	Stroma FSAP 2012	Software '		Versio	n: 1.0.4.16	
	Р	roperty Address: Flat	: 01			
Address :						
Overall dwelling dimen	isions:	A v = = (m= 2)	A. Hainbi	- \	Maliana a (ma2)	
Basement		Area(m²) 64.54 (1a)	Av. Height(m	(2a) =	Volume(m³)	(3a)
Ground floor				<u> </u>		╣
	\.\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	32.28 (1b)	x 3.27	(2b) =	105.56	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1r	96.82 (4)		_		_
Dwelling volume		(3a)-	+(3b)+(3c)+(3d)+(3e)+	(3n) =	279.82	(5)
2. Ventilation rate:					2	
	main secondar heating heating	y other	total		m³ per hour	
Number of chimneys	0 + 0	+ 0 =	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0	x 20 =	0	(6b)
Number of intermittent fan	s		3	x 10 =	30	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fire	es		0	x 40 =	0	(7c)
				L		_
				Air ch	anges <mark>per</mark> hou	ur
Infiltration due to chimney	s, flu <mark>es an</mark> d fans = (6a)+(6b)+(7	(7b)+(7c) =	30	÷ (5) =	0.11	(8)
	en ca <mark>rried o</mark> ut or is inten <mark>ded, pr</mark> ocee	d to (17), otherwise continu	ue from (9) to (16)	-		_ _
Number of storeys in the	e dw <mark>elling</mark> (ns)				0	(9)
Additional infiltration				(9)-1]x0.1 =	0	(10)
	25 for steel or timber frame or				0	(11)
deducting areas of opening	esent, use the value corresponding to gs); if equal user 0.35	ine greater wan area (ant	ŧI			
	por, enter 0.2 (unsealed) or 0	.1 (sealed), else ente	r 0		0	(12)
If no draught lobby, ente	er 0.05, else enter 0				0	(13)
Percentage of windows	and doors draught stripped			Ī	0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	Ì	0	(15)
Infiltration rate		(8) + (10) + (11)	+ (12) + (13) + (15) =		0	(16)
Air permeability value, o	50, expressed in cubic metre	s per hour per squar	e metre of envelor	oe area	5	(17)
•	y value, then (18) = [(17) ÷ 20]+(8		·		0.36	(18)
Air permeability value applies	if a pressurisation test has been dor	ne or a degree air permeab	oility is being used	L		_
Number of sides sheltered	1				0	(19)
Shelter factor		(20) = 1 - [0.075	5 x (19)] =	ļ	1	(20)
Infiltration rate incorporating	ng shelter factor	$(21) = (18) \times (20)$)) =]	0.36	(21)
Infiltration rate modified fo	r monthly wind speed					
Jan Feb N	Mar Apr May Jun	Jul Aug S	ep Oct No	v Dec		
Monthly average wind spe	ed from Table 7					

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infiltr	ration rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m		-	-	_	
0.46	0.45	0.44	0.39	0.38	0.34	0.34	0.33	0.36	0.38	0.4	0.42]	
Calculate effe		_	rate for t	he appli	cable ca	ise			1				
If mechanic			andiv N. 70	12h) = (22a	a) v Emy (oguation (I	NEN otho	nuino (22h	s) = (22a)			0	
If balanced with)) = (23a)			0	=== ` '
		-	-	_					2h\m + /:	22h) v [1 (226)	0	(23c)
a) If balance (24a)m= 0		0	0	0	0		0	0	0	230) ^ [$\frac{1 - (230)}{0}$] - 100j]	(24a)
b) If balance												J	(= :=)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h			<u> </u>								<u> </u>	J	(- /
•	n < 0.5 ×			•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24c)
d) If natural	ventilation	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	loft				_	
if (22b)r	m = 1, th	en (24d)	m = (22l	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59]	(24d)
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	x (25)				,	
(25)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(25)
3. Heat losse													
o. I loat lood	es and ne	eat l oss p	oaram <u>et</u>										
ELEMENT	Gros	ss	Openin	gs	Net Ar		U-valı W/m2		A X U	K)	k-value		A X k
ELEMENT	Gros area	ss		gs	A ,r	m²	W/m ²	2K	(W/I	K)	k-valu kJ/m²·		kJ/K
ELEMENT Windows Type	Gros area e 1	ss	Openin	gs	A ,r	m² x1		2K 0.04] =	9.49	K)			kJ/K (27)
ELEMENT Windows Type Windows Type	Gros area e 1	ss	Openin	gs	A ,r 7.16	m² x1 x1	W/m2 /[1/(1.4)+ /[1/(1.4)+	2K 0.04] = 0.04] =	9.49 1.33	K)			kJ/K (27) (27)
Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3	ss	Openin	gs	A ,r 7.16 1 2.3	m² x1 x1 x1	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K 0.04] = 0.04] = 0.04] =	9.49 1.33 3.05	<) 			kJ/K (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3	ss	Openin	gs	A ,r 7.16 1 2.3 9.45	x1 x1 x1 x1 x1	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.49 1.33 3.05 12.53				kJ/K (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Floor	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs	A ,r 7.16 1 2.3 9.45 64.53	x1 x1 x1 9 x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04]	9.49 1.33 3.05 12.53 8.39007				(27) (27) (27) (27) (27) (28)
Windows Type Windows Type Windows Type Windows Type Floor Walls Type1	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs 1 ²	A ,r 7.16 1 2.3 9.45 64.53 23.54	x1 x1 x1 9 x 4 x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13	0.04] = 0.04]	9.49 1.33 3.05 12.53 8.39007 4.24				(27) (27) (27) (27) (27) (28) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2	Gros area e 1 e 2 e 3 e 4 23.5	55 (m²)	Openin m	gs 1 ²	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98	x1 x1 x1 y9 x x x x x x x x x x x x x x x x x x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	0.04] = 0.04]	9.49 1.33 3.05 12.53 8.39007 4.24 6.3				(27) (27) (27) (27) (27) (28) (29) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3	Gros area e 1 e 2 e 3 e 4 23.5 54.8 31.1	55 (m²) 54 39	0 19.9	gs 1 ²	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15	x1 x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18	0.04] = 0.04]	9.49 1.33 3.05 12.53 8.3900 4.24 6.3 5.61				(27) (27) (27) (27) (28) (29) (29) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof	Gros area e 1 e 2 e 3 e 4 23.5 54.8 31.1 33.9	54 (m²) 54 15	Openin m	gs 1 ²	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.18	x1 x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	0.04] = 0.04]	9.49 1.33 3.05 12.53 8.39007 4.24 6.3				(27) (27) (27) (27) (28) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e	Gros area e 1 e 2 e 3 e 4 23.5 54.8 31.1 33.9 elements	54 69 15 65 67 68 69	0 19.9 0	gs l ²	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.18 33.98	x1 x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.13	0.04] = 0.04]	9.49 1.33 3.05 12.53 8.39007 4.24 6.3 5.61 4.41	7	kJ/m²-	K C	(27) (27) (27) (27) (28) (29) (29) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e * for windows and	Gros area e 1 e 2 e 3 e 4 23.5 54.8 31.1 33.9 elements	54 39 55 5, m ² 5, wse e	Openin m 19.9 0 19.9 0 effective wi	gs gs 1 1	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.18 33.98 208.0	x1 x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.13	0.04] = 0.04]	9.49 1.33 3.05 12.53 8.39007 4.24 6.3 5.61 4.41	7	kJ/m²-	K C	(27) (27) (27) (27) (28) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e	Gros area e 1 e 2 e 3 e 4 23.5 54.8 31.1 33.9 elements d roof winder as on both	54 39 15 35 37 38 39 39 30 30 30 30 30 30 30 30 30 30	Openin m 19.9 0 19.9 0 offective winternal wall	gs gs 1 1	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.18 33.98 208.0	x1 x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.13	2K 0.04] = 0.	9.49 1.33 3.05 12.53 8.39007 4.24 6.3 5.61 4.41	7	kJ/m²-	K	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e * for windows and ** include the area	Gros area e 1 e 2 e 3 e 4 23.5 54.8 31.1 33.9 elements d roof windows, w/K =	54 39 55 5, m ² 5 ows, use e sides of interest of the sides of t	Openin m 19.9 0 19.9 0 offective winternal wall	gs gs 1 1	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.18 33.98 208.0	x1 x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.18 0.18	2K 0.04] = 0.	9.49 1.33 3.05 12.53 8.39007 4.24 6.3 5.61 4.41	7	kJ/m²·	K C	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e * for windows and ** include the area Fabric heat los	Gros area e 1 e 2 e 3 e 4 23.5 54.8 31.1 33.9 elements d roof winder as on both ss, W/K: Cm = S(54 59 15 55 5, m ² 5, m ² 5, m ² 5, m ² 5 (A x x (A x k)	Openin m 19.9 19.9 0 output outpu	gs 1 ² 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15 33.98 208.0 alue calculatitions	x1 x1 x1 x1 x1 x1 x x1 x x x x x x x x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.18 0.18	2K 0.04] = 0.	9.49 1.33 3.05 12.53 8.39007 4.24 6.3 5.61 4.41	7 7 7 7 7 7 7 7 7 7	kJ/m²·	h 3.2	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31) (34) (33) (33)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design asses	Gros area e 1 e 2 e 3 e 4 23.5 54.8 31.1 33.9 elements d roof winder as on both ss, W/K: Cm = S(54 39 15 39 15 39 15 39 15 39 30 30 31 31 32 33 34 35 36 37 38 39 30 31 31 32 33 34 35 36 37 37 38 38 38 38 38 38 38 38 38 38	Openin m 19.9 19.9 0 offective wing ternal walk U) P = Cm = tails of the	gs 1 1 1 Indow U-vals and pan	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.18 33.98 208.0 alue calculatitions	x1 x	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.18 0.13 (continued of the continued of the continue	2K 0.04] = 0.	9.49 1.33 3.05 12.53 8.39007 4.24 6.3 5.61 4.41 (30) + (32) attive Value	7 7 7 7 7 7 7 7 7 7	kJ/m²· n paragraph(32e) =	h 3.2	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31) (34) (33) (34)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat los Heat capacity Thermal mass	Gros area e 1 e 2 e 3 e 4 23.5 54.8 31.1 33.9 elements d roof windo as on both ss, W/K: Cm = S(g parame sments whe ead of a december of a de	54 39 55 5, m ² 5, m ² 5, m ² 6, m ² 6 Sides of interpretable o	Openin m 19.9 0 19.9 0 offective with the properties of the pulation.	gs 12 1 1 1 Indow U-valls and part 1: TFA) ir	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.19 208.0 alue calculatitions	x1 x1 x1 y1 x1 y2 x1	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.18 0.13 (continued of the continued of the continue	2K 0.04] = 0.	9.49 1.33 3.05 12.53 8.39007 4.24 6.3 5.61 4.41 (30) + (32) attive Value	7 7 7 7 7 7 7 7 7 7	kJ/m²· n paragraph(32e) =	h 3.2	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31) (31) (33) (33) (34) (35)

	eat loss							(33) +			L	62.77	(37
entilation he		alculated	monthly	/	Г	ı		` ,	= 0.33 × (25)m x (5)) 		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 55.75	55.38	55.01	53.3	52.98	51.49	51.49	51.21	52.06	52.98	53.63	54.3		(38
leat transfer	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
39)m= 118.52	118.15	117.78	116.07	115.75	114.26	114.26	113.98	114.83	115.75	116.4	117.08		_
leat loss para	omotor (L	אין אין אין אין	m²l⁄						Average = = (39)m ÷	Sum(39) ₁	12 /12=	116.07	(39
1.22	1.22	1.22	1.2	1.2	1.18	1.18	1.18	1.19	1.2	1.2	1.21		
1.22	1.22	1.22	1.2	1.2	1.10	1.10	1.10			Sum(40) ₁	1	1.2	(40
lumber of da	ys in mor	nth (Tabl	le 1a)					,	werage	Cum(+o)	12712	1,2	
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	tina ener	av reaui	rement:								kWh/ye	ar:	
													
ssumed occ if TFA > 13.			[1 ovn	/ n nnna	240 v /T	= A 12 O)2)1 ± 0 (1012 v /	Γ Γ Λ 12		.71		(42
if TFA £ 13.		T 1.70 X	[ı - exp	(-0.0003	749 X (11	-A -13.9)2)] + 0.0) X C 1 OC	IFA -13.	ອ)			
nnual averaç	ge hot wa										3.52		(4
edu <mark>ce the</mark> annu ot more that 125	_					-	to achieve	a water us	e target o				
								_					
Jan lot water usage	Feb	Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
									100.10				
14)m= 108.37	104.43	100.49	96.55	92.61	88.67	88.67	92.61	96.55	100.49	104.43	108.37	1100.0	
nergy content o	f hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1182.2	(44
15)m= 160.71	140.56	145.04	126.45	121.33	104.7	97.02	111.33	112.66	131.3	143.32	155.64		
100.71	140.00	140.04	120.40	121.00	104.7	07.02	111.00			m(45) ₁₁₂ =	-	1550.06	(4
instantaneous ı	vater heatir	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)			(10)112	L		`
46)m= 24.11	21.08	21.76	18.97	18.2	15.71	14.55	16.7	16.9	19.69	21.5	23.35		(46
Vater storage	loss:				!	•							
storage volun	ne (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(4
community l	•			-			` '						
Otherwise if n		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Vater storage a) If manufac		eclared l	nee facto	nr is kno	wn (k\//h	n/day).					0		(4
emperature) 13 KHO	wii (itwi	naay).					0		`
•				oor			(48) x (49)				0		(4)
nergy lost from the contract (nergy lost) in		_	-		or is not		(40) X (49)	-			0		(5)
•	age loss		-								0		(5
iot water stol		ee sectio	on 4.3										
community l	•												
community lolume factor	from Tal	ble 2a									0		(5
	from Tal	ble 2a								-	0		(52 (53

Water storage loss of	alculated	for each	month			((56)m = (55) × (41)	m				
(56)m= 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedica	ted solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss (annual) fro	om Table	e 3							0		(58)
Primary circuit loss of	alculated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified by factor	from Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculate	d for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 50.96 46.03	50.96	47.61	47.19	43.73	45.18	47.19	47.61	50.96	49.32	50.96		(61)
Total heat required for	or water h	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 211.67 186.5	3 196	174.06	168.52	148.43	142.2	158.52	160.27	182.26	192.64	206.6		(62)
Solar DHW input calculate	d 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 water he	eater											
(64)m= 211.67 186.5	3 196	174.06	168.52	148.43	142.2	158.52	160.27	182.26	192.64	206.6		
						Outp	out from wa	ater heate	r (annual) ₁	12	2127.75	(64)
Heat gains from water	er heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m] + 0.8 x	د [(4 <mark>6)</mark> m	+ (57)m	+ (59)m	1	
(65)m= 66.18 58.24	60.97	53.95	52.14	45.74	43.55	48.82	49.36	56.4	59.98	64.40		(65)
		00.00	02.17	40.74	40.00	40.02	49.30	30.4	59.96	64.49		(00)
in <mark>clude</mark> (57)m in ca											leating	(00)
include (57)m in ca	alculation	of (65)m	only if c								eating	(00)
	alculation ee Table t	of (65)m	only if c								eating	(00)
5. Internal gains (s	alculation ee Table S	of (65)m	only if c								neating	(00)
5. Internal gains (s Metabolic gains (Tab	le 5), War	of (65)m and 5a	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	rom com	munity h	eating	(66)
5. Internal gains (s Metabolic gains (Tab	le 5), War Mar	of (65)m 5 and 5a tts Apr 135.4	only if control is the control of th	Jun 135.4	Jul 135.4	Aug 135.4	Sep	ater is fr	om com	munity h	eating	
5. Internal gains (s Metabolic gains (Tab Jan Feb (66)m= 135.4 135.4	le 5), War Mar 135.4	of (65)m 5 and 5a tts Apr 135.4	only if control is the control of th	Jun 135.4	Jul 135.4	Aug 135.4	Sep	ater is fr	om com	munity h	neating	
5. Internal gains (s Metabolic gains (Tab Jan Fet (66)m= 135.4 135.4 Lighting gains (calculate)	Mar 135.4 lated in A	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29	only if co): May 135.4 L, equat	Jun 135.4 ion L9 or	Jul 135.4 r L9a), a	Aug 135.4 Iso see	Sep 135.4 Table 5	Oct 135.4	Nov	Dec	eating	(66)
5. Internal gains (s Metabolic gains (Tab Jan Fet (66)m= 135.4 135.4 Lighting gains (calcumus) (67)m= 22.48 19.97	le 5), War Mar 135.4 lated in A 16.24	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append	only if co): May 135.4 L, equat	Jun 135.4 ion L9 or	Jul 135.4 r L9a), a	Aug 135.4 Iso see	Sep 135.4 Table 5	Oct 135.4	Nov	Dec	eating	(66)
5. Internal gains (s Metabolic gains (Tab Jan Feb (66)m= 135.4 135.4 Lighting gains (calcu (67)m= 22.48 19.97 Appliances gains (calculation)	Mar 135.4 lated in A 16.24 lculated ir	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15	only if co): May 135.4 L, equat 9.19 dix L, eq 215.5	Jun 135.4 ion L9 or 7.76 uation L	Jul 135.4 r L9a), a 8.38 13 or L1 187.84	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 see Ta	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4	eating	(66) (67)
5. Internal gains (s Metabolic gains (Tab Jan Fet (66)m= 135.4 135.4 Lighting gains (calcu (67)m= 22.48 19.97 Appliances gains (ca (68)m= 251.08 253.6	Mar 135.4 lated in A 16.24 lculated in A 247.12 lated in A	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15	only if co): May 135.4 L, equat 9.19 dix L, eq 215.5	Jun 135.4 ion L9 or 7.76 uation L	Jul 135.4 r L9a), a 8.38 13 or L1 187.84	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 see Ta	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4	eating	(66) (67)
5. Internal gains (s Metabolic gains (Tab Jan Feb (66)m= 135.4 135.4 Lighting gains (calcu (67)m= 22.48 19.97 Appliances gains (calcu (68)m= 251.08 253.60 Cooking gains (calcu	le 5), War 135.4 lated in A 16.24 lculated ir 247.12 lated in A 36.54	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54	only if construction only in construction only in construction only in c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a)	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 See Ta 191.8	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4 23.11	peating	(66) (67) (68)
5. Internal gains (s Metabolic gains (Tab Jan Feb (66)m= 135.4 135.4 Lighting gains (calcu (67)m= 22.48 19.97 Appliances gains (calcu (68)m= 251.08 253.60 Cooking gains (calcu (69)m= 36.54 36.54	le 5), War 135.4 lated in A 16.24 lculated ir 247.12 lated in A 36.54	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54	only if construction only in construction only in construction only in c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a)	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 See Ta 191.8	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4 23.11	eating	(66) (67) (68)
5. Internal gains (s Metabolic gains (Tab Jan Fet (66)m= 135.4 135.4 Lighting gains (calcu (67)m= 22.48 19.97 Appliances gains (calcu (68)m= 251.08 253.6 Cooking gains (calcu (69)m= 36.54 36.54 Pumps and fans gain	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 as (Table s	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15 ppendix 36.54 5a) 3	only if only i	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42 36.54	Dec 135.4 23.11 240.01 36.54	eating	(66) (67) (68) (69)
5. Internal gains (s Metabolic gains (Tab Jan Fet Jan Fet (66)m= 135.4 135.4 Lighting gains (calcumediate) (67)m= 22.48 19.97 Appliances gains (cancumediate) Cooking gains (cancumediate)	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 as (Table s 3 ion (negar	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54 5a) 3 tive valu	only if only i	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42 36.54	Dec 135.4 23.11 240.01 36.54	leating	(66) (67) (68) (69)
5. Internal gains (s Metabolic gains (Tab Jan Feb (66)m= 135.4 135.4 Lighting gains (calcument (67)m= 22.48 19.97 Appliances gains (calcument (68)m= 251.08 253.66) Cooking gains (calcument (69)m= 36.54 36.54) Pumps and fans gain (70)m= 3 3 Losses e.g. evapora	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 ls (Table s 3 ion (nega	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54 5a) 3 tive valu	only if construction only if c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42 36.54	Dec 135.4 23.11 240.01 36.54	leating	(66) (67) (68) (69) (70)
5. Internal gains (s Metabolic gains (Tab Jan Feb (66)m= 135.4 135.4 Lighting gains (calcumed (67)m= 22.48 19.97 Appliances gains (cander (68)m= 251.08 253.66 Cooking gains (calcumed (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3 Losses e.g. evapora (71)m= -108.32 -108.3	Mar 135.4 lated in A 16.24 lculated in A 36.54 ls (Table 5) 3 ion (nega 2 -108.32 (Table 5)	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54 5a) 3 tive valu	only if construction only if c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42 36.54	Dec 135.4 23.11 240.01 36.54	leating	(66) (67) (68) (69) (70)
5. Internal gains (s Metabolic gains (Tab Jan Feb 135.4 135.4 Lighting gains (calcu (67)m= 22.48 19.97 Appliances gains (ca (68)m= 251.08 253.60 Cooking gains (calcu (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3 Losses e.g. evapora (71)m= -108.32 -108.3 Water heating gains	le 5), War lated in A lated in A lated in A lated in A 247.12 lated in A 36.54 as (Table s 108.32 (Table 5) 81.94	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15 ppendix 36.54 5a) 3 tive valu -108.32	only if construction only if c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54 3 ole 5) -108.32	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 3 -108.32	Nov 135.4 21.68 223.42 36.54 3	Dec 135.4 23.11 240.01 36.54 3 -108.32	leating	(66) (67) (68) (69) (70)
5. Internal gains (s Metabolic gains (Tab Jan Feb (66)m= 135.4 135.4 Lighting gains (calcument (67)m= 22.48 19.97 Appliances gains (calcument (68)m= 251.08 253.66) Cooking gains (calcument (69)m= 36.54 36.54) Pumps and fans gain (70)m= 3 3 Losses e.g. evaporation (71)m= -108.32 -108.32 Water heating gains (72)m= 88.94 86.67	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 ls (Table s 3 ion (nega 2 -108.32 (Table 5) 81.94	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15 ppendix 36.54 5a) 3 tive valu -108.32	only if construction only if c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54 3 ole 5) -108.32	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 3 -108.32	Nov 135.4 21.68 223.42 36.54 3	Dec 135.4 23.11 240.01 36.54 3 -108.32	leating	(66) (67) (68) (69) (70)

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

Orientation: Access Factor Table 6d	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	2.3	x	11.28	x	0.63	x	0.7	=	7.93	(75)
Northeast 0.9x 0.77	2.3	x	22.97	х	0.63	x	0.7	=	16.14	(75)
Northeast 0.9x 0.77	2.3	x	41.38	х	0.63	x	0.7	=	29.09	(75)
Northeast 0.9x 0.77	2.3	x	67.96	x	0.63	x	0.7	=	47.77	(75)
Northeast 0.9x 0.77	2.3	x	91.35	х	0.63	x	0.7	=	64.21	(75)
Northeast 0.9x 0.77	2.3	x	97.38	х	0.63	x	0.7	=	68.45	(75)
Northeast 0.9x 0.77	2.3	x	91.1	х	0.63	x	0.7	=	64.04	(75)
Northeast 0.9x 0.77	2.3	x	72.63	х	0.63	X	0.7	=	51.05	(75)
Northeast 0.9x 0.77	2.3	x	50.42	х	0.63	x	0.7	=	35.44	(75)
Northeast 0.9x 0.77	2.3	X	28.07	х	0.63	x	0.7	=	19.73	(75)
Northeast 0.9x 0.77	2.3	x	14.2	x	0.63	x	0.7	=	9.98	(75)
Northeast 0.9x 0.77	2.3	x	9.21	x	0.63	x	0.7] =	6.48	(75)
Northwest 0.9x 0.77	7.16	X	11.28	х	0.63	X	0.7	=	24.69	(81)
Northwest 0.9x 0.77	1	x	11.28	х	0.63	X	0.7	=	3.45	(81)
Northwest 0.9x 0.77	9.45	x	11.28	х	0.63	x	0.7	=	32.59	(81)
Northwest 0.9x 0.77	7.16	X	22.97	Х	0.63	X	0.7	=	50.26	(81)
Northwest 0.9x 0.77	1	х	22.97	х	0.63	x	0.7	=	7.02	(81)
Northwest 0.9x 0.77	9.45	x	22.97	×	0.63	x	0.7	=	66.33	(81)
Northwest 0.9x 0.77	7.16	х	41.38	x	0.63	x	0.7	=	90.54	(81)
Northwest 0.9x 0.77	1	х	41.38	×	0.63	x	0.7	=	12.65	(81)
Northwest 0.9x 0.77	9.45	х	41,38	х	0.63	x	0.7	=	119.5	(81)
Northwest 0.9x 0.77	7.16	х	67.96	х	0.63	x	0.7	=	148.7	(81)
Northwest 0.9x 0.77	1	x	67.96	х	0.63	x	0.7] =	20.77	(81)
Northwest 0.9x 0.77	9.45	x	67.96	х	0.63	x	0.7	=	196.26	(81)
Northwest 0.9x 0.77	7.16	x	91.35	x	0.63	X	0.7	=	199.88	(81)
Northwest 0.9x 0.77	1	x	91.35	x	0.63	x	0.7	=	27.92	(81)
Northwest 0.9x 0.77	9.45	x	91.35	x	0.63	x	0.7] =	263.81	(81)
Northwest 0.9x 0.77	7.16	X	97.38	x	0.63	x	0.7	=	213.1	(81)
Northwest 0.9x 0.77	1	x	97.38	x	0.63	x	0.7	=	29.76	(81)
Northwest 0.9x 0.77	9.45	X	97.38	x	0.63	x	0.7	=	281.25	(81)
Northwest 0.9x 0.77	7.16	x	91.1	x	0.63	X	0.7	=	199.35	(81)
Northwest 0.9x 0.77	1	x	91.1	x	0.63	x	0.7	=	27.84	(81)
Northwest 0.9x 0.77	9.45	x	91.1	х	0.63	x	0.7	=	263.1	(81)
Northwest 0.9x 0.77	7.16	x	72.63	х	0.63	X	0.7	=	158.92	(81)
Northwest 0.9x 0.77	1	x	72.63	x	0.63	x	0.7	=	22.2	(81)
Northwest 0.9x 0.77	9.45	x	72.63	x	0.63	x	0.7	=	209.75	(81)
Northwest 0.9x 0.77	7.16	×	50.42	х	0.63	x	0.7	j =	110.33	(81)
Northwest 0.9x 0.77	1	×	50.42	x	0.63	x	0.7	j =	15.41	(81)
Northwest 0.9x 0.77	9.45	x	50.42	х	0.63	х	0.7	=	145.62	(81)

_															
Northwest _{0.9x}	0.77	X	7.1	16	X	2	8.07	X		0.63	x	0.7	=	61.42	(81)
Northwest 0.9x	0.77	x	1		X	2	8.07	X		0.63	X	0.7	=	8.58	(81)
Northwest _{0.9x}	0.77	X	9.4	15	x	2	8.07	X		0.63	x	0.7	=	81.06	(81)
Northwest _{0.9x}	0.77	X	7.1	16	x	1	14.2	X		0.63	x	0.7	=	31.07	(81)
Northwest _{0.9x}	0.77	X	1		x	1	14.2	X		0.63	x	0.7	=	4.34	(81)
Northwest _{0.9x}	0.77	X	9.4	15	x	1	14.2	X		0.63	x	0.7	=	41	(81)
Northwest 0.9x	0.77	X	7.1	16	x	9	9.21	X		0.63	x	0.7	=	20.16	(81)
Northwest _{0.9x}	0.77	X	1		x	9	9.21	X		0.63	x	0.7	=	2.82	(81)
Northwest _{0.9x}	0.77	X	9.4	15	x	9	9.21	X		0.63	x	0.7	=	26.61	(81)
Solar gains in v	vatts, ca	alculated	for eac	h month				(83)m	= Su	ım(74)m .	(82)m			_	
(83)m= 68.65	139.75	251.78	413.49	555.82	59	92.56	554.33	441	.92	306.8	170.78	86.38	56.07		(83)
Total gains – in	iternal a	nd solar	(84)m =	= (73)m	+ (8	33)m	, watts						•	-	
(84)m= 497.79	566.7	663.71	800.48	917.21	92	29.39	875.72	770.	.28	648.41	537.55	481.41	472.48		(84)
7. Mean intern	nal temp	erature	(heating	season)										
Temperature of			`		<i>'</i>	area f	rom Tah	nle 9	Th1	l (°C)				21	(85)
Utilisation fact	•	•			-).O O,	,	(0)					(00)
Jan	Feb	Mar	<u>_</u>	May	Ė	Jun	Jul			Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	Apr 0.97	0.89).72	0.56	0.6	ug	0.9	0.99	1	1		(86)
					_				_		0.99				(00)
Me <mark>an int</mark> ernal	-			<u> </u>	_									1	
(87)m= 19.58	19.72	20	20.4	20.75	2	0.94	20.99	20.9	97	20.8	20.35	19.91	19.57		(87)
Temperature o	during h	eating p	eriods ir	n rest of	dw	elling	from Ta	ble 9), Th	2 (°C)					
(88)m= 19.9	19.9	19.91	19.92	19.92	1	9.94	19.94	19.9	94	19.93	19.92	19.92	19.91		(88)
Utilisation fact	or for a	ains for	rest of d	wellina.	h2.	m (se	e Table	9a)							
(89)m= 1	1	0.99	0.96	0.84	_	0.63	0.43	0.5	51	0.84	0.98	1	1]	(89)
Mean internal	temper	ature in	the rest	of dwell	ina	T2 (f	ollow etc	ne 3	to 7	in Tabl	o 0c)			J	
(90)m= 18.01	18.21	18.61	19.2	19.67		19.9	19.93	19.9	_	19.76	19.15	18.49	17.99	1	(90)
(66)	10.21	10.01	10.2	10.01	<u> </u>	10.0	10.00					ng area ÷ (4		0.22	(91)
												(•	0.22	(01)
Mean internal		ature (fo	r the wh		llin	g) = fl	_A × T1	+ (1	– fL/	4) × T2				1	
(92)m= 18.35	18.54	18.92	19.46	19.91	2	0.12	20.16	20.	16	19.99	19.41	18.8	18.34		(92)
Apply adjustm	ent to the	ne mean	interna	temper	atu	re fro		4e,	whe	re appro	priate			•	
(93)m= 18.35	18.54	18.92	19.46	19.91	2	0.12	20.16	20.	16	19.99	19.41	18.8	18.34		(93)
8. Space heat	ing requ	uirement													
Set Ti to the m					ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=(76)m an	d re-cal	culate	
the utilisation f				ı	_	. 1		_				1	Γ_	1	
Jan	Feb	Mar	Apr	May		Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec		
Utilisation fact			r		_	1				1			Π.	1	(0.4)
(94)m= 1	1	0.99	0.95	0.84		0.64	0.46	0.5	64	0.85	0.98	1	1		(94)
Useful gains, I					T =		100.00	447	00	540.5	500.07	1.70.44	1,74,00	1	(05)
(95)m= 496.7	564.24	655.49	762.4	774.21	<u> </u>	97.72	402.02	417.	.38	549.5	526.07	479.41	471.68		(95)
Monthly avera				i	_		45.5		, 1	,,, l	40 =	T - /	T	1	(00)
(96)m= 4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.		14.1	10.6	7.1	4.2	J	(96)
Heat loss rate				r	_		- '	- `	- -	<u> </u>		1,000 ::	10== = :	1	(07)
(97)m= 1665.46	1611.75	1462.54	1226.14	950.35	6	31.27	407.09	428	.22	676.06	1020.06	1362.42	1655.08	J	(97)

	600.45	333.89	131.05	0	0	0)m – (95 0	367.53	635.77	880.44		
						Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	4522.62	(98)
Space heating requiren	nent in	kWh/m²	/year							Ī	46.71	(99)
a. Energy requirements	– Indi	vidual h	eating sy	⁄stems i	ncluding	micro-C	HP)					
Space heating: Fraction of space heat	from o	oondor	/aunalai	montory	ovotom					Г		(201
Fraction of space heat				пенату	•	(202) = 1 -	- (201) =			L T	1	(202
Fraction of total heating		-	` '			(204) = (204)	` '	(203)] =		L T	1	(204
Efficiency of main space		-				. , ,	, -			ļ	93.4	☐ (206
Efficiency of secondary				g system	ı, %					Ī	0	(208
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ∶ar
Space heating requiren	nent (c	alculate	d above)									
	600.45	333.89	131.05	0	0	0	0	367.53	635.77	880.44		
211)m = {[(98)m x (204) 931)] } x 1 _{642.88}	00 ÷ (20 357.49	6) 140.31	0		0	0	393.5	680.69	942.66		(211
931 / 753.67	042.00	357.49	140.31	0	0	_	I (kWh/yea				4842.2	(211
Space heating fuel (sec	ondar	y), kWh/	month						7 15, 10 12	L		
{[(98)m x (201)]} x 100												
215)m= 0 0	0	0	0	0	0	0	0	0	0	0		٦.,,,
Vat <mark>er he</mark> ating						Tola	I (kWh/yea	ii) –Suiii(2	15) _{15,1012}	_	0	(215
Output from water heate	r (calcı	ulated al	oove)									
211.67 186.58	196	174.06	168.52	148.43	142.2	158.52	160.27	182.26	192.64	206.6		_
										,	80.3	1/04/
Efficiency of water heate		00.00	24.40	00.0	20.0		20.0	00.70	0-00	0000		(216
217)m= 88.23 88.08	87.69	86.66	84.43	80.3	80.3	80.3	80.3	86.78	87.83	88.29		(217
217)m= 88.23 88.08 Fuel for water heating, k 219)m = (64)m x 100 =	87.69 Wh/mc	onth	84.43	80.3	80.3	80.3	80.3	86.78	87.83	88.29		┛`
217)m= 88.23 88.08 Fuel for water heating, k 219)m = (64)m x 100 =	87.69 Wh/mc	onth	199.61	80.3	80.3	197.41	199.59	210.02	219.32	234		(217
217)m= 88.23 88.08 Fuel for water heating, k 219)m= (64)m x 100 = 219)m= 239.91 211.84 2	87.69 Wh/mo ÷ (217)	onth m				197.41		210.02 19a) ₁₁₂ =	219.32	234	2498	(217
217)m= 88.23 88.08 Fuel for water heating, k 219)m = (64)m x 100 = 219)m= 239.91 211.84 2 Annual totals	87.69 Wh/mo ÷ (217) 223.53	onth m 200.85	199.61			197.41	199.59	210.02 19a) ₁₁₂ =		234	2498 kWh/yea l 4842.2	(217
217)m= 88.23 88.08 [uel for water heating, k 219)m = (64)m x 100 = 219)m= 239.91 211.84 2 [unnual totals [pace heating fuel used]	87.69 Wh/mo ÷ (217) 223.53	onth m 200.85	199.61			197.41	199.59	210.02 19a) ₁₁₂ =	219.32	234	kWh/yea	(215
217)m= 88.23 88.08 [uel for water heating, k 219)m = (64)m x 100 = 219)m= 239.91 211.84 2 [unnual totals [pace heating fuel used] Vater heating fuel used	87.69 Wh/mc ÷ (217) 223.53 , main	onth m 200.85 system	199.61	184.84		197.41	199.59	210.02 19a) ₁₁₂ =	219.32	234	kWh/yea 4842.2	(215
117)m= 88.23 88.08 uel for water heating, k 219)m = (64)m x 100 = 119)m= 239.91 211.84 2 annual totals pace heating fuel used Vater heating fuel used lectricity for pumps, fan	87.69 Wh/mc ÷ (217) 223.53 , main	onth m 200.85 system	199.61	184.84		197.41	199.59	210.02 19a) ₁₁₂ =	219.32	234	kWh/yea 4842.2	(215
uel for water heating, k 219)m = (64)m x 100 = 219)m = 239.91 211.84 2 239.91 211.84 2 239.91 211.84 2 24.00 and totals 24.00 pace heating fuel used 25.00 vater heating fuel used 26.00 vater heating fuel used 27.00 page 19.00 page	87.69 Wh/mc ÷ (217) 223.53 , main	onth m 200.85 system	199.61	184.84		197.41	199.59	210.02 19a) ₁₁₂ =	219.32	234	kWh/yea 4842.2	(21)
217)m= 88.23 88.08 Fuel for water heating, k 219)m = (64)m x 100 = 219)m= 239.91 211.84 2 Annual totals Expace heating fuel used Vater heating fuel used Electricity for pumps, fancentral heating pump: boiler with a fan-assiste	87.69 Wh/mo ÷ (217) (223.53 , main and ded flue	system	199.61 1 keep-hot	184.84		197.41 Tota	199.59	210.02 19a) ₁₁₂ = k\	219.32 Wh/year	234	kWh/yea 4842.2 2498	(21) (21) (23) (23)
217)m= 88.23 88.08 Fuel for water heating, k 219)m = (64)m x 100 =	87.69 Wh/mo ÷ (217) (223.53 , main and ded flue	system	199.61 1 keep-hot	184.84		197.41 Tota	199.59 I = Sum(2	210.02 19a) ₁₁₂ = k\	219.32 Wh/year	234	kWh/yea 4842.2	(21)

Energy

kWh/year

Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	1045.92	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	539.57	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1585.48	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	206.07	(268)
Total CO2, kg/year	sum	of (265)(271) =		1830.48	(272)
TER =				18.91	(273)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.4.16 Property Address: Flat 02 Address: 1. Overall dwelling dimensions Area(m²) Av. Height(m) Volume(m³) **Basement** 52.41 (1a) x 2.7 (2a) =141.51 (3a) Ground floor (1b) x (2b) (3b) 32.02 3.27 104.71 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)84.43 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 246.22 2. Ventilation rate: main secondary other total m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)3 30 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c)0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.12 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17) 5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.37 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 1 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.37 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4.9

4.4

5

3.8

4.3

3.8

3.7

4

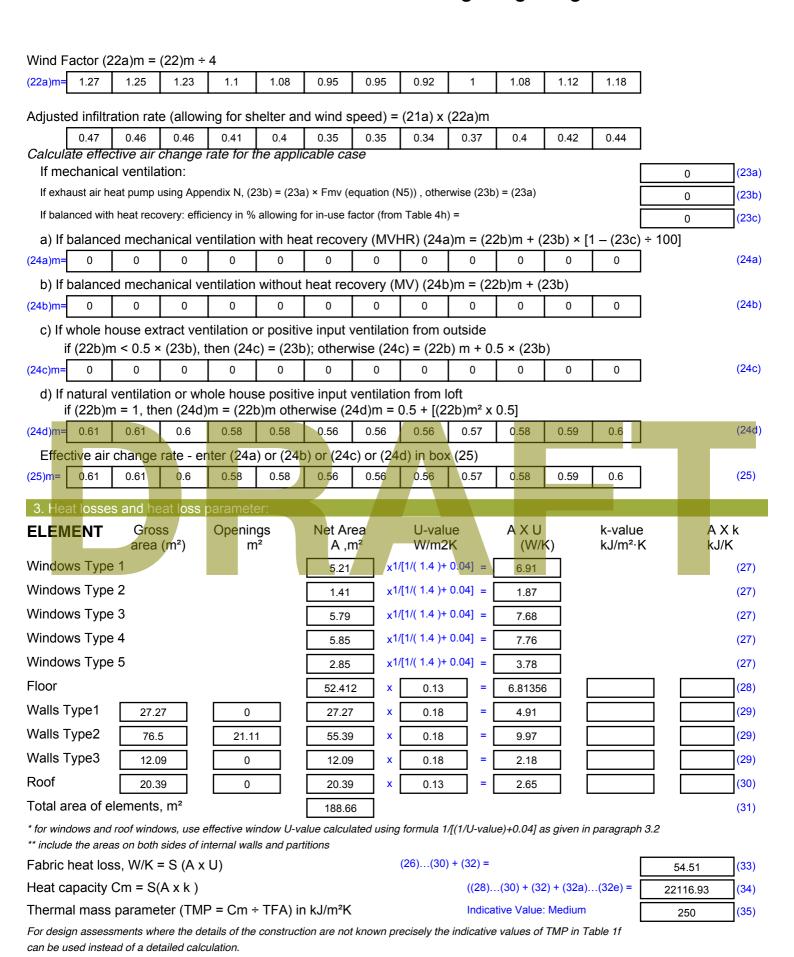
4.3

4.5

4.7

(22)m=

5.1



Stroma FSAP 2012 Version: 1.0.4.16 (SAP 9.92) - http://www.stroma.com

Therm	al bridge	es : S (L	x Y) cal	culated i	using Ap	pendix l	<						7.14	(36)
	of therma	0 0	are not kn	own (36) =	= 0.15 x (3	1)			(00)	(00)				_
	abric heation hea		alculated	d monthly	y				(33) + (38)m	,	25)m x (5)		61.65	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	49.76	49.4	49.06	47.42	47.12	45.7	45.7	45.43	46.24	47.12	47.74	48.38		(38)
Heat to	ransfer c	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m		•	
(39)m=	111.41	111.05	110.71	109.07	108.77	107.35	107.35	107.08	107.89	108.77	109.39	110.03		
Heat lo	oss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) _{1.} (4)	12 /12=	109.07	(39)
(40)m=	1.32	1.32	1.31	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.3	1.3		
Numbe	er of day	s in moi	nth (Tab	le 1a)			•		,	Average =	Sum(40) _{1.}	12 /12=	1.29	(40)
rtanio	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
				Į.	ļ.									
4. Wa	ater heat	ing enei	gy requ	irement:								kWh/ye	ear:	
A 001100	and annu	nanay l	NI.										1	(40)
	ned occu FA > 13.9			[1 - exp	(-0.0003	49 x (TF	A -13.9	(2)] + 0.0	0013 x (T	ΓFA -13.		54		(42)
	A £ 13.9							(O=\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \						
	Il averag									se target o		.56		(43)
	e that 125						-							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	104.02	100.24	96.45	92.67	88.89	85.11	85.11	88.89	92.67	96.45	100.24	104.02		
		f1 -1				400 1/4		T / 0000			m(44) ₁₁₂ =		1134.76	(44)
	content of												1	
(45)m=	154.26	134.91	139.22	121.38	116.46	100.5	93.13	106.86	108.14	126.03	137.57	149.39		
If instan	ntaneous w	ater heatii	ng at point	t of use (no	hot water	storage),	enter 0 in	boxes (46,		Fotal = Su	m(45) ₁₁₂ =		1487.84	(45)
(46)m=	23.14	20.24	20.88	18.21	17.47	15.07	13.97	16.03	40.00		20.04	22.41		(46)
Matar							l	10.00	16.22	18.9	20.64			(10)
	storage		. , ,	<u> </u>										, ,
Storag	ge volum	e (litres)		ng any so	olar or W	WHRS	storage	within sa				0		(47)
Storag	ge volum munity h	e (litres) eating a	nd no ta	ng any so ank in dw	olar or W velling, e	/WHRS nter 110	storage litres in	within sa	ame vess	sel				, ,
Storag If com Otherv	ge volum munity h	e (litres) eating a stored	nd no ta	ng any so ank in dw	olar or W velling, e	/WHRS nter 110	storage litres in	within sa	ame vess	sel				, ,
Storag If com Otherv Water	ge volum munity h	e (litres) eating a stored loss:	nd no ta hot wate	ng any so ank in dw er (this ir	olar or W velling, e ncludes i	/WHRS nter 110 nstantar	storage litres in neous co	within sa	ame vess	sel	47)			, ,
Storag If com Otherv Water a) If m	ge volum munity h wise if no storage	e (litres) eating a o stored loss: urer's de	nd no ta hot wate	ng any so ank in dw er (this ir	olar or W velling, e ncludes i	/WHRS nter 110 nstantar	storage litres in neous co	within sa	ame vess	sel	47)	0		(47)
Storag If commother Other Water a) If m	ge volum munity h wise if no storage nanufact	e (litres) eating a o stored loss: urer's de	nd no ta hot wate eclared I m Table	ng any so ank in dw er (this ir oss facto	Dlar or W velling, e ncludes i	/WHRS nter 110 nstantar	storage litres in neous co n/day):	within sa	ame vess	sel	47)	0		(47)
Storag If com Otherw Water a) If m Tempe Energy b) If m	ge volum munity h wise if no storage nanufact erature for y lost fro	e (litres) eating a stored loss: urer's de actor fro m water urer's de	nd no ta hot wate eclared I m Table storage eclared o	ng any so ank in dw er (this ir oss facto 2b e, kWh/ye	olar or W velling, e ncludes i or is kno ear loss fact	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) Imbi boil	ame vess	sel	47)	0		(47) (48) (49)
Storag If commodified the commodities of the commo	ge volum munity h wise if no storage nanufact erature fa y lost fro nanufact ater stora	e (litres) eating a o stored loss: urer's de actor fro m water urer's de	nd no ta hot wate eclared I m Table storage eclared of factor fr	ng any so ank in dw er (this ir oss facto 2b e, kWh/ye cylinder l	olar or W velling, e ncludes i or is kno ear loss fact	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) Imbi boil	ame vess	sel	47)	0		(47) (48) (49)
Storag If com Otherv Water a) If m Tempe Energy b) If m Hot wa	ge volum munity h wise if no storage nanufact erature for y lost fro	e (litres) eating a o stored loss: urer's de actor fro m water urer's de age loss eating s	nd no ta hot wate eclared I m Table storage eclared of factor free secti	ng any so ank in dw er (this ir oss facto 2b e, kWh/ye cylinder l	olar or W velling, e ncludes i or is kno ear loss fact	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) Imbi boil	ame vess	sel	47)	0 0 0 0		(47) (48) (49) (50) (51)
Storag If com Otherv Water a) If m Tempe Energy b) If m Hot wa If com Volum	ge volum munity havise if no storage manufact erature from anufact exter stora munity have solventiculater stora munity have stora exter exter exter exter exter exter exter external e	e (litres) eating a o stored loss: urer's de actor fro m water urer's de age loss eating s from Ta	nd no ta hot wate eclared I m Table storage eclared of factor fr ee secti ble 2a	ng any so ank in dw er (this ir oss facto 2b cylinder l com Tabl on 4.3	olar or W velling, e ncludes i or is kno ear loss fact	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) Imbi boil	ame vess	sel	47)	0 0 0		(47) (48) (49) (50)

Energy lost from water storage, kWh/year Enter (50) or (54) in (55)	(47) x (51) x (52) x (53) =	0	(54)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		(33)
(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 when	re (H11) is from App	endix H
(57)m= 0 0 0 0 0 0 0	0 0 0	0 0	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷	` '		
(modified by factor from Table H5 if there is solar water hea	, , , , , , , , , , , , , , , , , , , 	' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' 	(59)
(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 × (4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 		—
(61)m= 50.96 46.03 49.15 45.7 45.3 41.97 43.37	45.3 45.7 49.1		
Total heat required for water heating calculated for each mon	<u> </u>	<u> </u>	¬`´´``´
(62)m= 205.22 180.94 188.37 167.08 161.76 142.47 136.5	152.16 153.84 175.1		
Solar DHW input calculated using Appendix G or Appendix H (negative quan (add additional lines if FGHRS and/or WWHRS applies, see A	• , ,	bution to water heati	ng)
(63)m= 0 0 0 0 0 0 0 0		0 0	(63)
Output from water heater			
(64)m= 205.22 180.94 188.37 167.08 161.76 142.47 136.5	152.16 153.84 175.1	18 186.88 200.3	5
	Output from water hea		2050.74 (64)
Heat gains from water heating, kWh/month 0.25 ' [0.85 × (45)			
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81	46.86 47.38 54.19		
	70.00 77.30 37.1	9 58.07 62.4	1 (65)
include (57)m in calculation of (65)m only if cylinder is in the			
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):			
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	dwelling or hot water is	s from communit	y heating
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	dwelling or hot water is Aug Sep Oc	s from communit	y heating
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oc	s from communit	y heating
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oc	s from communit	c (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep Oc 127.08 127.08 127.08 also see Table 5 9.87 13.25 16.8	s from communit	c (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep Oc 127.08 127.08 127.0 also see Table 5 9.87 13.25 16.8 13a), also see Table 5	s from communit ct Nov De 08 127.08 127.0 2 19.64 20.9	c 8 (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep Oc 127.08 127.08 127.0 also see Table 5 9.87 13.25 16.8 13a), also see Table 5 168.54 174.51 187.2	s from communit ct Nov De 08 127.08 127.0 2 19.64 20.9	c 8 (66)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep Oc 127.08 127.08 127.0 also see Table 5 9.87 13.25 16.8 13a), also see Table 5 168.54 174.51 187.2	s from communit ct Nov De 08 127.08 127.0 2 19.64 20.9 23 203.29 218.3	y heating (66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep Oc 127.08 127.08 127.08 also see Table 5 9.87 13.25 16.8 13a), also see Table 5 168.54 174.51 187.2 a), also see Table 5	s from communit ct Nov De 08 127.08 127.0 2 19.64 20.9 23 203.29 218.3	y heating (66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep Oc 127.08 127.08 127.08 also see Table 5 9.87 13.25 16.8 13a), also see Table 5 168.54 174.51 187.2 a), also see Table 5	s from communit ct Nov De 08 127.08 127.0 2 19.64 20.9 23 203.29 218.3	y heating (66) (67) (68)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep Oc 127.08 127.08 127.0 also see Table 5 9.87 13.25 16.8 13a), also see Table 5 168.54 174.51 187.2 a), also see Table 5 35.71 35.71 35.7	s from communit ot Nov De 08 127.08 127.0 2 19.64 20.9 23 203.29 218.3 11 35.71 35.7	y heating (66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oc 127.08 127.08 127.0 also see Table 5 9.87 13.25 16.8 13a), also see Table 5 168.54 174.51 187.2 a), also see Table 5 35.71 35.71 35.7	s from communit 2t Nov De 28 127.08 127.0 2 19.64 20.9 23 203.29 218.3 1 35.71 35.7	c (66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan	Aug Sep Oc 127.08 127.08 127.0 also see Table 5 9.87 13.25 16.8 13a), also see Table 5 168.54 174.51 187.2 a), also see Table 5 35.71 35.71 35.7	s from communit 2t Nov De 28 127.08 127.0 2 19.64 20.9 23 203.29 218.3 1 35.71 35.7	c (66) (67) (68) (69)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep Oc 127.08 127.08 127.0 also see Table 5 9.87 13.25 16.8 13a), also see Table 5 168.54 174.51 187.2 a), also see Table 5 35.71 35.71 35.7	s from communit 2t Nov De 08 127.08 127.0 2 19.64 20.9 23 203.29 218.3 11 35.71 35.7 3 3 66 -101.66 -101.6	c 88 (66) 3 (67) 7 (68) (70) 66 (71)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 127.09 Cooking gains (calculated in Appendix L, equation L13 or L15 (68)m= 228.45 230.82 224.85 212.13 196.08 180.99 170.9 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 35.71 35.7	Aug Sep Oc 127.08 127.08 127.0 also see Table 5 9.87 13.25 16.8 13a), also see Table 5 168.54 174.51 187.2 a), also see Table 5 35.71 35.71 35.7 3 3 3 3	s from communit 2t Nov De 28 127.08 127.0 2 19.64 20.9 23 203.29 218.3 1 35.71 35.7 3 3 66 -101.66 -101.6 4 80.65 83.8	c 88 (66) 3 (67) 7 (68) (70) 66 (71)
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep Oc 127.08 127.08 127.0 also see Table 5 9.87 13.25 16.8 13a), also see Table 5 168.54 174.51 187.2 a), also see Table 5 35.71 35.71 35.7 3 3 3 3 6 -101.66 -101.66 -101.6 62.98 65.81 72.8 m + (68)m + (69)m + (70)m +	s from communit 2t Nov De 28 127.08 127.0 2 19.64 20.9 23 203.29 218.3 1 35.71 35.7 3 3 66 -101.66 -101.6 4 80.65 83.8 + (71)m + (72)m	c 88 (66) 3 (67) 7 (68) (1 (70) 66 (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 0.9	0.77	X	5.85	x	11.28	x	0.63	x	0.7	=	20.17	(75)
Northeast 0.9	0.77	X	2.85	x	11.28	x	0.63	X	0.7	=	9.83	(75)
Northeast 0.9	0.77	X	5.85	x	22.97	x	0.63	X	0.7	=	41.06	(75)
Northeast 0.9	0.77	X	2.85	x	22.97	x	0.63	x	0.7] =	20	(75)
Northeast 0.9	0.77	X	5.85	x	41.38	x	0.63	x	0.7	=	73.98	(75)
Northeast 0.9	0.77	X	2.85	x	41.38	x	0.63	X	0.7	=	36.04	(75)
Northeast 0.9	0.77	X	5.85	x	67.96	x	0.63	x	0.7	=	121.49	(75)
Northeast 0.9	0.77	x	2.85	x	67.96	x	0.63	x	0.7	=	59.19	(75)
Northeast 0.9	0.77	X	5.85	x	91.35	x	0.63	x	0.7	=	163.31	(75)
Northeast 0.9	0.77	X	2.85	x	91.35	x	0.63	x	0.7	=	79.56	(75)
Northeast 0.9	0.77	x	5.85	x	97.38	x	0.63	x	0.7	=	174.11	(75)
Northeast 0.9	0.77	X	2.85	x	97.38	x	0.63	x	0.7	=	84.82	(75)
Northeast 0.9	0.77	X	5.85	x	91.1	x	0.63	X	0.7	=	162.87	(75)
Northeast 0.9	0.77	X	2.85	x	91.1	x	0.63	X	0.7	=	79.35	(75)
Northeast 0.9	0.77	X	5.85	x	72.63	x	0.63	x	0.7	=	129.85	(75)
Northeast 0.9>	0.77	X	2.85	X	72.63	Х	0.63	X	0.7	=	63.26	(75)
Northeast 0.9	0.77	x	5.85	х	50.42	х	0.63	x	0.7] =	90.14	(75)
Northeast 0.9	0.77	x	2.85	x	50.42	×	0.63	x	0.7	=	43.92	(75)
Northeast 0.9	0.77	X	5.85	х	28.07	x	0.63	x	0.7	=	50.18	(75)
Northeast 0.9	0.77	x	2.85	х	28.07	×	0.63	x	0.7	=	24.45	(75)
Northeast 0.9	0.77	x	5.85	х	14.2	х	0.63	x	0.7] =	25.38	(75)
Northeast 0.9	0.77	X	2.85	x	14.2	x	0.63	x	0.7] =	12.37	(75)
Northeast 0.9	0.77	X	5.85	х	9.21	x	0.63	x	0.7	=	16.47	(75)
Northeast 0.9	0.77	X	2.85	x	9.21	x	0.63	x	0.7	=	8.03	(75)
Southwest _{0.9}	0.77	X	1.41	x	36.79		0.63	X	0.7	=	15.85	(79)
Southwest _{0.9}	0.77	x	1.41	x	62.67		0.63	x	0.7	=	27.01	(79)
Southwest _{0.9}	0.77	X	1.41	x	85.75		0.63	x	0.7	=	36.95	(79)
Southwest _{0.9}	0.77	X	1.41	x	106.25		0.63	X	0.7	=	45.79	(79)
Southwest _{0.9}	0.77	X	1.41	x	119.01		0.63	x	0.7	=	51.28	(79)
Southwest _{0.9}	0.77	X	1.41	x	118.15		0.63	x	0.7	=	50.91	(79)
Southwest _{0.9}	0.77	X	1.41	x	113.91		0.63	x	0.7	=	49.09	(79)
Southwest _{0.9}	0.77	X	1.41	x	104.39		0.63	x	0.7	=	44.98	(79)
Southwest _{0.9}	0.77	x	1.41	x	92.85	Ì	0.63	x	0.7] =	40.01	(79)
Southwest _{0.9}	0.77	x	1.41	x	69.27	ĺ	0.63	x	0.7	j =	29.85	(79)
Southwest _{0.9}	0.77	x	1.41	x	44.07	ĺ	0.63	x	0.7	j =	18.99	(79)
Southwest _{0.9}	0.77	X	1.41	x	31.49	j	0.63	x	0.7	j =	13.57	(79)
Northwest 0.9	0.77	X	5.21	x	11.28	x	0.63	x	0.7	j =	17.97	(81)
Northwest 0.9	0.77	X	5.79	x	11.28	x	0.63	x	0.7	j =	19.97	(81)
Northwest 0.9x	0.77	x	5.21	x	22.97	х	0.63	X	0.7	j =	36.57	(81)

Northwest a c		_		٦.		٦		-		_		7
Northwest 0.9x	0.77	×	5.79	X	22.97	X	0.63	X	0.7	=	40.64	(81)
Northwest 0.9x	0.77	×	5.21	X	41.38	X	0.63	X	0.7	=	65.89	(81)
Northwest 0.9x	0.77	X	5.79	X	41.38	X	0.63	X	0.7	=	73.22	(81)
Northwest _{0.9x}	0.77	X	5.21	X	67.96	X	0.63	X	0.7	=	108.2	(81)
Northwest 0.9x	0.77	X	5.79	X	67.96	X	0.63	X	0.7	=	120.25	(81)
Northwest 0.9x	0.77	X	5.21	X	91.35	X	0.63	X	0.7	=	145.45	(81)
Northwest 0.9x	0.77	X	5.79	X	91.35	X	0.63	X	0.7	=	161.64	(81)
Northwest 0.9x	0.77	x	5.21	X	97.38	x	0.63	x	0.7	=	155.06	(81)
Northwest 0.9x	0.77	x	5.79	X	97.38	X	0.63	x	0.7	=	172.32	(81)
Northwest 0.9x	0.77	x	5.21	X	91.1	x	0.63	X	0.7	=	145.06	(81)
Northwest 0.9x	0.77	×	5.79	X	91.1	X	0.63	x	0.7	=	161.2	(81)
Northwest 0.9x	0.77	×	5.21	X	72.63	x	0.63	x	0.7	=	115.64	(81)
Northwest 0.9x	0.77	×	5.79	X	72.63	x	0.63	x	0.7	=	128.51	(81)
Northwest 0.9x	0.77	×	5.21	i x	50.42	X	0.63	x	0.7	=	80.28	(81)
Northwest 0.9x	0.77	×	5.79	X	50.42	X	0.63	x	0.7	=	89.22	(81)
Northwest 0.9x	0.77	×	5.21	j×	28.07	j x	0.63	×	0.7	=	44.69	(81)
Northwest 0.9x	0.77	×	5.79	X	28.07	j x	0.63	x	0.7	=	49.66	(81)
Northwest 0.9x	0.77	×	5.21	X	14.2	X	0.63	Х	0.7	=	22.6	(81)
Northwest _{0.9x}	0.77	ا ×	5.79	X	14.2	X	0.63	x	0.7		25.12	(81)
Northwest _{0.9x}	0.77	T x	5.21	X	9.21	i x	0.63	x	0.7	= =	14.67	(81)
Northwest _{0.9x}	0.77	i x	5.79	X	9.21	i x	0.63	x	0.7	_	16.3	(81)
_		7				_						`
Solar gains in	watts, calcu	ılated	for each mor	nth		(83)m	n = Sum(74)m .	(82)m				
(83)m= 83.78		36.08	454.92 601.2	_	37.22 597.57	482	.24 343.57	198.83	104.46	69.04		(83)
Total gains – ii	nternal and	solar	(84)m = (73)	m + (83)m , watts	•						
(84)m= 482.79	562.2 60	68.5	814.23 937.0)4 9	50.35 896.39	787	.75 661.27	539.85	472.16	456.36		(84)
7. Mean inter	nal tempera	ature (heating seas	on)	-		•					
Temperature	•				area from Ta	ble 9	Th1 (°C)				21	(85)
Utilisation fac	•	•		•								
Jan		Mar	Apr Ma	Ť	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 1).99	0.96 0.85		0.67 0.51	0.		0.98	1	1		(86)
Mean interna	l temneratu	re in l	iving area T1	(follo	w stens 3 to	7 in T	able 0c)					
(87)m= 19.51		9.98	20.41 20.7	`	20.95 20.99	20.		20.35	19.86	19.49		(87)
` ′	<u> </u>		I				 		1			, ,
Temperature (88)m= 19.83		ting pe	eriods in rest 19.85 19.8		velling from 18	_	` 	19.85	19.84	19.84		(88)
(88)m= 19.83	19.03	9.03	19.00 19.0	° _	19.00	19.	87 19.86	19.65	19.04	19.04		(00)
Utilisation fac					`_	9a)			_		I	
(89)m= 1	1 0).98	0.94 0.8		0.57 0.39	0.4	6 0.8	0.97	1	1		(89)
Mean interna	l temperatu	re in t	he rest of dw	elling	T2 (follow ste	eps 3	to 7 in Tabl	e 9c)				
(90)m= 17.85	18.09 18	8.54	19.16 19.6	3	19.83 19.86	19.	86 19.71	19.09	18.38	17.83		(90)
<u> </u>							f	LA = Liv	ring area ÷ (4	4) =	0.25	(91)
Moan intorna	l temperatu	re (foi	r the whole d	wallin	α) = fl Δ x T1	± (1	fl Λ \ x T2			!		

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

(92)m= 18.27 1	18.49	18.9	19.47	19.91	20.11	20.14	20.14	19.98	19.4	18.75	18.25		(92)
Apply adjustme	nt to th	e mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate		<u> </u>		
· · · · · · · · · · · · · · · · · · ·	18.49	18.9	19.47	19.91	20.11	20.14	20.14	19.98	19.4	18.75	18.25		(93)
8. Space heatin	g requi	irement											
Set Ti to the me the utilisation fa					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		
Utilisation factor	r for ga	ins, hm	<u> </u>	-									
(94)m= 1	0.99	0.98	0.93	0.8	0.59	0.42	0.5	0.8	0.97	0.99	1		(94)
Useful gains, hr	nGm ,	W = (94	l)m x (84	1)m									
(95)m= 481.09 5	58.11	655.07	757.61	750.62	564.67	375.91	391.36	532.25	522.18	468.98	455.11		(95)
Monthly average	e exter	nal 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					Lm , W =	=[(39)m	x [(93)m	– (96)m]		· .		
` ′				893.31	591.16	380.02	399.97	634.7	957.18	1274.1	1545.59		(97)
Space heating r		1						<u> </u>	<u> </u>		1		
(98)m= 799.75 6	38.84	533.73	284.98	106.16	0	0	0	0	323.64	579.68	811.32		_
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	4078.1	(98)
Space heating r	require	ment in	kWh/m²	/year								48.3	(99)
9a. Energy requi	rement	s – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:	:												
Fraction of space	ce h <mark>eat</mark>	from se	econdary	//supple	<mark>men</mark> tary	system						0	(201)
Fraction of ange													
Fraction of space	ce neat	from m	ain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total								- (201) = 02) × [1 -	(203)] =			1	(202)
Fraction of total	heatin	g from r	main sys	stem 1					(203)] =				╡`
	heatin ain spac	g from r ce heati	main sys	stem 1 em 1	g system				(203)] =			1	(204)
Fraction of total	heatin ain spac	g from r ce heati	main sys	stem 1 em 1	g system Jun				(203)] =	Nov	Dec	93.4	(204) (206) (208)
Fraction of total Efficiency of ma	heatin ain space condary	g from r ce heati y/supple Mar	main sys ng syste ementary Apr	etem 1 em 1 y heating	Jun	1, %	(204) = (2	02) × [1 –		Nov	Dec	93.4	(204) (206) (208)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r	heatin space condary Feb requires	g from r ce heati y/supple Mar	main sys ng syste ementary Apr	etem 1 em 1 y heating	Jun	1, %	(204) = (2	02) × [1 –		Nov 579.68	Dec 811.32	93.4	(204) (206) (208)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r	heatin space condary Feb requirer 638.84	g from r ce heati y/supple Mar ment (ca	ng systementary Apr alculated	em 1 y heating May d above;	Jun	n, %	(204) = (2 Aug	02) × [1 –	Oct			93.4	(204) (206) (208)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m	heatin spacecondary Feb requires 38.84 n x (204	g from r ce heati y/supple Mar ment (ca	ng systementary Apr alculated	em 1 y heating May d above;	Jun	n, %	Aug 0	02) × [1 - Sep	Oct 323.64 346.51	579.68 620.65	811.32 868.65	93.4	(204) (206) (208)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m]	heatin spacecondary Feb requires 38.84 n x (204	g from received heating the second of the se	main systementary Apr Alculated 284.98	tem 1 y heating May d above; 106.16	Jun) 0	n, % Jul 0	Aug 0	02) × [1 – Sep	Oct 323.64 346.51	579.68 620.65	811.32 868.65	93.4	(204) (206) (208)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m]	heatin space condary Feb requires 38.84 at (204) 183.99	g from rece heating/supplement (constant) x 1 571.45	main systementary Apr alculated 284.98 00 ÷ (20 305.12	m 1 y heating May d above 106.16 6) 113.66	Jun) 0	n, % Jul 0	Aug 0	02) × [1 - Sep	Oct 323.64 346.51	579.68 620.65	811.32 868.65	0 kWh/ye	(204) (206) (208) ear (211)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m) 856.26 6	heatin space condary Feb require si38.84 1 1 x (204 si33.99 1 fuel (se	g from rece heating/supplement (case 533.73 lt)] } x 1 secondary	main systementary Apr alculated 284.98 00 ÷ (20 305.12	m 1 y heating May d above 106.16 6) 113.66	Jun) 0	n, % Jul 0	Aug 0	02) × [1 - Sep	Oct 323.64 346.51	579.68 620.65	811.32 868.65	0 kWh/ye	(204) (206) (208) ear (211)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m 856.26 6}	heatin space condary Feb require si38.84 1 1 x (204 si33.99 1 fuel (se	g from rece heating/supplement (case 533.73 lt)] } x 1 secondary	main systementary Apr alculated 284.98 00 ÷ (20 305.12	m 1 y heating May d above 106.16 6) 113.66	Jun) 0	n, % Jul 0	(204) = (2 Aug 0 Tota	02) × [1 - Sep 0 0 I (kWh/yea	Oct 323.64 346.51 ar) =Sum(2	579.68 620.65 211) _{15,1012}	811.32 868.65 =	0 kWh/ye	(204) (206) (208) ear (211)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m 856.26 6} Space heating f = {[(98)m x (201)]	heatin space condary Feb requires 38.84 at (204 883.99) fuel (see b) } x 10	g from rece heating/supplement (constant) 3 x 1 571.45	main systementary Apr alculated 284.98 00 ÷ (20 305.12 y), kWh/s	month	Jun) 0	o 0	(204) = (2 Aug 0 Tota	02) × [1 – 0	Oct 323.64 346.51 ar) =Sum(2	579.68 620.65 211) _{15,1012}	811.32 868.65 =	0 kWh/ye	(204) (206) (208) ear (211)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m 856.26 6} Space heating f = {[(98)m x (201)]	heatin space condary Feb requires 38.84 at (204 883.99) fuel (see b) } x 10	g from rece heating/supplement (constant) 3 x 1 571.45	main systementary Apr alculated 284.98 00 ÷ (20 305.12 y), kWh/s	month	Jun) 0	o 0	(204) = (2 Aug 0 Tota	02) × [1 - Sep 0 0 I (kWh/yea	Oct 323.64 346.51 ar) =Sum(2	579.68 620.65 211) _{15,1012}	811.32 868.65 =	0 kWh/ye	(204) (206) (208) (211) (211)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m 856.26 6} Space heating f = {[(98)m x (201) (215)m= 0} Water heating Output from water	heatin space condary Feb requires 38.84	g from rece heating/supplement (constant) 3 x 1 571.45 condary 0 ÷ (200 condary) 0 ÷	main systementary Apr alculated 284.98 00 ÷ (20 305.12 y), kWh/n 8) 0	month stem 1 y heating May 106.16 113.66	Jun) 0 0	o 0	(204) = (2 Aug 0 Tota	Sep 0 0 1 (kWh/yea	Oct 323.64 346.51 ar) = Sum(2	579.68 620.65 211) _{15,1012} 0 215) _{15,1012}	811.32 868.65 = 0	0 kWh/ye	(204) (206) (208) (211) (211)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m 856.26 6} Space heating f = {[(98)m x (201) (215)m= 0} Water heating Output from wate 205.22 1	heatin space condary Feb require siss.84 siss.99 require siss.90 require siss.	g from rece heating/supplement (case heating) Mar	main systementary Apr alculated 284.98 00 ÷ (20 305.12 y), kWh/n 8) 0	month	Jun) 0	o 0	(204) = (2 Aug 0 Tota	02) × [1 - Sep 0 0 I (kWh/yea	Oct 323.64 346.51 ar) =Sum(2	579.68 620.65 211) _{15,1012}	811.32 868.65 =	1 93.4 0 kWh/ye	(204) (206) (208) (211) (211) (215)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m 856.26 6} Space heating f = {[(98)m x (201) (215)m= 0 Water heating Output from wate 205.22 1 Efficiency of wate	heatin space condary Feb requires 38.84 sa.99 fuel (see so.94 see heate so.94 see heate	g from rece heating/supplement (case heating) Mar ment (case heating) X 1 571.45 1 1 1 1 1 1 1 1 1	main systementary Apr alculated 284.98 00 ÷ (20 305.12 y), kWh/n8) 0	month bitem 1 wheating May diabove 106.16 6) 113.66 month	Jun 0 0 0 142.47	0 0 136.5	(204) = (2 Aug 0 Tota 152.16	02) × [1 - Sep 0 0 I (kWh/yea 153.84	Oct 323.64 346.51 ar) =Sum(2 0 ar) =Sum(2	579.68 620.65 211) _{15,1012} 0 215) _{15,1012}	811.32 868.65 = 0	0 kWh/ye	(204) (206) (208) (211) (211) (215)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m 856.26 6} Space heating f = {[(98)m x (201) (215)m= 0 Water heating Output from wate 205.22 1 Efficiency of wate (217)m= 88.14 8	heatin space condary Feb requirer (38.84	g from rece heating/supplement (castalan) x 1 571.45 condary 0 + (200 0 0 0 0 0 0 0 0 0	main systementary Apr alculated 284.98 00 ÷ (20 305.12 y), kWh/s8) 0	month stem 1 y heating May 106.16 113.66	Jun) 0 0	o 0	(204) = (2 Aug 0 Tota	Sep 0 0 1 (kWh/yea	Oct 323.64 346.51 ar) = Sum(2	579.68 620.65 211) _{15,1012} 0 215) _{15,1012}	811.32 868.65 = 0	1 93.4 0 kWh/ye	(204) (206) (208) (211) (211) (215)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m 856.26 6} Space heating f = {[(98)m x (201) (215)m= 0 Water heating Output from water 205.22 1 Efficiency of water (217)m= 88.14 8	heatin space condary Feb requirer (38.84	g from rece heating/supplement (co. 533.73 lt)] } x 1 lt 571.45 lt condary 0 ÷ (200 0 lt 188.37 lt 188.37 lt 187.53 lt kWh/mc	main systementary Apr alculated 284.98 00 ÷ (20 305.12 y), kWh/s8) 0 ulated at 167.08 86.38 onth	month bitem 1 wheating May diabove 106.16 6) 113.66 month	Jun 0 0 0 142.47	0 0 136.5	(204) = (2 Aug 0 Tota 152.16	02) × [1 - Sep 0 0 I (kWh/yea 153.84	Oct 323.64 346.51 ar) =Sum(2 0 ar) =Sum(2	579.68 620.65 211) _{15,1012} 0 215) _{15,1012}	811.32 868.65 = 0	1 93.4 0 kWh/ye	(204) (206) (208) (211) (211) (215)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m 856.26 6} Space heating f = {[(98)m x (201) (215)m= 0 Water heating Output from water 205.22 1 Efficiency of water (217)m= 88.14 8 Fuel for water he (219)m = (64)m	heatin space condary Feb requires (38.84 states) Fuel (see heate 80.94 re heate 87.96 reating, Factoring and the seating, Factoring and the seating, Factoring and the seating, Factoring and the seating, Factoring and the seating are seating as the seating are s	g from rece heating/supplement (co. 533.73 lt)] } x 1 lt 571.45 lt condary 0 ÷ (200 0 lt 188.37 lt 188.37 lt 187.53 lt kWh/mc	main systementary Apr alculated 284.98 00 ÷ (20 305.12 y), kWh/s8) 0 ulated at 167.08 86.38 onth	month bitem 1 wheating May diabove 106.16 6) 113.66 month	Jun 0 0 0 142.47	0 0 136.5	(204) = (2 Aug 0 Tota 152.16	02) × [1 - Sep 0 0 I (kWh/yea 153.84	Oct 323.64 346.51 ar) =Sum(2 0 ar) =Sum(2	579.68 620.65 211) _{15,1012} 0 215) _{15,1012}	811.32 868.65 = 0	1 93.4 0 kWh/ye	(204) (206) (208) (211) (211) (215)
Fraction of total Efficiency of ma Efficiency of sec Jan Space heating r 799.75 6 (211)m = {[(98)m 856.26 6} Space heating f = {[(98)m x (201) (215)m= 0 Water heating Output from wate 205.22 1 Efficiency of wate (217)m= 88.14 8 Fuel for water he (219)m = (64)m	heatin space condary Feb requires (38.84 states) Fuel (see heate 80.94 re heate 87.96 reating, Factoring and the seating, Factoring and the seating, Factoring and the seating, Factoring and the seating, Factoring and the seating are seating as the seating are s	g from rece heating/supplement (cassas, recondary, reco	main systementary Apr alculated 284.98 00 ÷ (20 305.12 y), kWh/68) 0 ulated at 167.08 86.38 onth	month o o o o o o o o o o o o o	Jun 0 0 0 142.47 80.3	0 0 136.5 80.3	O Tota 152.16 80.3	02) × [1 - Sep 0 0 I (kWh/yea 153.84	Oct 323.64 346.51 ar) = Sum(2 175.18 86.58	579.68 620.65 211) _{15,1012} 0 215) _{15,1012} 186.88	811.32 868.65 = 0 = 200.35	1 93.4 0 kWh/ye	(204) (206) (208) (211) (211) (215)

Annual totals		kWh/yea	r	kWh/year	
Space heating fuel used, main system 1				4366.28]
Water heating fuel used				2410.73	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				359.68	(232)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission factors in the Emissi	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	943.12	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	520.72	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1463.83	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	186.68	(268)
Total CO2, kg/year	sum	of (265)(271) =		1689.44	(272)
TER =				20.01	(273)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.4.16 Property Address: Flat 03 Address: 1. Overall dwelling dimensions Area(m²) Av. Height(m) Volume(m³) **Basement** 63.22 (1a) x 2.7 (2a) =170.69 (3a) Ground floor (1b) x (2b) (3b) 39.79 3.27 130.12 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)103.01 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 300.81 2. Ventilation rate: main secondary other total m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =40 (7a)4 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c)0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.13 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.38 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 1 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.38 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4.9

4.4

5

3.8

4.3

3.8

3.7

4

4.3

4.5

4.7

(22)m=

5.1

Wind Factor (22a)m = (22)m ÷	· 4										
(22a)m = 1.27 1.25 1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
` '	ļ	<u> </u>		!	ļ .		<u> </u>	!	!	1	
Adjusted infiltration rate (allow	· —			i ´	`	` 	Ι	Ι	Τ.	1	
0.49 0.48 0.47 Calculate effective air change	0.42	0.41 he appli	0.36 cable ca	0.36 ase	0.35	0.38	0.41	0.43	0.45]	
If mechanical ventilation:	1410 101 1	по арри	00010 00	.00						0	(23a)
If exhaust air heat pump using App	endix N, (2	23b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with heat recovery: efficient	ciency in %	allowing f	or in-use f	actor (fron	n Table 4h	ı) =				0	(23c)
a) If balanced mechanical v	entilation	with he	at recov	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 balanced mechanical v	entilation	without	heat red	covery (N	ЛV) (24k	o)m = (22	2b)m + (23b)		_	
(24b)m= 0 0 0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ve		•	•								
if $(22b)m < 0.5 \times (23b)$,	- `	_	ŕ –	· ` `	ŕ	í –	<u> </u>	í – –	1	1	(2.4.)
(24c)m= 0 0 0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural ventilation or wh if (22b)m = 1, then (24d							0.51				
$(24d)_{m} = 0.62 0.61 0.61$	0.59	0.58	0.57	0.57	0.56	0.57	0.58	0.59	0.6		(24d)
Effective air change rate - e										,	
(25)m= 0.62 0.61 0.61	0.59	0.58	0.57	0.57	0.56	0.57	0.58	0.59	0.6	1	(25)
										,	
							_				
3. Heat losses and heat loss			Not Ar	202	LLval	110	A V I I		k valu		A Y k
3. Heat losses and heat loss ELEMENT Gross area (m²)	paramet Openin m	igs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value		A X k kJ/K
ELEMENT Gross	Openin	igs		m²		2K					
ELEMENT Gross area (m²)	Openin	igs	A ,r	m² x1	W/m2	2K · 0.04] =	(W/				kJ/K
ELEMENT Gross area (m²) Windows Type 1	Openin	igs	A ,r	m ² x1.	W/m2 /[1/(1.4)+	2K · 0.04] = · 0.04] =	(W/ 8.09				kJ/K (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2	Openin	igs	A ,r 6.1	m² x1. x1. x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	2K · 0.04] = · 0.04] = · 0.04] =	8.09 2.19				kJ/K (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3	Openin	igs	A ,r 6.1 1.65 6.78	x1. x1. x1. x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K 0.04] = 0.04] = 0.04] = 0.04] =	8.09 2.19 8.99				kJ/K (27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	Openin	igs	A ,r 6.1 1.65 6.78 4.6	x1. x1. x1. x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/ 8.09 2.19 8.99 6.1				(27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	Openin	igs	A ,r 6.1 1.65 6.78 4.6	x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	8.09 2.19 8.99 6.1 2.19				(27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	Openin	igs	A ,r 6.1 1.65 6.78 4.6 1.65	x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/ 8.09 2.19 8.99 6.1 2.19	k) 			(27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Floor	Openin m	igs	A ,r 6.1 1.65 6.78 4.6 1.65 3.33 63.22	x1.	W/m ² /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	8.09 2.19 8.99 6.1 2.19 2.19 4.41 8.2186	k) 			(27) (27) (27) (27) (27) (27) (27) (28)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Floor Walls Type 1 29.04	Openin m	gs n²	A ,r 6.1 1.65 6.78 4.6 1.65 3.33 63.22 29.04	x1.	W/m ² /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/ 8.09 2.19 8.99 6.1 2.19 2.19 4.41 8.2186 5.23	k) 			(27) (27) (27) (27) (27) (27) (27) (28) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Floor Walls Type1 29.04 Walls Type2 80.83	0 25.7	gs n²	A ,r 6.1 1.65 6.78 4.6 1.65 3.33 63.22 29.04	x1.	W/m ² /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = =	(W/ 8.09 2.19 8.99 6.1 2.19 2.19 4.41 8.2186 5.23 9.91	k) 			(27) (27) (27) (27) (27) (27) (27) (28) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Floor Walls Type1 Walls Type2 80.83 Walls Type3 13.42	0 25.70	gs n²	A ,r 6.1 1.65 6.78 4.6 1.65 3.33 63.22 29.04 55.07	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W/ 8.09 2.19 8.99 6.1 2.19 4.41 8.2186 5.23 9.91 2.42	k) 			(27) (27) (27) (27) (27) (27) (27) (28) (28) (29) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Floor Walls Type1 Walls Type2 80.83 Walls Type3 Roof 24.91	0 25.7	gs n²	A ,r 6.1, 1.65 6.78 4.6 1.65 3.33 63.22 29.04 55.07 13.42	x1.	W/m ² /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = =	(W/ 8.09 2.19 8.99 6.1 2.19 2.19 4.41 8.2186 5.23 9.91	k) 			(27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (29) (30)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Floor Walls Type1 29.04 Walls Type2 80.83 Walls Type3 13.42 Roof 24.91 Total area of elements, m²	0 25.70 0	gs n²	A ,r 6.1, 1.65 6.78 4.6 1.65 3.33 63.22 29.04 55.07 13.42 24.9	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.13	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W/ 8.09 2.19 8.99 6.1 2.19 4.41 8.2186 5.23 9.91 2.42 3.24	k)	kJ/m²-	K _	(27) (27) (27) (27) (27) (27) (27) (28) (28) (29) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Floor Walls Type1 Walls Type2 80.83 Walls Type3 Roof 24.91	Openin m 0 25.70 0 effective wi	ngs n ²	A ,r 6.1 1.65 6.78 4.6 1.65 3.33 63.22 29.04 55.07 13.42 24.9	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.13	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W/ 8.09 2.19 8.99 6.1 2.19 4.41 8.2186 5.23 9.91 2.42 3.24	k)	kJ/m²-	K _	(27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (29) (30)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Floor Walls Type1 Walls Type2 80.83 Walls Type3 13.42 Roof 24.91 Total area of elements, m² * for windows and roof windows, use	Openin m 0 25.70 0 effective winternal wal	ngs n ²	A ,r 6.1 1.65 6.78 4.6 1.65 3.33 63.22 29.04 55.07 13.42 24.9	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.13	2K 0.04] = 0.04] =	(W/ 8.09 2.19 8.99 6.1 2.19 4.41 8.2186 5.23 9.91 2.42 3.24	k)	kJ/m²-	K _	(27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Floor Walls Type 1 29.04 Walls Type 2 80.83 Walls Type 3 13.42 Roof 24.91 Total area of elements, m² * for windows and roof windows, use ** include the areas on both sides of items area (m²)	Openin m 0 25.70 0 original walks to the control of the contro	indow U-valls and part	A ,r 6.1 1.65 6.78 4.6 1.65 1.65 3.33 63.22 29.04 55.07 13.42 24.9° 211.4 alue calculatitions	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.18 0.13	2K 0.04] = 0.	8.09 2.19 8.99 6.1 2.19 2.19 4.41 8.2186 5.23 9.91 2.42 3.24	k)	kJ/m²-	h 3.2	(27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (29) (30) (31)

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

can be used inste													
Thermal bridge				ısina An	nendiy k	<i>(</i>						0.26	(36)
if details of therma	,	,		• .	•	`						9.26	(30)
Total fabric he			- ()	(-	,			(33) +	(36) =			72.42	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 61.47	61.01	60.56	58.44	58.05	56.2	56.2	55.86	56.91	58.05	58.85	59.68		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 133.89	133.43	132.98	130.86	130.47	128.62	128.62	128.28	129.33	130.47	131.27	132.11		
Heat loss para	ımeter (H	HLP), W/	m²K						Average = = (39)m ÷	` '	12 /12=	130.86	(39)
(40)m= 1.3	1.3	1.29	1.27	1.27	1.25	1.25	1.25	1.26	1.27	1.27	1.28		
Number of day	/s in mor	nth (Tabl	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.27	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ener	gy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	013 x (⁻	ΓFA -13.		77		(42)
if TFA £ 13.9	· \						(05)						
Annual averag Reduce the annua									se target o		.89		(43)
not m <mark>ore tha</mark> t 125	litres p <mark>er p</mark>	oerson per	day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	able 1c x	(43)						
(44)m= 109.87	105.88	101.88	97.89	93.89	89.9	89.9							
Energy content of	hot water	used - cal				<u> </u>	93.89	97.89	101.88	105.88	109.87		- 1
		useu - can	culated mo	onthly = 4.	190 x Vd,r	n x nm x D		-	Total = Su	m(44) ₁₁₂ =		1198.63	(44)
(45)m= I 162 94	142 51			-		1)Tm / 3600	kWh/mor	I Total = Sui oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1198.63	(44)
(45)m= 162.94	142.51	147.06	culated mo	onthly = 4. 123.02	190 x Vd,ri 106.15	98.37			Total = Su	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1198.63 1571.59	(44)
(45)m= 162.94 If instantaneous w		147.06	128.21	123.02	106.15	98.37	0Tm / 3600 112.88	114.23	Total = Sunth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)		_
If instantaneous w (46)m= 24.44	vater heatii 21.38	147.06	128.21	123.02	106.15	98.37	0Tm / 3600 112.88	114.23	Total = Sunth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)		_
If instantaneous w (46)m= 24.44 Water storage	vater heatii 21.38 IOSS:	147.06 ng at point 22.06	128.21 of use (no	123.02 hot water 18.45	106.15 storage),	98.37 enter 0 in 14.76	112.88 boxes (46)	114.23 1 to (61)	Total = Sur 133.12 Total = Sur 19.97	m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ =	23.67		(45) (46)
If instantaneous w (46)m= 24.44 Water storage Storage volum	vater heatin 21.38 loss: ne (litres)	147.06 ng at point 22.06 includin	128.21 of use (no 19.23	123.02 hot water 18.45	106.15 storage), 15.92 /WHRS	98.37 enter 0 in 14.76 storage	112.88 boxes (46) 16.93 within sa	114.23 1 to (61)	Total = Sur 133.12 Total = Sur 19.97	m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ =	c, 1d)		(45)
If instantaneous w (46)m= 24.44 Water storage Storage volum If community h	21.38 loss: ne (litres)	147.06 ng at point 22.06 includin nd no ta	of use (no 19.23 ng any so nk in dw	123.02 hot water 18.45 blar or W relling, e	106.15 * storage), 15.92 /WHRS nter 110	98.37 enter 0 in 14.76 storage	112.88 boxes (46) 16.93 within sa	114.23 1 to (61) 17.13	Total = Sunth (see Tail 133.12 Total = Sunth 19.97	m(44) ₁₁₂ = abbles 1b, 1 145.31 m(45) ₁₁₂ = 21.8	23.67		(45) (46)
If instantaneous w (46)m= 24.44 Water storage Storage volum	21.38 loss: ne (litres) neating a p stored	147.06 ng at point 22.06 includin nd no ta	of use (no 19.23 ng any so nk in dw	123.02 hot water 18.45 blar or W relling, e	106.15 * storage), 15.92 /WHRS nter 110	98.37 enter 0 in 14.76 storage	112.88 boxes (46) 16.93 within sa	114.23 1 to (61) 17.13	Total = Sunth (see Tail 133.12 Total = Sunth 19.97	m(44) ₁₁₂ = abbles 1b, 1 145.31 m(45) ₁₁₂ = 21.8	23.67		(45) (46)
If instantaneous w (46)m= 24.44 Water storage Storage volum If community h Otherwise if no	21.38 loss: lee (litres) leating a loss: lestored loss:	147.06 ng at point 22.06 includin nd no ta hot wate	of use (no 19.23 ng any so nk in dw er (this in	123.02 hot water 18.45 Dlar or W relling, e	106.15 storage), 15.92 /WHRS nter 110 nstantar	98.37 enter 0 in 14.76 storage litres in neous co	112.88 boxes (46) 16.93 within sa	114.23 1 to (61) 17.13	Total = Sunth (see Tail 133.12 Total = Sunth 19.97	m(44) ₁₁₂ = 145.31 m(45) ₁₁₂ = 21.8	23.67		(45) (46)
If instantaneous w (46)m= 24.44 Water storage Storage volum If community h Otherwise if no Water storage	21.38 loss: lee (litres) leating a loss: loss: leating a loss: loss: lurer's de	147.06 ang at point 22.06 including and no tale to the water	of use (not) 19.23 In any so the ser (this in the coss factors)	123.02 hot water 18.45 Dlar or W relling, e	106.15 storage), 15.92 /WHRS nter 110 nstantar	98.37 enter 0 in 14.76 storage litres in neous co	112.88 boxes (46) 16.93 within sa	114.23 1 to (61) 17.13	Total = Sunth (see Tail 133.12 Total = Sunth 19.97	m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	23.67		(45) (46) (47)
If instantaneous w (46)m= 24.44 Water storage Storage volum If community h Otherwise if no Water storage a) If manufact Temperature for Energy lost from	21.38 loss: lee (litres) leating a loss: lee to stored loss: lurer's de lactor fro	147.06 ng at point 22.06 includin nd no ta hot wate eclared le m Table	of use (not) 19.23 In any so the ser (this in) coss factor 2b , kWh/ye	123.02 hot water 18.45 plar or W relling, e acludes i	106.15 r storage), 15.92 /WHRS nter 110 nstantar	98.37 enter 0 in 14.76 storage litres in neous co	112.88 boxes (46) 16.93 within sa	114.23 1 to (61) 17.13 ame vess	Total = Sunth (see Tail 133.12 Total = Sunth 19.97	m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	c, 1d) 157.8 23.67		(45) (46) (47) (48)
If instantaneous w (46)m= 24.44 Water storage Storage volum If community h Otherwise if no Water storage a) If manufact Temperature for Energy lost fro b) If manufact	21.38 loss: le (litres) leating a loss: leating a loss: lurer's de lactor fro	147.06 ng at point 22.06 includin nd no ta hot wate eclared le m Table storage eclared of	of use (not) 19.23 In any so the ser (this in) coss factor 2b ykWh/ye cylinder I	123.02 hot water 18.45 plar or W relling, e reludes i or is known	106.15 storage), 15.92 /WHRS nter 110 nstantar wn (kWh	98.37 enter 0 in 14.76 storage litres in neous con/day):	112.88 boxes (46) 16.93 within sa (47)	114.23 1 to (61) 17.13 ame vess	Total = Sunth (see Tail 133.12 Total = Sunth 19.97	m(44) ₁₁₂ = abbles 1b, 1 145.31 m(45) ₁₁₂ = 21.8	c, 1d) 157.8 23.67 0 0 0		(45) (46) (47) (48) (49) (50)
If instantaneous w (46)m= 24.44 Water storage Storage volum If community h Otherwise if no Water storage a) If manufact Temperature for Energy lost from	21.38 loss: lee (litres) leating a control stored loss: leactor from water curer's de lage loss	147.06 ang at point 22.06 including and no tale to the colored learned to the colored colored factor fr	of use (not) 19.23 In grany so the ser (this in) coss factor 2b , kWh/ye cylinder I to make the service of th	123.02 hot water 18.45 plar or W relling, e reludes i or is known	106.15 storage), 15.92 /WHRS nter 110 nstantar wn (kWh	98.37 enter 0 in 14.76 storage litres in neous con/day):	112.88 boxes (46) 16.93 within sa (47)	114.23 1 to (61) 17.13 ame vess	Total = Sunth (see Tail 133.12 Total = Sunth 19.97	m(44) ₁₁₂ = abbles 1b, 1 145.31 m(45) ₁₁₂ = 21.8	23.67 0		(45) (46) (47) (48) (49)
If instantaneous we (46)m= 24.44 Water storage Storage volum If community h Otherwise if not Water storage a) If manufact Temperature for the community in the community h Otherwise if not the community in the community h Otherwise if not the community in the co	21.38 loss: lee (litres) leating a loss: leactor fro lactor fro la	147.06 ang at point 22.06 including and no tale and no tale and	of use (not) 19.23 In any so the ser (this in) coss factor 2b y kWh/ye the sylinder I to the sylinde	123.02 hot water 18.45 plar or W relling, e reludes i or is known	106.15 storage), 15.92 /WHRS nter 110 nstantar wn (kWh	98.37 enter 0 in 14.76 storage litres in neous con/day):	112.88 boxes (46) 16.93 within sa (47)	114.23 1 to (61) 17.13 ame vess	Total = Sunth (see Tail 133.12 Total = Sunth 19.97	m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	c, 1d) 157.8 23.67 0 0 0		(45) (46) (47) (48) (49) (50)

Energy lost from water storage, kWh/year Enter (50) or (54) in (55)	(47) x (51) x (52) x (53) =	0	(54) (55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		(00)
(56)m= 0 0 0 0 0 0 0	0 0 0	0 0	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] +	(50), else (57)m = (56)m where	(H11) is from Append	H xilt
(57)m= 0 0 0 0 0 0 0	0 0 0	0 0	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 3	` ,		
(modified by factor from Table H5 if there is solar water hea	, , , , , , , , , , , , , , , , , , ,] (50)
(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 × (4	'i	, ,	1
(61)m= 50.96 46.03 50.96 48.27 47.85 44.33 45.81	47.85 48.27 50.96	49.32 50.96	(61)
Total heat required for water heating calculated for each mont	- 	ì i i i i i i i i i i i i i i i i i i i	ı`´´
(62)m= 213.9 188.54 198.01 176.48 170.86 150.49 144.18		194.63 208.76	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quant		tion to water heating	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)		(63)
		0 0	(03)
Output from water heater (64)m= 213.9 188.54 198.01 176.48 170.86 150.49 144.18	3 160.73 162.5 184.08	194.63 208.76	1
(64)m= 213.9 188.54 198.01 176.48 170.86 150.49 144.18	3 160.73 162.5 184.08 Output from water heate		2153.15 (64)
Heat going from water heating IVMh/month 9.35 (10.95 x (45)			
Heat gains from water heating, kWh/month 0.25 [0.85 × (45)] (65)m= 66.92 58.89 61.64 54.7 52.86 46.38 44.16		60.64 65.21	(65)
include (57)m in calculation of (65)m only if cylinder is in the			J ' '
	dwelling of flot water is i	TOTTI COMMITTALINEY I	leating
5. Internal gains (see Table 5 and 5a):			
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul			
	I Aug I San I Oct	Nov Dec	 1
	Aug Sep Oct	Nov Dec	(66)
(66)m= 138.29 138.29 138.29 138.29 138.29 138.29 138.29	138.29 138.29 138.29	Nov Dec 138.29 138.29	(66)
(66)m= 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5	138.29 138.29	J
(66)m= 138.29	also see Table 5 11.28 15.14 19.23	 	(66)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92	(67)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29	J
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58	(67) (68)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92	(67)
(66)m= 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 Lighting gains (calculated in Appendix L, equation L9 or L9a), (67)m= 23.28 20.68 16.81 12.73 9.52 8.03 8.68 Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 261.11 263.82 256.99 242.45 224.1 206.86 195.34 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 36.83 36.83 36.83 36.83 36.83 36.83 36.83 36.83 36.83	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83	(67) (68) (69)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83	(67) (68)
(66)m= 138.29 13	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3	[(67) (68) (69) (70)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3	(67) (68) (69)
(66)m= 138.29 138.3 138.3	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3	[(67) (68) (69) (70)
(66)m= 138.29 138.69 138.68 138.68 139.3	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3 -110.63 -110.63 84.23 87.64	(67) (68) (69) (70) (71)
(66)m= 138.29 138.68 86.8 86.8 86.8 86.8 138.68 138.68 86.8 138.68 195.34 106.86 195.34 195.34 195.34 195.34 1	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3 -110.63 -110.63 84.23 87.64	(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 Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	x	4.6	x	11.28	x	0.63	x	0.7	=	15.86	(75)
Northeast _{0.9x} 0.77	x	3.33	x	11.28	x	0.63	x	0.7	=	11.48	(75)
Northeast 0.9x 0.77	x	4.6	x	22.97	x	0.63	x	0.7	=	32.29	(75)
Northeast 0.9x 0.77	x	3.33	x	22.97	x	0.63	x	0.7] =	23.37	(75)
Northeast 0.9x 0.77	x	4.6	x	41.38	x	0.63	x	0.7	=	58.17	(75)
Northeast 0.9x 0.77	x	3.33	x	41.38	x	0.63	x	0.7	=	42.11	(75)
Northeast _{0.9x} 0.77	x	4.6	x	67.96	x	0.63	x	0.7	=	95.53	(75)
Northeast _{0.9x} 0.77	x	3.33	X	67.96	x	0.63	X	0.7	=	69.16	(75)
Northeast _{0.9x} 0.77	x	4.6	x	91.35	x	0.63	x	0.7	=	128.42	(75)
Northeast _{0.9x} 0.77	x	3.33	x	91.35	x	0.63	X	0.7	=	92.96	(75)
Northeast _{0.9x} 0.77	x	4.6	x	97.38	x	0.63	x	0.7	=	136.9	(75)
Northeast _{0.9x} 0.77	x	3.33	x	97.38	x	0.63	x	0.7	=	99.11	(75)
Northeast _{0.9x} 0.77	x	4.6	x	91.1	x	0.63	x	0.7] =	128.07	(75)
Northeast _{0.9x} 0.77	x	3.33	x	91.1	x	0.63	x	0.7	=	92.71	(75)
Northeast _{0.9x} 0.77	x	4.6	x	72.63	x	0.63	x	0.7	=	102.1	(75)
Northeast _{0.9x} 0.77	x	3.33	X	72.63	X	0.63	X	0.7] =	73.91	(75)
Northeast 0.9x 0.77	x	4.6	х	50.42	x	0.63	x	0.7	=	70.88	(75)
Northeast _{0.9x} 0.77	x	3.33	x	50.42	×	0.63	x	0.7	=	51.31	(75)
Northeast _{0.9x} 0.77	x	4.6	х	28.07	x	0.63	x	0.7	=	39.46	(75)
Northeast _{0.9x} 0.77	x	3.33	х	28.07	×	0.63	x	0.7	=	28.56	(75)
Northeast 0.9x 0.77	x	4.6	х	14.2	Х	0.63	x	0.7	=	19.96	(75)
Northeast _{0.9x} 0.77	x	3.33	х	14.2	x	0.63	x	0.7	=	14.45	(75)
Northeast 0.9x 0.77	x	4.6	x	9.21	x	0.63	x	0.7	=	12.95	(75)
Northeast 0.9x 0.77	x	3.33	x	9.21	x	0.63	x	0.7	=	9.38	(75)
Southeast 0.9x 0.77	x	6.1	X	36.79	X	0.63	X	0.7	=	68.59	(77)
Southeast 0.9x 0.77	x	6.78	x	36.79	X	0.63	X	0.7	=	76.24	(77)
Southeast 0.9x 0.77	x	1.65	x	36.79	X	0.63	x	0.7	=	18.55	(77)
Southeast 0.9x 0.77	x	6.1	X	62.67	X	0.63	X	0.7	=	116.84	(77)
Southeast 0.9x 0.77	x	6.78	X	62.67	X	0.63	X	0.7	=	129.86	(77)
Southeast 0.9x 0.77	x	1.65	X	62.67	X	0.63	X	0.7	=	31.6	(77)
Southeast 0.9x 0.77	x	6.1	X	85.75	X	0.63	X	0.7	=	159.86	(77)
Southeast 0.9x 0.77	x	6.78	X	85.75	X	0.63	X	0.7	=	177.68	(77)
Southeast 0.9x 0.77	x	1.65	X	85.75	X	0.63	X	0.7	=	43.24	(77)
Southeast 0.9x 0.77	x	6.1	X	106.25	X	0.63	X	0.7	=	198.08	(77)
Southeast 0.9x 0.77	x	6.78	x	106.25	x	0.63	x	0.7	=	220.16	(77)
Southeast 0.9x 0.77	X	1.65	x	106.25	x	0.63	x	0.7	=	53.58	(77)
Southeast 0.9x 0.77	X	6.1	x	119.01	x	0.63	x	0.7	=	221.86	(77)
Southeast 0.9x 0.77	X	6.78	x	119.01	x	0.63	x	0.7	=	246.6	(77)
Southeast 0.9x 0.77	X	1.65	X	119.01	×	0.63	X	0.7] =	60.01	(77)

Southeast 0.9x 0.77 x 6.1 x 118.15 x 0.63 x 0.7 = 220.2 Southeast 0.9x 0.77 x 6.78 x 118.15 x 0.63 x 0.7 = 244.8 Southeast 0.9x 0.77 x 1.65 x 118.15 x 0.63 x 0.7 = 59.58 Southeast 0.9x 0.77 x 6.1 x 113.91 x 0.63 x 0.7 = 212.3 Southeast 0.9x 0.77 x 6.78 x 113.91 x 0.63 x 0.7 = 236.0	1 (77)
Southeast 0.9x	(77)
Southeast 0.9x 0.77 x 6.1 x 113.91 x 0.63 x 0.7 = 212.3	
	5 (<i>(//</i>)
Southeast $0.9x \mid 0.77 \mid x \mid 6.78 \mid x \mid 113.91 \mid x \mid 0.63 \mid x \mid 0.7 \mid = 1 236.0$	
	
Southeast 0.9x 0.77 x 1.65 x 113.91 x 0.63 x 0.7 = 57.44	
Southeast 0.9x 0.77 x 6.1 x 104.39 x 0.63 x 0.7 = 194.6	====
Southeast 0.9x 0.77 x 6.78 x 104.39 x 0.63 x 0.7 = 216.3	====
Southeast 0.9x 0.77 x 1.65 x 104.39 x 0.63 x 0.7 = 52.64	===
Southeast 0.9x 0.77 x 6.1 x 92.85 x 0.63 x 0.7 = 173.1	====
Southeast 0.9x 0.77 x 6.78 x 92.85 x 0.63 x 0.7 = 192.3	9 (77)
Southeast 0.9x 0.77 x 1.65 x 92.85 x 0.63 x 0.7 = 46.82	(77)
Southeast 0.9x 0.77 x 6.1 x 69.27 x 0.63 x 0.7 = 129.1	3 (77)
Southeast 0.9x 0.77 x 6.78 x 69.27 x 0.63 x 0.7 = 143.5	3 (77)
Southeast 0.9x 0.77 x 1.65 x 69.27 x 0.63 x 0.7 = 34.93	(77)
Southeast 0.9x 0.77 x 6.1 x 44.07 x 0.63 x 0.7 = 82.16	(77)
Southeast 0.9x 0.77 x 6.78 x 44.07 x 0.63 x 0.7 = 91.32	(77)
Southeast 0.9x 0.77 x 1.65 x 44.07 x 0.63 x 0.7 = 22.22	(77)
Southeast 0.9x 0.77 x 6.1 x 31.49 x 0.63 x 0.7 = 58.7	(77)
Southeast 0.9x 0.77 x 6.78 x 31.49 x 0.63 x 0.7 = 65.24	(77)
Southeast 0.9x 0.77 x 1.65 x 31.49 x 0.63 x 0.7 = 15.88	(77)
Southwest _{0.9x} 0.77 x 1.65 x 36.79 0.63 x 0.7 = 18.55	(79)
Southwest _{0.9x} 0.77 x 1.65 x 62.67 0.63 x 0.7 = 31.6	(79)
Southwest _{0.9x} 0.77 x 1.65 x 85.75 0.63 x 0.7 = 43.24	(79)
Southwest _{0.9x} 0.77 x 1.65 x 106.25 0.63 x 0.7 = 53.58	(79)
Southwest _{0.9x} 0.77 x 1.65 x 119.01 0.63 x 0.7 = 60.01	(79)
Southwest _{0.9x} 0.77 x 1.65 x 118.15 0.63 x 0.7 = 59.58	(79)
Southwest _{0.9x} 0.77 x 1.65 x 113.91 0.63 x 0.7 = 57.44	(79)
Southwest _{0.9x} 0.77 x 1.65 x 104.39 0.63 x 0.7 = 52.64	(79)
Southwest _{0.9x} 0.77 x 1.65 x 92.85 0.63 x 0.7 = 46.82	(79)
Southwest $0.9x$ 0.77 x 1.65 x 69.27 0.63 x 0.7 = 34.93	(79)
Southwest $0.9x$ 0.77 x 1.65 x 44.07 0.63 x 0.7 = 22.22	(79)
Southwest _{0.9x} 0.77 x 1.65 x 31.49 0.63 x 0.7 = 15.88	(79)
Northwest 0.9x 0.77 x 1.65 x 11.28 x 0.63 x 0.7 = 5.69	(81)
Northwest $0.9x$ 0.77 x 1.65 x 22.97 x 0.63 x 0.7 = 11.58	(81)
Northwest 0.9x 0.77 x 1.65 x 41.38 x 0.63 x 0.7 = 20.87	(81)
Northwest 0.9x 0.77 x 1.65 x 67.96 x 0.63 x 0.7 = 34.27	(81)
Northwest $0.9x$ 0.77 x 1.65 x 91.35 x 0.63 x 0.7 = 46.06	(81)
Northwest 0.9x 0.77 x 1.65 x 97.38 x 0.63 x 0.7 = 49.11	(81)
Northwest 0.9x 0.77 x 1.65 x 91.1 x 0.63 x 0.7 = 45.94	(81)
Northwest $0.9x$ 0.77 x 1.65 x 72.63 x 0.63 x 0.7 = 36.62	(81)

Northwest 0.9x	0.77	X	1.6	5	X	50.42	X	0.63	x	0.7	=	25.43	(81)
Northwest 0.9x	0.77	X	1.6	55	х	28.07	x	0.63	x	0.7	=	14.15	(81)
Northwest _{0.9x}	0.77	x	1.6	55	x	14.2	X	0.63	X	0.7	=	7.16	(81)
Northwest 0.9x	0.77	×	1.6	55	x	9.21	х	0.63	x	0.7	=	4.65	(81)
•													_
Solar gains in	watts, ca	alculated	for eacl	n month			(83)m = 9	Sum(74)m .	(82)m				
(83)m= 214.97	377.15	545.18	724.35	855.93	869.35	829.98	728.83	606.76	424.69	259.49	182.68		(83)
Total gains –	internal a	nd solar	(84)m =	(73)m ·	+ (83)m	, watts	•	•		•	•		
(84)m= 656.78	816.76	969.31	1122.99	1228.09	1216.14	1160.84	1066.75	958.35	802.01	665.98	611.32		(84)
7. Mean inte	rnal temp	erature	(heating	season)								
Temperature	·					from Tal	ole 9, Th	n1 (°C)				21	(85)
Utilisation fa	Ū	٠.			Ū		,	` ,					``
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.93	0.82	0.64	0.48	0.54	0.79	0.96	0.99	1		(86)
	1			T4 /6					<u> </u>	l			
Mean interna	 			<u> </u>		i 	1		00.40	10.00	10.57		(07)
(87)m= 19.6	19.81	20.13	20.52	20.81	20.96	20.99	20.99	20.88	20.48	19.96	19.57		(87)
Temperature	during h	eating p	eriods ir	rest of	dwellin	g from Ta	able 9, T	h2 (°C)	•	•		•	
(88)m= 19.84	19.84	19.85	19.86	19.87	19.88	19.88	19.88	19.88	19.87	19.86	19.85		(88)
Util <mark>isatio</mark> n fa	ctor for g	ains for r	est of d	welling,	n2,m (s	ee Table	9a)						
(89)m= 1	0.99	0.97	0.91	0.76	0.54	0.36	0.41	0.71	0.94	0.99	1		(89)
Me <mark>an int</mark> erna	al temper	ature in t	the rest	of dwelli	ng T2 (follow ste	ens 3 to	7 in Tabl	e 9c)				
(90)m= 17.99	18.3	18.76	19.32	19.69	19.85	19.88	19.88	19.79	19.28	18.54	17.95		(90)
` /								1	L LA = Livin	g area ÷ (4	4) =	0.26	(91)
N.4		- to	a tha a coda			SI A ±4	. /4 6	A) TO					
Mean interna (92)m= 18.4	18.69	19.11	19.63	19.98	11ng) = 20.14	1	+ (1 – f) 20.16	_A) × 12 20.07	19.58	18.9	18.37		(92)
` '	<u> </u>	<u> </u>				20.16	<u> </u>		<u> </u>	10.9	10.37		(92)
Apply adjust	18.69	19.11	19.63	19.98	20.14	20.16	20.16	20.07	19.58	18.9	18.37	1	(93)
8. Space hea			19.03	19.90	20.14	20.10	20.10	20.07	19.50	10.9	16.57		(00)
Set Ti to the	·		nneratur	e obtain	ed at e	ten 11 of	Tahla 0	h so tha	t Ti m=/	76)m an	d re-calc	rulata	
the utilisation					cu at s	tep 11 of	Table 3	D, 30 tria	it 11,111—(r Ojili ali	u re-care	uiate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	ctor for g	ains, hm	:									l	
(94)m= 0.99	0.99	0.96	0.9	0.77	0.57	0.39	0.45	0.73	0.94	0.99	1		(94)
Useful gains	, hmGm	, W = (94	l)m x (84	4)m			•						
(95)m= 653.31	805.58	934.59	1011.78	941.62	687.32	454.85	476.27	694.92	753	658.32	608.95		(95)
Monthly ave	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 mea	an intern	al tempe	erature,	Lm , W	=[(39)m	x [(93)m	– (96)m]			•	
(97)m= 1887.8	1839.91	1677.19	1403.89	1080.47	712.27	458.36	482.6	771.85	1172.23	1549.22	1871.54		(97)
Space heatir	ng require	ement fo	r each m	nonth, k\	Vh/mor	1 = 0.02	24 x [(97	')m – (95)m] x (4	1)m		•	
(98)m= 918.46	695.07	552.49	282.32	103.3	0	0	0	0	311.91	641.45	939.37		
							Tota	al per year	(kWh/year	r) = Sum(9	8)15,912 =	4444.37	(98)
Space heatir	ng require	ement in	kWh/m²	/year								43.14	(99)
	•												_

9a. Energy requirements – Indi	ividual heating	g systems	including	g micro-C	CHP)					
Space heating:					,					—
Fraction of space heat from se	, ,		y system		(204) -				0	(201)
Fraction of space heat from m	-			(202) = 1		(000)]			1	(202)
Fraction of total heating from	-	1		(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heat	• •								93.4	(206)
Efficiency of secondary/supple	ementary hea	ting syster	n, % 						0	(208)
Jan Feb Mar	Apr Ma		Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space heating requirement (c	282.32 103.	-i	0	0	0	311.91	641.45	939.37		
		<u> </u>		0		311.91	041.43	939.57		(211)
$(211)m = \{[(98)m \times (204)] \} \times 1$ $983.36 744.19 591.54$	302.27 110.	6 0	T 0	0	0	333.95	686.78	1005.75		(211)
	1 002.2.	• •			l (kWh/yea				4758.43	(211)
Space heating fuel (secondar	v), kWh/mont	h								
$= \{[(98)m \times (201)]\} \times 100 \div (201)$	• /								_	
(215)m= 0 0 0	0 0	0	0	0	0	0	0	0		
				Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating										
Output from water heater (calc	176.48 170.4		144.18	160.73	162.5	184.08	194.63	208.76		
Efficiency of water heater			1		10210				80.3	(216)
(217)m= 88.3 88.04 87.5	86.23 83.8	3 80.3	80.3	80.3	80.3	86.37	87.83	88.38		(217)
Fuel for water heating, kWh/mo	onth									
(219) m = (64) m x $100 \div (217)$ (219)m = 242.24 214.15 226.31	204.67 203.8	32 187.41	179.55	200.16	202.37	213.13	221.6	236.21	1	
(219)111- 242.24 214.13 220.31	204.07 203.0	32 107.41	179.55		I = Sum(2		221.0	230.21	2531.61	(219)
Annual totals					·		Wh/yeaı	r	kWh/yea	
Space heating fuel used, main	system 1						,		4758.43	
Water heating fuel used									2531.61	
Electricity for pumps, fans and	electric keep-	hot								
central heating pump:								30]	(2300
]	
boiler with a fan-assisted flue					5 (000)	(222.)		45		(2306
Total electricity for the above, k	kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting									411.09	(232)
12a. CO2 emissions – Individ	ual heating sy	stems incl	uding mi	icro-CHF)					
			nergy Vh/year			Emiss kg CO	ion fac 2/kWh	tor	Emission kg CO2/y	_
Space heating (main system 1))	(21	1) x			0.2	16	=	1027.82	(261)
Space heating (secondary)		(21	5) x			0.5	19	=	0	(263)
Water heating		(21	9) x			0.2		=	546.83	(264)
Space and water heating				+ (263) + (264) =		· <u>·</u>			=
opace and water neating		(20	(202)	(=55) - (,				1574.65	(265)

Electricity for pumps, fans and electric keep-hot (267) 0.519 38.93 Electricity for lighting (232) x (268) 213.36 0.519 Total CO2, kg/year sum of (265)...(271) = (272) 1826.93

(231) x

(273)TER = 17.74

		User Details:				
Assessor Name:		Stroma Nu				
Software Name:	Stroma FSAP 2012	Software \		Versio	n: 1.0.4.16	
	Р	roperty Address: Flat	04			
Address :						
Overall dwelling dime	nsions:	A 400/m²)	Av Height/m	.	Volume(m3)	
Basement		Area(m²) 59.89 (1a)	Av. Height(m	(2a) =	Volume(m³)	(3a)
Ground floor		46.65 (1b)		(2b) =	152.55](3b)
	a)+(1b)+(1c)+(1d)+(1e)+(1r		3.21		132.33	_(00)
	a)+(1b)+(1c)+(1a)+(1e)+(11	,, , ,	· (01) · (0) · (0 1) · (0) ·	6) [_
Dwelling volume		(3a)+	+(3b)+(3c)+(3d)+(3e)+.	(3n) =	314.25	(5)
2. Ventilation rate:	main secondar	v other	total		m³ per hour	
	heating heating	y other	101ai	_	m° per nour	_
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 far	าร		4	x 10 =	40	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fir	res		0	x 40 =	0	(7c)
				Air ch	anges per ho	ur _
	vs, flues and fans = $(6a)+(6b)+(7a)$		40	÷ (5) =	0.13	(8)
Number of storeys in the	een carried out or is intended, proceed ne dwelling (ns)	d to (17), otherwise continu	ie from (9) to (16)	Г	0	(9)
Additional infiltration	ie dweiling (113)		T/	9)-1]x0.1 =	0	(10)
	25 for steel or timber frame or	0.35 for masonry cor		[0	(11)
	esent, use the value corresponding to			L		
deducting areas of openin		4 () -	- 0	Г		٦
•	loor, enter 0.2 (unsealed) or 0.	1 (sealed), else ente	ru	ļ	0	(12)
If no draught lobby, ent				ļ	0	(13)
· ·	and doors draught stripped	0.25 [0.2 × /4.4) : 1001 –	Į	0	(14)
Window infiltration		0.25 - [0.2 x (14	•	ļ	0	(15)
Infiltration rate			+ (12) + (13) + (15) =		0	(16)
•	q50, expressed in cubic metre		e metre of envelop	e area	5	(17)
·	ty value, then $(18) = [(17) \div 20] + (8)$				0.38	(18)
	s if a pressurisation test has been don	e or a degree air permeab	ility is being used	Г		٦
Number of sides sheltere	d	(20) = 1 - [0.075	v (10)] =	-	0	(19)
Shelter factor	ing abolton foots:			[r	1	(20)
Infiltration rate incorporati	_	$(21) = (18) \times (20)$	·) –		0.38	(21)
Infiltration rate modified for		lul Aug C	on Oct No	, Daa		
	Mar Apr May Jun	Jul Aug Se	ep Oct Nov	/ Dec		
Monthly average wind spe	eed from Table 7					

4.3

3.8

3.8

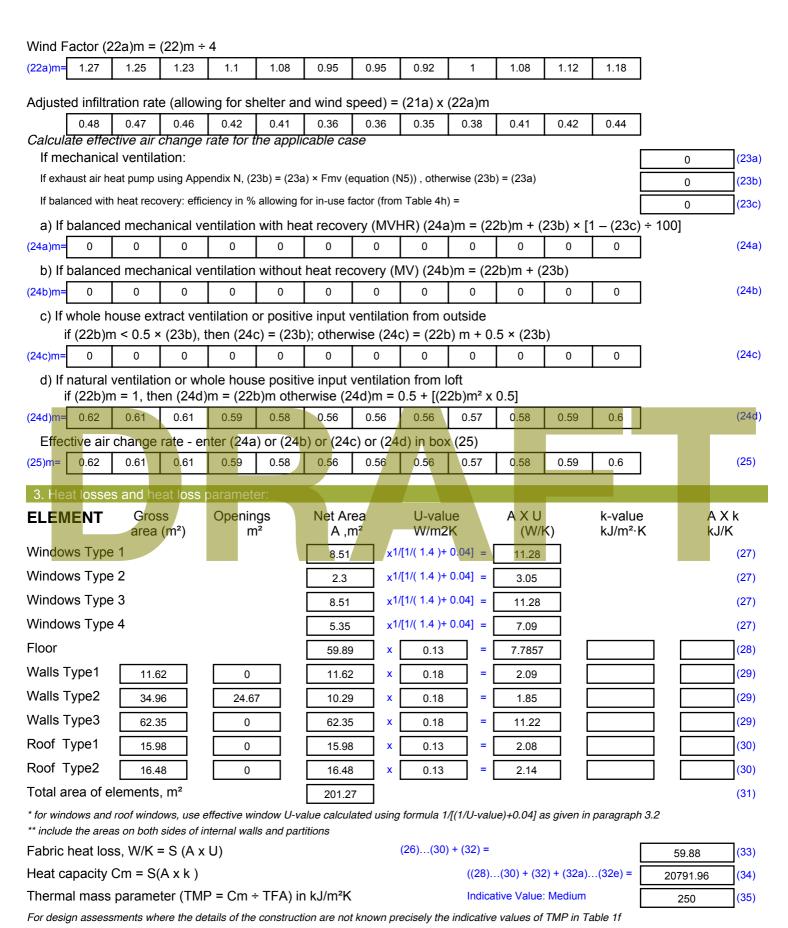
3.7

4

4.3

4.5

4.7



can be used instead of a detailed calculation.

Thorm	al bridge	oo : C /I	v V) ool	oulated i	uoina Ar	nondiy k	/					ı		7(20)
	•	•	•	own (36) =	• .	pendix k	`						4.53	(36)
	abric he			o (00)	011011(0	•,			(33) +	(36) =			64.41	(37)
Ventila	ation 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=	63.85	63.38	62.93	60.78	60.38	58.51	58.51	58.17	59.23	60.38	61.19	62.04		(38)
Heat tr	ansfer c	oefficie	nt, W/K						(39)m	= (37) + (37)	38)m		•	
(39)m=	128.26	127.79	127.33	125.19	124.79	122.92	122.92	122.57	123.64	124.79	125.6	126.45		
Heat lo	oss para	meter (l	HLP), W	m²K						Average = = (39)m ÷	Sum(39) _{1.} (4)	12 /12=	125.19	(39)
(40)m=	1.2	1.2	1.2	1.18	1.17	1.15	1.15	1.15	1.16	1.17	1.18	1.19		
Numbe	er of day	s in mo	nth (Tab	le 1a)						Average =	Sum(40) ₁ .	12 /12=	1.18	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
													l	
4. Wa	ater heat	ing ene	rgy requi	irement:								kWh/ye	ear:	
		_											ı	
	ned occu A > 13.9			[1 - exp	(-0.0003	349 x (TF	A -13.9	(2)1 + 0.0)013 x (TFA -13.		79		(42)
	A £ 13.9				((/_/]	(
						ay Vd,ave Iwelling is				no torget o		0.52		(43)
						hot and co	-	o acriieve	a water us	se largel o	I			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate						ctor from T								
(44)m=	110.57	106.55	102.53	98.51	94.49	90.47	90.47	94.49	98.51	102.53	106.55	110.57		
											m(44) ₁₁₂ =		1206.23	(44)
Energy (content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600	kWh/mon	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	163.97	143.41	147.99	129.02	123.8	106.83	98.99	113.59	114.95	133.96	146.23	158.8		_
If instan	taneous w	rator hoati	na at noint	of use (no	hot water	r storage),	enter∩in	hoves (46		Total = Su	m(45) ₁₁₂ =		1581.56	(45)
			-		1					20.00	21.93	22.02	1	(46)
(46)m= Water	24.6 storage	21.51 loss:	22.2	19.35	18.57	16.02	14.85	17.04	17.24	20.09	21.93	23.82		(40)
	•		includir	ng any so	olar or W	/WHRS	storage	within sa	me ves	sel		0		(47)
If com	munity h	eating a	nd no ta	ınk in dw	elling, e	nter 110	litres in	(47)					l	
Otherv	vise if no	stored	hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage												İ	
					or is kno	wn (kWh	n/day):					0		(48)
-			m Table									0		(49)
			_	, kWh/ye		or is not		(48) x (49)	=			0		(50)
•				-		h/litre/da						0		(51)
		_	ee secti		`		• /					-	I	` '
	e factor											0		(52)
Tempe	erature fa	actor fro	m Table	2b							1 7	0		(53)
												U		(33)

Energy lost from water storage, kWh/year Enter (50) or (54) in (55)	(47) x (51) x (52) x (53) =	0	(54) (55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$	0	(00)
(56)m= 0 0 0 0 0 0 0	0 0 0	0 0	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m when	e (H11) is from Appen	dix H
(57)m= 0 0 0 0 0 0	0 0 0	0 0	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) \div	` ,		_
(modified by factor from Table H5 if there is solar water hea			7 (50)
(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 × (4	11)m		-
(61)m= 50.96 46.03 50.96 48.58 48.15 44.61 46.1	48.15 48.58 50.96	6 49.32 50.96	(61)
Total heat required for water heating calculated for each mon		+ (46)m + (57)m +	¬` ′ ` ′
(62)m= 214.93 189.44 198.95 177.6 171.95 151.44 145.0			(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quar		oution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see /	`i i 		7 (63)
(63)m= 0 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater	0 404 74 403 53 404 0	2 405 55 200 70	1
(64)m= 214.93 189.44 198.95 177.6 171.95 151.44 145.0			2164.91 (64)
Heat arise from water heating INA/E (results 0.05 / 10.05 w /45	Output from water hea		
Heat gains from water heating, kWh/month 0.25 [0.85 × (45 (65)m= 67.26 59.19 61.95 55.04 53.2 46.67 44.44	1 1 1		1 J (65)
include (57)m in calculation of (65)m only if cylinder is in th	e dwelling of flot water is	Trom community	nealing
5. Internal gains (see Table 5 and 5a):			
		_	
Metabolic gains (Table 5), Watts	Aug Son Oo	Nov Doo	1
Jan Feb Mar Apr May Jun Jul	Aug Sep Oc		(66)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6</td> <td></td> <td>(66)</td>	2 139.62 139.62 139.6		(66)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5</td> <td>2 139.62 139.62</td> <td>_</td>	2 139.62 139.62 139.6 also see Table 5	2 139.62 139.62	_
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.62</td> <td>2 139.62 139.62</td> <td>(66)</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.62	2 139.62 139.62	(66)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.62 _13a), also see Table 5</td> <td>2 139.62 139.62</td> <td>(67)</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.62 _13a), also see Table 5	2 139.62 139.62	(67)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 13a), also see Table 5 6 196.6 203.57 218.4</td> <td>2 139.62 139.62</td> <td>_</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 13a), also see Table 5 6 196.6 203.57 218.4	2 139.62 139.62	_
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5</td> <td>2 139.62 139.62 2 22.91 24.42 4 237.13 254.73</td> <td>(67)</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5	2 139.62 139.62 2 22.91 24.42 4 237.13 254.73	(67)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5</td> <td>2 139.62 139.62 2 22.91 24.42 4 237.13 254.73</td> <td>(67)</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5	2 139.62 139.62 2 22.91 24.42 4 237.13 254.73	(67)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 8.86 48.86 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 133), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5 3 36.96 36.96 36.96</td> <td>2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 6 36.96 36.96</td> <td>(67)</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 133), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5 3 36.96 36.96 36.96	2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 6 36.96 36.96	(67)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 133), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5 3 36.96 36.96 36.96</td> <td>2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 6 36.96 36.96</td> <td>(67) (68) (69)</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 133), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5 3 36.96 36.96 36.96	2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 6 36.96 36.96	(67) (68) (69)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5 6 36.96 36.96 36.96 3 3 3 3</td> <td>2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 3 36.96 36.96 3 3</td> <td>(67) (68) (69)</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5 6 36.96 36.96 36.96 3 3 3 3	2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 3 36.96 36.96 3 3	(67) (68) (69)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5 6 36.96 36.96 36.96 3 3 3 3</td> <td>2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 3 36.96 36.96 3 3</td> <td>(67) (68) (69) (70)</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5 6 36.96 36.96 36.96 3 3 3 3	2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 3 36.96 36.96 3 3	(67) (68) (69) (70)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 133), also see Table 5 6 196.6 203.57 218.6 6), also see Table 5 6) 36.96 36.96 36.96 3 3 3 3</td> <td>2 139.62 139.62 2 22.91 24.42 3 237.13 254.73 3 36.96 36.96 3 3 3 7 -111.7 -111.7</td> <td>(67) (68) (69) (70)</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 133), also see Table 5 6 196.6 203.57 218.6 6), also see Table 5 6) 36.96 36.96 36.96 3 3 3 3	2 139.62 139.62 2 22.91 24.42 3 237.13 254.73 3 36.96 36.96 3 3 3 7 -111.7 -111.7	(67) (68) (69) (70)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 <td>2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 133), also see Table 5 6 196.6 203.57 218.6 6), also see Table 5 6) 36.96 36.96 36.96 3 3 3 3</td> <td>2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 6 36.96 36.96 3 3 3 7 -111.7 -111.7</td> <td>(67) (68) (69) (70) (71)</td>	2 139.62 139.62 139.6 also see Table 5 11.52 15.46 19.6 133), also see Table 5 6 196.6 203.57 218.6 6), also see Table 5 6) 36.96 36.96 36.96 3 3 3 3	2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 6 36.96 36.96 3 3 3 7 -111.7 -111.7	(67) (68) (69) (70) (71)
Jan Feb Mar Apr May Jun Jul (66)m= 139.62 8.86 8.86 8.86 8.86 8.86 8.86 8.86 8.86 8.86 8.86 8.86 12.99 9.71 8.2 8.86 8.86 6 228.72 211.12 <t< td=""><td>2</td><td>2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 6 36.96 36.96 3 3 3 7 -111.7 -111.7 9 84.65 88.09 (71)m + (72)m</td><td>(67) (68) (69) (70) (71)</td></t<>	2	2 139.62 139.62 2 22.91 24.42 4 237.13 254.73 6 36.96 36.96 3 3 3 7 -111.7 -111.7 9 84.65 88.09 (71)m + (72)m	(67) (68) (69) (70) (71)

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

	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	X	8.51	x	36.79	x	0.63	x	0.7	=	95.69	(77)
Southeast _{0.9x}	0.77	X	8.51	x	36.79	x	0.63	x	0.7	=	95.69	(77)
Southeast 0.9x	0.77	X	5.35	x	36.79	x	0.63	x	0.7	=	60.16	(77)
Southeast 0.9x	0.77	X	8.51	x	62.67	x	0.63	x	0.7] =	163	(77)
Southeast _{0.9x}	0.77	X	8.51	x	62.67	x	0.63	x	0.7	=	163	(77)
Southeast _{0.9x}	0.77	X	5.35	x	62.67	x	0.63	x	0.7	=	102.47	(77)
Southeast _{0.9x}	0.77	X	8.51	x	85.75	x	0.63	x	0.7	=	223.02	(77)
Southeast _{0.9x}	0.77	X	8.51	x	85.75	x	0.63	x	0.7	=	223.02	(77)
Southeast _{0.9x}	0.77	X	5.35	x	85.75	x	0.63	x	0.7	=	140.21	(77)
Southeast _{0.9x}	0.77	X	8.51	x	106.25	x	0.63	x	0.7	=	276.34	(77)
Southeast _{0.9x}	0.77	X	8.51	x	106.25	x	0.63	x	0.7	=	276.34	(77)
Southeast 0.9x	0.77	X	5.35	x	106.25	x	0.63	x	0.7	=	173.72	(77)
Southeast _{0.9x}	0.77	X	8.51	x	119.01	x	0.63	x	0.7	=	309.52	(77)
Southeast 0.9x	0.77	X	8.51	x	119.01	X	0.63	x	0.7	=	309.52	(77)
Southeast 0.9x	0.77	X	5.35	x	119.01	X	0.63	x	0.7	=	194.59	(77)
Southeast 0.9x	0.77	X	8.51	X	118.15	X	0.63	X	0.7		307.28	(77)
Southeast _{0.9x}	0.77	X	8.51	х	118.15	x	0.63	x	0.7	=	307.28	(77)
Southeast _{0.9x}	0.77	X	5.35	x	118.15	×	0.63	x	0.7	=	193.18	(77)
Southeast _{0.9x}	0.77	X	8.51	х	113.91	x	0.63	x	0.7	=	296.25	(77)
Southeast _{0.9x}	0.77	X	8.51	х	113.91	_x	0.63	x	0.7	=	296.25	(77)
Southeast _{0.9x}	0.77	X	5.35	х	113.91	х	0.63	x	0.7	=	186.24	(77)
Southeast 0.9x	0.77	X	8.51	х	104.39	X	0.63	x	0.7	=	271.5	(77)
Southeast _{0.9x}	0.77	X	8.51	X	104.39	X	0.63	X	0.7	=	271.5	(77)
Southeast _{0.9x}	0.77	X	5.35	X	104.39	X	0.63	X	0.7	=	170.68	(77)
Southeast 0.9x	0.77	X	8.51	X	92.85	X	0.63	X	0.7	=	241.49	(77)
Southeast 0.9x	0.77	X	8.51	x	92.85	x	0.63	x	0.7	=	241.49	(77)
Southeast 0.9x	0.77	X	5.35	x	92.85	x	0.63	x	0.7	=	151.82	(77)
Southeast _{0.9x}	0.77	X	8.51	X	69.27	X	0.63	X	0.7	=	180.15	(77)
Southeast 0.9x	0.77	X	8.51	X	69.27	X	0.63	X	0.7	=	180.15	(77)
Southeast _{0.9x}	0.77	X	5.35	X	69.27	X	0.63	X	0.7	=	113.25	(77)
Southeast _{0.9x}	0.77	X	8.51	X	44.07	X	0.63	x	0.7	=	114.62	(77)
Southeast 0.9x	0.77	X	8.51	X	44.07	X	0.63	X	0.7	=	114.62	(77)
Southeast _{0.9x}	0.77	X	5.35	X	44.07	X	0.63	X	0.7	=	72.06	(77)
Southeast _{0.9x}	0.77	X	8.51	X	31.49	X	0.63	X	0.7	=	81.89	(77)
Southeast _{0.9x}	0.77	X	8.51	X	31.49	X	0.63	X	0.7	=	81.89	(77)
Southeast 0.9x	0.77	X	5.35	x	31.49	x	0.63	x	0.7	=	51.48	(77)
Southwest _{0.9x}	0.77	X	2.3	x	36.79]	0.63	x	0.7	=	25.86	(79)
Southwest _{0.9x}	0.77	X	2.3	x	62.67]	0.63	x	0.7	=	44.05	(79)
Southwest _{0.9x}	0.77	X	2.3	x	85.75		0.63	X	0.7] =	60.28	(79)

Southwest _{0.9x} 0.77	X	2.3		x [10	06.25			0.63	x	0.7	=	74.69	(79)
Southwest _{0.9x} 0.77	X	2.3		x	11	19.01] [0.63	x	0.7	=	83.65	(79)
Southwest _{0.9x} 0.77	X	2.3		x	11	18.15] [0.63	x	0.7	=	83.05	(79)
Southwest _{0.9x} 0.77	X	2.3		x [11	13.91] [0.63	x	0.7	=	80.07	(79)
Southwest _{0.9x} 0.77	X	2.3		x [10)4.39] [0.63	x	0.7	=	73.38	(79)
Southwest _{0.9x} 0.77	X	2.3		x [9:	2.85] [0.63	x [0.7	=	65.27	(79)
Southwest _{0.9x} 0.77	X	2.3		x [6	9.27			0.63	x [0.7	=	48.69	(79)
Southwest _{0.9x} 0.77	x	2.3		x [4	4.07			0.63	x	0.7	=	30.98	(79)
Southwest _{0.9x} 0.77	x	2.3		x [3	1.49			0.63	×	0.7	=	22.13	(79)
	_													
Solar gains in watts, calcula	ated	for each	month				(83)m	= Sı	ım(74)m .	(82)m			_	
(83)m= 277.41 472.53 646	.53	801.08	897.28	890).79	858.82	787.	.05	700.05	522.24	332.27	237.4		(83)
Total gains – internal and s	olar	(84)m =	(73)m -	+ (83	3)m ,	watts	-						-	
(84)m= 725.94 918.85 1077	7.12	1205.86	1275.1	124	2.82	1194.66	113	30	1056.92	905.15	744.84	672.53		(84)
7. Mean internal temperat	ure (heating s	season)										
Temperature during heating	ng pe	eriods in	the livir	ng a	rea f	rom Tab	ole 9,	Th	1 (°C)				21	(85)
Utilisation factor for gains	for li	ving area	a, h1,m	(se	e Ta	ble 9a)								
Jan Feb M	lar	Apr	May	J	un	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m= 1 0.99 0.9	97	0.91	0.79	0.	61	0.45	0.4	.9	0.73	0.94	0.99	1		(86)
Mean internal temperature	in I	iving area	a T1 (fo	llow	ster	os 3 to 7	in T	able	9c)				4	
(87)m= 19.76 20 20	_	20.63	20.87		.97	21	20.9		20.93	20.61	20.12	19.73	1	(87)
			root of			facus To	blo 0						J	
Temperature during heating (88)m= 19.92 19.92 19.92		19.94	19.94		.96	19.96	19.9	_	12 (C) 19.95	19.94	19.94	19.93	1	(88)
	_								10.00	10.04	10.04	10.00	J	(00)
Utilisation factor for gains	$\overline{}$				`		r –		0.05	0.00	1 000		1	(00)
(89)m= 1 0.99 0.9	96	0.88	0.73	0.	52	0.34	0.3	8	0.65	0.92	0.99	1]	(89)
Mean internal temperature	e in t	he rest o			`	ollow ste	ps 3	to 7	in Tabl	e 9c)			,	
(90)m= 18.28 18.62 19.	06	19.53	19.82	19	.94	19.96	19.9	96	19.9	19.51	18.81	18.24		(90)
									f	LA = Livii	ng area ÷ (4	4) =	0.25	(91)
Mean internal temperature	e (foi	the who	le dwel	ling) = fL	_A × T1	+ (1 -	– fL	A) × T2					
(92)m= 18.65 18.96 19.	37	19.81	20.08	20).2	20.21	20.2	21	20.16	19.79	19.14	18.61		(92)
Apply adjustment to the m	ean	internal t	temper	atur	e fro	m Table	4e, ۱	whe	re appro	priate	-		-	
(93)m= 18.65 18.96 19.	37	19.81	20.08	20).2	20.21	20.2	21	20.16	19.79	19.14	18.61		(93)
8. Space heating requiren														
Set Ti to the mean interna		•		ed a	at ste	p 11 of	Table	e 9b	, so that	t Ti,m=	(76)m an	d re-cal	culate	
the utilisation factor for ga					un	Jul	۸.]	Con	Oct	Nov	Doo	1	
Jan Feb M Utilisation factor for gains,	lar hm:	Apr	May	J	un	Jui	Αι	ug [Sep	OCI	INOV	Dec	J	
(94)m= 0.99 0.98 0.9	-	0.88	0.74	0.	54	0.37	0.4	1	0.67	0.91	0.98	1	1	(94)
Useful gains, hmGm , W =												<u> </u>	J	
_ 	`		944.13	671	1.71	442.31	464.	.32	704.2	826.83	733.11	669.31]	(95)
Monthly average external	tem	perature	from Ta	able	8						1	1	4	
(96)m= 4.3 4.9 6.		8.9	11.7		1.6	16.6	16.	4	14.1	10.6	7.1	4.2]	(96)
Heat loss rate for mean in	terna	al temper	rature, l	Lm ,		[(39)m	x [(93	3)m-	- (96)m				-	
(97)m= 1840.34 1797.36 1638	3.26	1365.4	1045.86	688	3.02	444.28	467.	.59	749.07	1146.24	1511.76	1822.1]	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (97)m –	95)m] x (41)m
(98)m= 832.74 602.17 456.36 220.07 75.68 0 0 0 0	237.64 560.62 857.68
Total per year	ar (kWh/year) = Sum(98) _{15,912} = 3842.96 (98)
Space heating requirement in kWh/m²/year	36.07 (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) $(202) = 1 - (201) = 1$	
Fraction of total heating from main system 1 (204) = (202) × [1	
Efficiency of main space heating system 1	93.4 (206
Efficiency of secondary/supplementary heating system, %	0 (208
Jan Feb Mar Apr May Jun Jul Aug Sep	O Oct Nov Dec kWh/year
Space heating requirement (calculated above) 832.74 602.17 456.36 220.07 75.68 0 0 0 0	237.64 560.62 857.68
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	(211
891.58 644.72 488.61 235.62 81.03 0 0 0 0	254.43 600.24 918.28
Total (kWh/)	/ear) =Sum(211) _{15,1012} = 4114.52 (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 Table (MAN)s	0 0 0
	/ear) =Sum(215) _{15,1012} = 0 (215
Water heating Output from water heater (calculated above)	
214.93 189.44 198.95 177.6 171.95 151.44 145.09 161.74 163.53	3 184.92 195.55 209.76
Efficiency of water heater	80.3 (216
(217)m= 88.13 87.76 87.07 85.59 83.14 80.3 80.3 80.3 80.3	85.68 87.55 88.22 (217
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	
	5 215.82 223.35 237.77
Total = Sum	(219a) ₁₁₂ = 2553.85 (219
Annual totals	kWh/year kWh/year
Space heating fuel used, main system 1	4114.52
Water heating fuel used	2553.85
Electricity for pumps, fans and electric keep-hot	
central heating pump:	30 (230
boiler with a fan-assisted flue	45 (230
Total electricity for the above, kWh/year sum of (230a	a)(230g) = 75 (231
Electricity for lighting	419.57 (232
<i>-</i> , <u></u>	1 110.01

Energy

kWh/year

Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	888.74	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	551.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1440.37	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	217.76	(268)
Total CO2, kg/year	sum	of (265)(271) =		1697.05	(272)
TER =				15.93	(273)

		User D	otaile: -						
Access with the second				_					
Assessor Name: Stroma FSAF	2012		Strom				Varai	n: 1 0 4 16	
Software Name: Stroma FSAF			Softwa Address:				versio	on: 1.0.4.16	
Address :	FI	operty <i>i</i>	Audress.	rial 05					
1. Overall dwelling dimensions:									
3		Area	a(m²)		Av. He	ight(m)		Volume(m	³)
Basement		7	1.92	(1a) x	2	2.5	(2a) =	179.81	(3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)$)+(1e)+(1n)	7	1.92	(4)			_		
Dwelling volume	, , , , , ,)+(3c)+(3c	d)+(3e)+	.(3n) =	179.81	(5)
2. Ventilation rate:									
main	secondary	•	other		total			m³ per hou	ır
Number of chimneys heating 0	heating + 0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues 0	+ 0]	0	」] = [0	x :	20 =	0	(6b)
Number of intermittent fans		J L		J L			10 =		╡`′
				Ļ	3			30	(7a)
Number of passive vents				Ĺ	0		10 =	0	(7b)
Number of flueless gas fires				L	0	X 4	40 =	0	(7c)
							Δir cl	nanges per h	our
Infiltration due to chimneys, flues and fans) = (6a)+(6b)+(7a)+(7b)+(5	70) =			_			_
If a pressurisation test has been carried out or is				ontinue fi	30		÷ (5) =	0.17	(8)
Number of storeys in the dwelling (ns)	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,, .			(0) 10	, ,		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or tir	mber frame or 0	0.35 for	masonr	y consti	ruction			0	(11)
if both types of wall are present, use the value deducting areas of openings); if equal user 0.3		the greate	er wall are	a (after					
If suspended wooden floor, enter 0.2 (u		(seale	d), else	enter 0				0	(12)
If no draught lobby, enter 0.05, else ent	•	(-,,					0	(13)
Percentage of windows and doors draw	ght stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	0	(15)			
Infiltration rate			(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16)
Air permeability value, q50, expressed i		•		•	etre of e	envelope	area	5	(17)
If based on air permeability value, then (18								0.42	(18)
Air permeability value applies if a pressurisation to Number of sides sheltered	est has been done	or a deg	ree air pei	meability	is being u	sed			— (40)
Shelter factor			(20) = 1 -	0.075 x (19)] =			0	(19)
Infiltration rate incorporating shelter factor			(21) = (18)	x (20) =				0.42	(21)
Infiltration rate modified for monthly wind s								0.42	(= - /
	May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind speed from Table 7	,							_	
	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
					•	•	•	_	
Wind Factor (22a)m = (22)m ÷ 4	100 1 00- 1	0.05	0.00		1 4 00	1 , , ,	T 445	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	

djusted infiltr	0.52	<u> </u>	0.46	0.45	0.4	` 	`´	`´	0.45	0.47	0.40	1	
alculate effe		0.51 change				0.4 se	0.39	0.42	0.45	0.47	0.49	İ	
If mechanica		-										0	(2
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(2
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(2
a) If balance	d mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0	j	(2
b) If balance	d mech	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b)m = (22	2b)m + (23b)	,	,	
lb)m= 0	0	0	0	0	0	0	0	0	0	0	0	ļ	(
c) If whole h				•									
if (22b)n		<u> </u>	<u> </u>	<u> </u>	ŕ	· ` `	ŕ	ŕ	· ·	ŕ		1	,
lc)m= 0	0	0		0	0	0	0	0	0	0	0	İ	(
d) If natural if (22b)n					ve input erwise (2				0.5]			_	
d)m= 0.64	0.64	0.63	0.61	0.6	0.58	0.58	0.57	0.59	0.6	0.61	0.62		(
Effective air	change	rate - er	iter (24a) or (24k	o) or (24	c) or (24	d) in box	x (25)				_	
5)m= 0.64	0.64	0.63	0.61	0.6	0.58	0.58	0.57	0.59	0.6	0.61	0.62		(
. Heat losse	s and he	eat loss r	paramete	er.							_		
EMENT	Gros		Openin		Net Ar	ea	U-valı	ue	AXU		k-value	9	ΑΧk
	area	(m ²)	'n		A ,r	n²	W/m2		(W/I	K)	kJ/m²·l	K	kJ/K
indows Type	e 1				11.8	x1	/[1/(1.4)+	0.04] =	15.64				(
n <mark>dows</mark> Type	2				3.09	x1	/[1/(1.4)+	0.04] =	4.1				(
ndows Type	: 3				3.09	x1	/[1/(1.4)+	0.04] =	4.1				(
alls Type1	68.6	66	17.9	8	50.68	x	0.18		9.12				(
alls Type2	17.7	76	0		17.76	3 X	0.18	=	3.2				(
tal area of e	lements	, m²			86.42	2						_	(
or windows and nclude the area						ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
bric heat los				is and pan	inions		(26)(30)) + (32) =				36.16	6 (
eat capacity		•	O)				, , , ,	, ((28)	(30) + (32	2) + (32a).	(32e) =	13003.	
ermal mass		,	o = Cm ÷	- TFA) ir	n kJ/m²K			., ,	tive Value		(3 2)	250	
r design assess	•	•		,			ecisely the				able 1f	230	
n be used inste	ad of a de	tailed calc	ulation.			•	-						
ermal bridge	•	•		• .	•	<						5.48	3 (
etails of therma		are not kn	own (36) =	= 0.15 x (3	1)			/20\ ·	(26) -				
tal fabric he		alouloto -	l manthi	,					(36) =	25\m \: (5)		41.64	4 (
entilation hea		r			lun	1, ,1	۸۰۰۰		= 0.33 × (i	1	
Jan 38.05	Feb 37.72	Mar 37.4	Apr 35.91	May 35.63	Jun 34.32	Jul 34.32	Aug 34.08	Sep 34.82	Oct 35.63	Nov 36.19	36.79		(
		<u> </u>	00.31	00.00	1 04.02	07.02	J 54.00		<u> </u>	ļ	1 30.79	i	(
eat transfer o	coefficie	nt, W/K						(39)m	= (37) + (37)	38)m			
9)m= 79.69	79.36	79.04	77.54	77.26	75.96	75.96	75.72	76.46	77.26	77.83	78.42	1	

Heat Ic	ss para	meter (F	ILP), W/	m²K					(40)m	= (39)m ÷	(4)			
40)m=	1.11	1.1	1.1	1.08	1.07	1.06	1.06	1.05	1.06	1.07	1.08	1.09		
Jumbe	ar of day	e in mor	nth (Tabl	(12 م					,	Average =	Sum(40) _{1.}	12 /12=	1.08	(40)
v uiiibe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
	ļ ļ		<u> </u>				<u> </u>	<u> </u>	l .		!			
4. Wa	iter heat	ing ener	gy requi	rement:								kWh/yea	r:	
\eeum	ed occu	nancy I	NI.									00		(40)
if TF), N = 1	+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		29		(42)
Reduce	the annua	l average	ater usag hot water	usage by	5% if the d	welling is	designed t			se target o		.63		(43)
ot more			person per						_		T			
lot wate	Jan er usage ir	Feb	Mar day for ea	Apr	May Vd.m = fac	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
44)m=	97.5	93.95	90.41	86.86	83.31	79.77	79.77	83.31	86.86	90.41	93.95	97.5		
,	07.0	00.00	00.11	00.00	00.01	70.77	10.77				m(44) ₁₁₂ =		1063.6	(44
nergy o	content of	hot water	used - cal	culated mo	onthly $= 4.$	190 x Vd,r	n x nm x E	Tm / 3600	kWh/mon	oth (see Ta	ables 1b, 1	c, 1d)		_
45)m=	144.58	126.45	130.49	113.76	109.16	94.2	87.29	100.16	101.36	118.12	128.94	140.02		_
instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage)	enter 0 in	hoxes (46		Total = Su	m(45) ₁₁₂ =		1394.54	(45
46)m=		18.97	19.57	17.06	16.37	14.13	13.09	15.02	15.2	17.72	19.34	21		(46
	storage		10.01	11.00	10.07	11.10	.0.00	10.02	10.2	2	10.01			
Storag	e volum	e (litres)	includin	g any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47
	•	•	nd no ta		•			` '	, ,	(0)				
	vise if no storage		hot wate	er (this in	iciudes II	nstantar	eous co	mbi boil	ers) ente	er 'O' in (47)			
	•		eclared lo	oss facto	or is knov	wn (kWł	n/day):					0		(48
empe	rature fa	actor fro	m Table	2b		`	• ,					0		(49
nergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(50
•			eclared o	-										
		_	factor from the factor from th		e ∠ (KVVI	ı/iitre/da	ıy)					0		(51
	e factor	_		311 1.0								0		(52
empe	rature fa	actor fro	m Table	2b								0		(53
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
Enter	(50) or (54) in (5	55)									0		(55
Vater	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56
cylinde	er contains	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 Appendix	Н	
57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58
	-		culated f			•	. ,	, ,						
		factor fr	om Tabl	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59

0 111				(0.1)	(00)	0= (44)							
Combi loss ca	_			` 	<u> </u>	· ` `		1 40.04	40.07	10.00	10.00		(61)
(61)m= 49.68	43.24	46.07	42.84	42.46	39.34	40.65	42.46	<u> </u>	46.07	46.33	49.68		(61)
							`			ì ´	` 	(59)m + (61)m	(22)
(62)m= 194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.62		164.19	175.27	189.71		(62)
Solar DHW input									r contribut	tion to wate	er heating)		
(add additiona						·				1 0	Ι ,	1	(62)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w			4-0.0	1-1-0	100 -0					1	100 =1	1	
(64)m= 194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.62		164.19	175.27	189.71	4000.40	(64)
						>		utput from wa				1926.19	(64)
Heat gains fro	_]	(05)
(65)m= 60.49	52.86	54.91	48.54	46.91	41.15	39.19	43.92		50.79	54.46	58.98		(65)
include (57)	m in calc	culation	of (65)m	only if c	ylinder i	s in the o	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Internal g	ains (see	Table 5	and 5a):									
Metab <u>olic gair</u>	ns (Table	5), Wat	ts							1		•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	<u> </u>	Oct	Nov	Dec		
(66)m= 114.6	114.6	114.6	114.6	114.6	114.6	114.6	114.6	114.6	114.6	114.6	114.6		(66)
Ligh <mark>ting gains</mark>	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), <mark>a</mark>	lso see	Table 5					
(67)m= 17.99	15.97	12.99	9.84	7.35	6.21	6.71	8.72	11.7	14.86	17.34	18.49		(67)
App <mark>liance</mark> s ga	iins (ca <mark>lc</mark>	<mark>ulat</mark> ed ir	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble <mark>5</mark>				
(68)m= 201.75	203.84	198.56	187.33	173.16	159.83	150.93	148.84	154.11	165.34	179.52	192.84		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also	see Table	5				
(69)m= 34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46		(69)
Pumps and fa	ns gains	(Table 5	āa)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m= -91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68		(71)
Water heating	gains (T	able 5)		-	-	-	-	-	-		-		
(72)m= 81.31	78.66	73.8	67.41	63.05	57.16	52.67	59.03	61.68	68.27	75.63	79.27		(72)
Total internal	gains =				(66))m + (67)m	ı + (68)n	n + (69)m + ((70)m + (7	71)m + (72))m	•	
(73)m= 361.42	358.85	345.73	324.96	303.94	283.58	270.68	276.96	287.87	308.85	332.87	350.98		(73)
6. Solar gain	s:					•					•		
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to	convert to th	e applical	ole orientat	tion.		
Orientation:		actor	Area		Flu			_ g	-	FF		Gains	
_	Table 6d		m²		ı a	ble 6a		Table 6b		able 6c		(W)	_
Northeast _{0.9x}	0.77	X	3.0)9	X 1	11.28	X	0.63	X	0.7	=	10.65	(75)
Northeast _{0.9x}	0.77	X	3.0)9	x 2	22.97	x _	0.63	x	0.7		21.69	(75)
Northeast _{0.9x}	0.77	X	3.0)9	X Z	1.38	x _	0.63	x	0.7	=	39.08	(75)
Northeast _{0.9x}	0.77	X	3.0)9	x 6	37.96	x	0.63	x	0.7	=	64.17	(75)
Northeast _{0.9x}	0.77	X	3.0	9	x 9	1.35	x	0.63	x	0.7	=	86.26	(75)

Northogat a a		_		٦		1		- r			_	–
Northeast 0.9x	0.77	X	3.09	X	97.38] X	0.63	⊒ × l	0.7	_ =	91.96	(75)
Northeast 0.9x	0.77	X	3.09	X	91.1] X	0.63	ַ × נ	0.7	_ =	86.03	(75)
Northeast 0.9x	0.77	X	3.09	_ X	72.63	X	0.63	× [0.7	_ =	68.58	(75)
Northeast 0.9x	0.77	X	3.09	X	50.42	X	0.63	x [0.7	=	47.61	(75)
Northeast _{0.9x}	0.77	X	3.09	×	28.07	X	0.63	X	0.7	=	26.51	(75)
Northeast _{0.9x}	0.77	X	3.09	X	14.2	X	0.63	X	0.7	=	13.41	(75)
Northeast 0.9x	0.77	X	3.09	X	9.21	X	0.63	X	0.7	=	8.7	(75)
Southeast _{0.9x}	0.77	X	11.8	×	36.79	X	0.63	X	0.7	=	132.69	(77)
Southeast _{0.9x}	0.77	X	11.8	X	62.67	X	0.63	X	0.7	=	226.02	(77)
Southeast 0.9x	0.77	X	11.8	X	85.75	X	0.63	X	0.7	=	309.24	(77)
Southeast 0.9x	0.77	X	11.8	X	106.25	X	0.63	x	0.7	=	383.17	(77)
Southeast 0.9x	0.77	X	11.8	X	119.01	X	0.63	X	0.7	=	429.18	(77)
Southeast _{0.9x}	0.77	X	11.8	X	118.15	X	0.63	x [0.7	=	426.08	(77)
Southeast _{0.9x}	0.77	X	11.8	X	113.91	X	0.63	x	0.7	=	410.78	(77)
Southeast 0.9x	0.77	X	11.8	X	104.39	X	0.63	x	0.7	=	376.46	(77)
Southeast 0.9x	0.77	x	11.8	X	92.85	x	0.63	x	0.7		334.85	(77)
Southeast 0.9x	0.77	x	11.8	X	69.27	x	0.63	x	0.7	<u> </u>	249.8	(77)
Southeast 0.9x	0.77	x	11.8	X	44.07	Х	0.63	Х	0.7	=	158.93	(77)
Southeast 0.9x	0.77	X	11.8	X	31.49	x	0.63	x	0.7	=	113.55	(77)
Southwest _{0.9x}	0.77	x	3.09	X	36.79		0.63	x	0.7	╡ =	34.75	(79)
Southwest _{0.9x}	0.77	X	3.09	X	62.67	i /	0.63	x	0.7	-	59.19	(79)
Southwest _{0.9x}	0.77	X	3.09	i x	85.75	i	0.63	x	0.7	=	80.98	(79)
Southwest _{0.9x}	0.77	X	3.09	x	106.25		0.63	x	0.7	=	100.34	(79)
Southwest _{0.9x}	0.77	X	3.09	х	119.01	i	0.63	x	0.7	=	112.39	(79)
Southwest _{0.9x}	0.77	x	3.09] x	118.15	i	0.63	×	0.7		111.57	(79)
Southwest _{0.9x}	0.77	X	3.09	i x	113.91	j	0.63	_ x	0.7	=	107.57	(79)
Southwest _{0.9x}	0.77	X	3.09	i x	104.39	i	0.63	x	0.7	= =	98.58	(79)
Southwest _{0.9x}	0.77	X	3.09	d x	92.85	i	0.63	╡ 。 ˈi	0.7	= =	87.68	(79)
Southwest _{0.9x}	0.77	X	3.09	d x	69.27	1	0.63	x	0.7	= =	65.41	(79)
Southwest _{0.9x}	0.77	X	3.09	X	44.07	<u>.</u>	0.63	x	0.7	= =	41.62	(79)
Southwest _{0.9x}	0.77	×	3.09	X	31.49]	0.63	_	0.7	_ =	29.74	(79)
5.0A L	0.77		0.00	」 ^	01.40	J	0.00	ן " ו	0.1		20.14	(,
Solar gains in v	vatts cal	culated	for each mor	nth		(83)m	n = Sum(74)m .	(82)m				
(83)m= 178.09		429.3	547.68 627.8	-	29.62 604.38	543		341.71	213.95	151.99		(83)
Total gains – in	ternal an	d solar	(84)m = (73)	m + (83)m , watts	!					Į.	
(84)m= 539.51	665.74	775.03	872.64 931.7	77 9	13.19 875.07	820	.58 758.02	650.56	546.82	502.97		(84)
7. Mean interr	nal tempe	erature (heating seas	on)	<u>, </u>		,		,			
Temperature of					area from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation fact	•	•		_		-	. (- /					_
Jan	Feb	Mar	Apr Ma	Ť	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.99	0.98	0.95	0.87 0.72	-	0.52 0.38	0.4		0.92	0.99	1		(86)
Mean internal	temperat	ture in l	iving area T1	(follo	w stens 3 to .	7 in 7	ahle 0c)	!	-1	I	1	
(87)m= 19.95		20.46	20.76 20.9		20.99 21	2	1	20.72	20.28	19.92		(87)
(51)				<u> </u>			1	L	1 -0.20	I <u>-</u>	1	• /

T	ali andre er l		and and a de-		ali a sa USas as	T	. I. I. O. T	LO (00)					
Temperature							· ·	- ` 	00.00	00.00	00.04		(88)
(88)m= 19.99	20	20	20.02	20.02	20.04	20.04	20.04	20.03	20.02	20.02	20.01		(00)
Utilisation fa		1			· `	i			1				(00)
(89)m= 0.99	0.98	0.94	0.84	0.66	0.45	0.3	0.34	0.58	0.88	0.98	0.99		(89)
Mean interna	al temper	ature in	the rest	of dwell	ing T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m= 18.62	18.94	19.35	19.76	19.96	20.03	20.04	20.04	20.01	19.73	19.11	18.58		(90)
								f	fLA = Livin	g area ÷ (4	4) =	0.42	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m= 19.18	19.46	19.81	20.18	20.37	20.43	20.44	20.44	20.41	20.14	19.6	19.14		(92)
Apply adjust	ment to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	priate		•		
(93)m= 19.18	19.46	19.81	20.18	20.37	20.43	20.44	20.44	20.41	20.14	19.6	19.14		(93)
8. Space hea	ating req	uirement											
Set Ti to the the utilisation			•		ned at sto	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		
Utilisation fa	ctor for g	ains, hm	:										
(94)m = 0.99	0.98	0.94	0.84	0.68	0.48	0.33	0.37	0.61	0.89	0.98	0.99		(94)
Useful gains	, hmGm	, W = (94	4)m x (8	4)m									
(95)m= 534.48	649.11	726.28	734.85	632.42	438.24	291.02	304.89	465.79	578.46	535.06	499.55		(95)
Monthly ave	rage exte	ernal tem	perature	from T	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)
He <mark>at los</mark> s rat		_	_			-]				
` '	1155.47			669.66	442.93	291.54	305.82	482.31	737.36	972.77	1171.64		(97)
Space heating				_						_	1		
(98)m= 484.25	340.27	242.61	100.68	27.71	0	0	0	0	118.22	315.15	500.03		_
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2128.93	(98)
Space heating	ng requir	ement in	kWh/m²	/year								29.6	(99)
9a. Energy re	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heati	•			, ,							ı	_	¬
Fraction of s	•				mentary	•						0	(201)
Fraction of s	pace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of to	otal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of	main spa	ace heat	ing syste	em 1								93.4	(206)
Efficiency of	seconda	ry/suppl	ementar	y heatin	g systen	ո, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	— ear
Space heating	ng requir	ement (c)	ļ.						,	
484.25	340.27	242.61	100.68	27.71	0	0	0	0	118.22	315.15	500.03		
(211)m = {[(98	B)m x (20)4)] } x 1	00 ÷ (20	(6)	•								(211)
518.47	 	259.75	107.79	29.67	0	0	0	0	126.57	337.42	535.37		
						!	Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	=	2279.37	(211)
Space heating	ng fuel (s	econdar	y), kWh/	month								<u> </u>	
= {[(98 <u>)</u> m x (2	•		• , .										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
	<u> </u>			· · ·	· · ·	· · ·	Tota	l (kWh/yea	ar) =Sum(2	215),5,1012	=	0	(215)
											•		

Water heating										
Output from water heater (calculated 194.27 169.7 176.56 156.	1 1	133.53	127.94	142.62	144.19	164.19	175.27	189.71	1	
Efficiency of water heater	0 151.02	133.33	127.94	142.02	144.19	104.19	173.27	109.71	80.3	(216)
(217)m= 87.26 86.77 85.85 83.9	7 81.71	80.3	80.3	80.3	80.3	84.24	86.51	87.38	00.3	(217)
Fuel for water heating, kWh/month									J	` ,
$(219)m = (64)m \times 100 \div (217)m$									1	
(219)m= 222.64 195.58 205.66 186.	9 185.55	166.29	159.32	177.61	179.57	194.91	202.6	217.11		7
				lota	ıl = Sum(2				2293.33	(219)
Annual totals Space heating fuel used, main systematics Space heati	m 1					K'	Wh/year	•	kWh/year 2279.37	٦
										_
Water heating fuel used									2293.33	J
Electricity for pumps, fans and elect	ic keep-hot								_	
central heating pump:								30		(230c)
boiler with a fan-assisted flue								45]	(230e)
Total electricity for the above, kWh/y	ear			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting									317.63	(232)
12a. CO2 emissions – Individual he	ating syste	mş inclı	uding mi	cro-CHF						
		En	ergy	,		Emico	ion fac	tor	Emissions	
			/h/ye <mark>ar</mark>			kg CO		lOi	kg CO2/yea	
Space heating (main system 1)		(21	-			0.2		=	492.34	(261)
Space heating (secondary)		(21	5) x			0.5	19	=	0	」 [263]
Water heating		(219	9) x			0.2	16	=	495.36	」 [264]
Space and water heating		(26	1) + (262)	+ (263) + ((264) =				987.7] (265)
Electricity for pumps, fans and elect	ic keep-hot	(23	1) x			0.5	19	=	38.93] (267)
Electricity for lighting		(232	2) x			0.5	19	=	164.85	」 (268)
Total CO2, kg/year					sum o	of (265)(2	271) =		1191.48] (272)

TER =

(273)

16.57

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	112		Strom Softwa				Versic	on: 1.0.4.16	
		Pi	roperty .	Address	: Flat 06	;				
Address :										
1. Overall dwelling dimer	nsions:		_							
Basement				a(m²) 65.1	(1a) x		2.5	(2a) =	Volume(m ²	3) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n	1) (65.1	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3d	d)+(3e)+	.(3n) =	162.74	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	у 	other 0	7 = F	total 0	x	40 =	m³ per hou	ır ─_ _(6a)
Number of open flues	0 +	0	┪╻	0	 	0	x	20 =	0	(6b)
Number of intermittent fan					J -	2	x	10 =	20	(7a)
Number of passive vents					L			10 =		(7b)
·					L	0		40 =	0	_
Number of flueless gas fire	es				L	0	^ '		nanges per ho	(7c)
Infiltration due to chimney	e flues and fans =	(6a)+(6b)+(7	(a)+(7h)+(7c) =			_		-	_
If a pressurisation test has be					continue f	20 rom (9) to		÷ (5) =	0.12	(8)
Number of storeys in the									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening		esponding to	the great	er wall are	a (after					
If suspended wooden flo		aled) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente	er 0.05, else enter 0								0	(13
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	` '	-			0	(15)
Infiltration rate						12) + (13)			0	(16)
Air permeability value, o			•	•	•	netre of e	envelope	area	5	(17)
If based on air permeabilit Air permeability value applies	-					is heina u	sed.		0.37	(18)
Number of sides sheltered		ao	0 0, 4 405	groo an po	modemity	io boilig a	Jou		0	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.37	(21)
Infiltration rate modified fo	r monthly wind spec	ed						'		_
Jan Feb M	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	1.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4								-	
Wind Factor (22a)m = (22 $(22a)$ m = 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
	1.00	1 0.00	3.00	1 3.52	<u> </u>	1	1	Lo	I	

djusted infiltra 0.48	0.47	0.46	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.42	0.44		
alculate effec		•	rate for t	he appli	cable ca	se	ļ						
If mechanica												0	
If exhaust air he) = (23a)			0	
If balanced with	heat reco	overy: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0	l	
b) If balance	d mech	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	o)m = (22	2b)m + (23b)	1	1	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	l	
c) If whole he if (22b)m				•	•				5 × (23b))			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		
d) If natural v				•	•				0.5]				
4d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		
Effective air	change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	d) in box	x (25)		-	-		
5)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		
. Heat losses	and he	eat loss i	narameti	or.					-				
EMENT	Gros area	ss	Openin	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value		A X kJ/ŀ
in <mark>dows</mark> Type		()			10.68	<u> </u>	/[1/(1.4)+		14.16				
indows Type					2.8		/[1/(1.4)+	, i	3.71	Ħ			
indows Type					2.8		/[1/(1.4)+	\ \ \ \ \	3.71	Ħ			
alls Type1	61.7	76	16.2		45.48		0.18	=	8.19	片 ,		-, F	
alls Type2	26.6		0			=			4.8	믁 ¦		극 누	
otal area of e					26.68	_	0.18	[4.0				
or windows and			offootivo wi	ndow II w	88.44		r formula 1	/[/1/ volu	(0) (0,041 (no aivon in	naraaranh		
include the area						ateu using	i ioiiiiuia ii	/[(1/ U- vaiu	e)+0.04] a	is giveri iii	paragrapi	1 3.2	
bric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				34.5	 57
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	13710).02
ermal mass	parame	ter (TMF	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		25	 0
r design assess	ments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
n be used instea						,							
ermal bridge	`	,		•	•	1						5.1	6
<i>letails of therma</i> Ital fabric hea		are not kn	iowii (30) =	- U. 13 X (3	11)			(33) +	(36) =			39.7	73
entilation hea		alculated	d monthly	/						[25)m x (5])		-
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
32.92	32.69	32.46	31.37	31.17	30.22	30.22	30.05	30.59	31.17	31.58	32.01		
eat transfer c		1 nt \///K	ļ			!			= (37) + (37)	1 38)m	I	1	
Jai ii ai i Si Ci U	Cemole	it, VV/IX						(33)111	(01) 1 (1		1	
9)m= 72.65	72.42	72.18	71.1	70.9	69.95	69.95	69.78	70.32	70.9	71.31	71.74		

Heat Ic	ss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.12	1.11	1.11	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.1	1.1		_
Numbe	or of day	e in mor	nth (Tabl	0 10)					,	Average =	Sum(40) ₁	12 /12=	1.09	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
	ļ													
4. Wa	iter heat	ing ener	gy requi	rement:								kWh/yea	r:	
if TF	ed occu A > 13.9 A £ 13.9), N = 1	N + 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		12		(42)
Reduce	the annua	l average	ater usag hot water o person per	usage by s	5% if the d	welling is	designed t			se target o		.59		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea		•				ОСР	001	1404	Dec		
(44)m=	93.04	89.66	86.28	82.89	79.51	76.13	76.13	79.51	82.89	86.28	89.66	93.04		
											m(44) ₁₁₂ =		1015.03	(44)
			used - cal							_				
45)m=	137.98	120.68	124.53	108.57	104.17	89.9	83.3	95.59	96.73	112.73	123.05	133.63	4000.07	
f inst <mark>ant</mark>	taneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		lotal = Su	m(45) ₁₁₂ =		1330.87	(45)
46)m=	20.7	18.1	18.68	16.29	15.63	13.48	12.5	14.34	14.51	16.91	18.46	20.04		(46)
	storage		7											
			includin						ame ves	sel		0		(47)
	•	•	nd no ta hot wate		•			` '	ars) ante	ar 'O' in <i>(</i>	47)			
	storage		not wate	1 (0113 111	Ciuues ii	iistaiitai	ieous co	ilibi boli	Cray Crite	51 0 111 (71)			
a) If m	anufact	urer's de	eclared lo	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Гетре	rature fa	actor fro	m Table	2b								0		(49)
•			storage					(48) x (49)) =			0		(50)
			eclared of factor fr	-										(51)
		_	ee section		C 2 (KVVI	i/iiti C/GC	<i>y)</i>					0		(31)
	e factor	_										0		(52)
Гетре	erature fa	actor fro	m Table	2b								0		(53)
			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	(50) or (, ,	•									0		(55)
Water :	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m 				
56)m= f cylinde	0 er contains	0 dedicated	0 d solar sto	0 rage, (57)r	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	m Appendix	Н	(56)
57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	v circuit	loss (an	ınual) fro	m Tahle	. 3	I	I	Į.	Į.	ļ		0		(58)
	-	•	culated f			59)m = ((58) ÷ 36	65 × (41)	m					. ,
	-				,	•	. ,	, ,	cylinde	r thermo	etat)			
(mod	allied by	iactor ii	OIII Tabi	CIIJII U	11010 13 3	olai wa	ioi iioatii	.9	· - j		July			

Combi loss c		1				1	ı —	1	T	T	1 .	1	(04)
(61)m= 47.41		43.97	40.88	40.52	37.54	38.79	40.52	40.88	43.97	44.22	47.41	J	(61)
							`		(45)m +	(46)m +	` 	(59)m + (61)m	
(62)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.11	137.61	156.7	167.27	181.04]	(62)
Solar DHW inpu									r contribu	tion to wate	er heating)		
(add addition	al lines if	FGHRS			applies	, see Ap	pendix	 		,	1	1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(63)
Output from	water hea	iter										1	
(64)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.11	137.61	156.7	167.27	181.04		7
							Ou	tput from w	ater heate	er (annual)	12	1838.24	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	[]	
(65)m= 57.73	50.44	52.4	46.32	44.77	39.28	37.4	41.91	42.38	48.47	51.97	56.29		(65)
include (57	m in cal	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ins (Table	e 5). Wat	ts										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m= 106.08	3 106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08		(66)
Ligh <mark>ting gain</mark>	s (calcula	ted in A	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 16.55	<u> </u>	11.95	9.05	6.76	5.71	6.17	8.02	10.76	13.67	15.95	17.01]	(67)
Appliances g	ains (calc	culated in	Append	dix L. ea	uation L	13 or L1	3a), als	o see Ta	ble 5			1	
(68)m= 185.6	,	182.67	172.34	159.3	147.04	138.85	136.92		152.11	165.15	177.41]	(68)
Cooking gair			nnendix	l equat	ion I 15	or I 15a	L also s	see Table	5		ļ	1	
(69)m= 33.61		33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61	1	(69)
Pumps and f								(3.3.3)					, ,
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
							_	<u> </u>		<u> </u>		l	()
Losses e.g. 6 (71)m= -84.86		-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	1	(71)
` ′	_!	ļ	-04.00	-04.00	-04.00	-04.00	-04.00	-04.00	-04.00	-04.00	-04.00	J	(7-1)
Water heatin	``		04.00	00.47	54.55	T 50.00	50.00	T 50.00	05.45	T 70.40	T 75.05	1	(72)
(72)m= 77.6	75.06	70.43	64.33	60.17	54.55	50.26	56.33	58.86	65.15	72.18	75.65	J	(72)
Total interna	_					, , , ,		+ (69)m +		· · ·		1	(70)
(73)m= 337.56		322.87	303.54	284.05	265.12	253.11	259.1	269.23	288.75	311.11	327.89		(73)
6. Solar gai				T-61- 0-		:-41	4: 4-		!!		·		
Solar gains are		•					itions to t		ie applica		uon.	Caina	
Orientation:	Table 6d		Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
Northeast 0.9x				_									7,,
		_	2.		-	11.28	X	0.63		0.7	_ = -	9.65	(75)
Northeast 0.9x			2.		-	22.97	X	0.63		0.7	_ =	19.65	[(75)
Northeast 0.9x			2.			11.38	X _	0.63		0.7	_ •	35.41	<u> </u> (75)
Northeast 0.9x			2.	8	X (67.96	X	0.63	x	0.7	=	58.15	(75)
Northeast 0.9x	0.77	X	2.	8	x	91.35	X	0.63	X	0.7	=	78.17	(75)

Northeast 0.9x 0.77	7 x	2.8	1 x	07	.38	1 x	0.63	x	0.7		83.33	(75)
Northeast 0.9x 0.77] x	2.8] x		1.1] x	0.63	×	0.7	╡ .	77.96	(75)
Northeast 0.9x 0.77]	2.8	l x		2.63] ^] _X	0.63	X	0.7	╡ .	62.15	(75)
Northeast 0.9x 0.77]]	2.8	ı I x	<u> </u>	.42]]	0.63	X	0.7	= -	43.15	(75)
Northeast 0.9x 0.77	」] x	2.8	」] _x		.07]] _x	0.63	x	0.7	= =	24.02	(75)
Northeast 0.9x 0.77] x	2.8	X		4.2] x	0.63	X	0.7	= =	12.15	(75)
Northeast 0.9x 0.77] x	2.8] x		21] x	0.63	X	0.7	╡ .	7.88	(75)
Southwest _{0.9x} 0.77] x	2.8] x		.79]	0.63	×	0.7	╡ .	31.49	(79)
Southwest _{0.9x} 0.77]]	2.8	ı I x		2.67]]	0.63	X	0.7	= -	53.63	(79)
Southwest _{0.9x} 0.77]] x	2.8	」 】 x		5.75]]	0.63	X	0.7		73.38	」(79)
Southwest _{0.9x} 0.77] x	2.8	, x		6.25	<u> </u> 	0.63	X	0.7		90.92	(79)
Southwest _{0.9x} 0.77	X	2.8] 		9.01	,]	0.63	X	0.7		101.84	(79)
Southwest _{0.9x} 0.77] x	2.8]]		8.15	<u> </u> 	0.63	x	0.7	╡.	101.1	(79)
Southwest _{0.9x} 0.77	X	2.8) X		3.91	<u>.</u>]	0.63	X	0.7		97.47	(79)
Southwest _{0.9x} 0.77	×	2.8	X		4.39		0.63	x	0.7	╡ -	89.33	(79)
Southwest _{0.9x} 0.77	X	2.8]] x		85	i	0.63	X	0.7	╡ -	79.45	(79)
Southwest _{0.9x} 0.77	j ×	2.8	X	69	.27	j	0.63	x	0.7		59.27	(79)
Southwest _{0.9x} 0.77	X	2.8	X	44	.07		0.63	X	0.7	=	37.71	(79)
Southwest _{0.9x} 0.77	X	2.8	X	31	.49	i	0.63	X	0.7	= -	26.94	(79)
Northwest _{0.9x} 0.77	x	10.68	X	11	.28	×	0.63	х	0.7	-	36.83	(81)
Northwest 0.9x 0.77	x	10.68	X	22	.97	x	0.63	х	0.7	=	74.96	(81)
Northwest 0.9x 0.77	x	10.68	х	41	.38	х	0.63	X	0.7	_	135.06	(81)
Northwest 0.9x 0.77	x	10.68	X	67	.96	х	0.63	X	0.7	-	221.8	(81)
Northwest 0.9x 0.77	X	10.68	X	91	.35	x	0.63	X	0.7	=	298.15	(81)
Northwest 0.9x 0.77	Īx	10.68	x	97	7.38	x	0.63	х	0.7		317.86	(81)
Northwest 0.9x 0.77	x	10.68	×	9	1.1	x	0.63	x	0.7		297.35	(81)
Northwest 0.9x 0.77	x	10.68	x	72	63	x	0.63	x	0.7	-	237.05	(81)
Northwest 0.9x 0.77	x	10.68	x	50	.42	x	0.63	x	0.7	=	164.57	(81)
Northwest 0.9x 0.77	Īx	10.68	x	28	.07	x	0.63	X	0.7	=	91.61	(81)
Northwest 0.9x 0.77	x	10.68	x	1	1.2	x	0.63	X	0.7	=	46.34	(81)
Northwest 0.9x 0.77	x	10.68	x	9.	21	x	0.63	x	0.7	=	30.07	(81)
	_		•									_
Solar gains in watts, calcul	ated	for each mon	th	_		(83)m	n = Sum(74)m	(82)m	1		_	
` ′	3.85	370.88 478.1		502.29	472.78	388	.53 287.17	174.9	96.2	64.9		(83)
Total gains – internal and	solar	` 	_	<u>` </u>	watts			,	_		1	
(84)m= 415.53 483.35 566	5.72	674.42 762.2	1	767.41	725.89	647	.63 556.4	463.6	5 407.3	392.79		(84)
7. Mean internal tempera	ture	(heating seaso	on)									
Temperature during heati	ng p	eriods in the li	ving	g area fr	om Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation factor for gains	for I	iving area, h1,	m (see Tab	le 9a)							_
Jan Feb N	⁄lar	Apr Ma	у	Jun	Jul	Α	ug Sep	Ос	t Nov	Dec		
(86)m= 1 0.99 0.	98	0.92 0.77		0.57	0.42	0.4	0.78	0.97	0.99	1		(86)
Mean internal temperatur	e in I	iving area T1	(foll	ow step	s 3 to 7	in T	able 9c)				_	
(87)m= 19.84 20 20	.29	20.65 20.9		20.98	21	20.	99 20.92	20.5	3 20.15	19.82		(87)
											=	

remp		baatina r		t -f	ما الميدا	from To	hia O T	ha (°C)					
(88)m=	erature during	19.99	20.01	20.01	20.02	20.02	20.02	20.02	20.01	20	20		(88)
	l l		ļ	<u>!</u>	ļ	<u>!</u>		20.02	20.01	20	20		(00)
	ation factor for	`	1		- `	i	'				. 1		(20)
(89)m=	1 0.99	0.97	0.9	0.72	0.49	0.33	0.39	0.7	0.95	0.99	1		(89)
Mean	internal tempo	erature in	the rest	of dwell	ing T2 (f	ollow ste	ps 3 to	7 in Tab	e 9c)				
(90)m=	18.44 18.69	19.09	19.61	19.92	20.01	20.02	20.02	19.96	19.53	18.9	18.42		(90)
								1	fLA = Livin	g area ÷ (4	1) =	0.42	(91)
Mean	internal tempo	erature (fo	or the wh	ole dwe	elling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.04 19.24	19.6	20.05	20.33	20.42	20.43	20.43	20.37	19.97	19.43	19.01		(92)
Apply	adjustment to	the mear	n interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.04 19.24	19.6	20.05	20.33	20.42	20.43	20.43	20.37	19.97	19.43	19.01		(93)
8. Sp	ace heating re	quiremen	t			•							
	i to the mean i		•		ned at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation factor	T			I .								
	Jan Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation factor for	`	i	l 0.74	1 0 50	I .				0.00			(04)
(94)m=	1 0.99	0.97	0.9	0.74	0.52	0.37	0.43	0.73	0.95	0.99	1		(94)
	ul gains, hmGn 413.58 478.32	<u> </u>	4)m x (8 606.55	4)m 560.96	400.58	267.32	270.54	405.94	439.96	403.35	204 20		(95)
(95)m=						207.32	279.51	405.94	439.96	403.35	391.39		(93)
(96)m=	average ex	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	loss rate for m									7.1	4.2		(00)
	1070.53 1038.6		793.01	612	407.32	268.18	281.41	440.69	664.32	879.13	1062.4		(97)
` '	e heating requ												(- /
(98)m=	488.77 376.56	1	134.26	37.97		0.02	0	0	166.92	342.56	499.23		
,	1			01.01	0	1 0				072.00	499.23 		
			<u> </u>	07.07	1 0				<u> </u>	<u> </u>		2340.57	(98)
Snoo	o booting room		l k\N/b/mi	<u> </u>	1 0			l per year	<u> </u>	<u> </u>		2340.57	(98)
	e heating requ	rement ir		²/year	1		Tota	l per year	<u> </u>	<u> </u>		2340.57 35.95	(98)
9a. En	ergy requirem	rement ir		²/year	1		Tota	l per year	<u> </u>	<u> </u>			=
9a. En	ergy requiremore heating:	rement ir ents – Ind	lividual h	²/year eating s	ystems i	ncluding	Tota	l per year	<u> </u>	<u> </u>		35.95	(99)
9a. En Spac Fracti	ergy requirements e heating: ion of space he	rement in ents – Indeed from s	lividual h	I 2/year eating s y/supple	ystems i	ncluding system	Tota	ll per year	<u> </u>	<u> </u>		35.95	(99)
9a. En Spac Fracti	ergy requirements e heating: ion of space he ion of space he	rement in ents – Ind eat from s eat from n	lividual h econdar nain syst	l eating s y/supple tem(s)	ystems i	ncluding v system	Total micro-C	CHP) - (201) =	(kWh/year	<u> </u>		35.95	(99) (201) (202)
9a. En Spac Fracti	ergy requirements e heating: ion of space he	rement in ents – Ind eat from s eat from n	lividual h econdar nain syst	l eating s y/supple tem(s)	ystems i	ncluding v system	Total micro-C	ll per year	(kWh/year	<u> </u>		35.95	(99)
9a. En Spac Fracti Fracti Fracti	ergy requirements e heating: ion of space he ion of space he	rement in ents – Independents – Inde	ividual h econdar nain syst main sys	eating s y/supple em(s) stem 1	ystems i	ncluding v system	Total micro-C	CHP) - (201) =	(kWh/year	<u> </u>		35.95 0 1	(99) (201) (202)
9a. En Spac Fracti Fracti Fracti	ergy requirements e heating: ion of space he ion of space he ion of total hea	rement in ents – Indeed eat from seat from no ting from bace heat	ividual hecondar nain systemain syst	eating s y/supple tem(s) stem 1	ystems i	ncluding system	Total micro-C	CHP) - (201) =	(kWh/year	<u> </u>		35.95 0 1 1	(99) (201) (202) (204)
9a. En Spac Fracti Fracti Fracti	ergy requirements e heating: ion of space he ion of space he ion of total heatency of main s	rement in ents – Indeed from seat from nating from bace heat ary/suppl	ividual hecondar nain systemain syst	eating s y/supple tem(s) stem 1	ystems i	ncluding system	Total micro-C	CHP) - (201) =	(kWh/year	<u> </u>		35.95 0 1 1 93.4	(99) (201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Fracti Efficie	ergy requirements e heating: ion of space he ion of space he ion of total heatency of main seency of second	rement in ents – Indeed from seat from noting from pace hear ary/supplements.	econdar nain syst main syst ting syste ementar	eating s y/supple tem(s) stem 1 em 1 y heatin May	ystems i ementary g systen Jun	ncluding system	Total micro-C (202) = 1 (204) = (2	CHP) - (201) = 02) × [1 -	(kWh/year) = Sum(9	8) _{15,912} =	0 1 1 93.4	(99) (201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Fracti Efficie	ergy requirements e heating: ion of space he ion of space he ion of total heat ency of main sency of second	rement in ents – Indeed from seat from noting from pace heaf ary/supplement (comparement (compar	econdar nain syst main syst ting syste ementar	eating s y/supple tem(s) stem 1 em 1 y heatin May	ystems i ementary g systen Jun	ncluding system	Total micro-C (202) = 1 (204) = (2	CHP) - (201) = 02) × [1 -	(kWh/year) = Sum(9	8) _{15,912} =	0 1 1 93.4	(99) (201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Efficie Efficie	ergy requirements e heating: ion of space he ion of total heatency of main seency of second Jan Feb e heating requirements	rement in ents – Indeed from seat from noting from pace heat ary/suppl Mar rement (0) 294.31	econdar nain systemain systementar Apr calculate	eating s y/supple tem(s) stem 1 em 1 y heatin May d above	ystems i ementary g systen Jun	ncluding system	Total micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 -	(kWh/year) = Sum(9	8) _{15,912} =	0 1 1 93.4	(99) (201) (202) (204) (206) (208)
9a. En Spac Fracti Fracti Efficie Efficie	ergy requirements e heating: ion of space he ion of total heatency of main seency of second Jan February 1976.56	rement in ents – Independents – Independent from a cat	econdar nain systemain systementar Apr calculate	eating s y/supple tem(s) stem 1 em 1 y heatin May d above	ystems i ementary g systen Jun	ncluding system	Total micro-C (202) = 1 - (204) = (2	CHP) - (201) = 02) × [1 -	(kWh/year) = Sum(9	8) _{15,912} =	0 1 1 93.4	(99) (201) (202) (204) (206) (208) ear
9a. En Spac Fracti Fracti Efficie Efficie	ergy requirements on of space he don of space he don of total heatency of main security of second Jan February 1976.56 he = {[(98)m x (20)]	rement in ents – Independents – Inde	econdar nain systemating systementar Apr calculate 134.26	eating s y/supple tem(s) stem 1 em 1 y heatin May d above 37.97	ystems i ementary g system Jun) 0	ncluding y system n, % Jul 0	Total micro-C (202) = 1 - (204) = (2 Aug 0	CHP) - (201) = 02) × [1 -	(kWh/year (203)] = Oct 166.92	Nov 342.56	B) _{15,912} =	0 1 1 93.4	(99) (201) (202) (204) (206) (208) ear
9a. En Spac Fracti Fracti Efficie Efficie (211)m	ergy requirements on of space he don of space he don of total heatency of main security of second Jan February 1976.56 he = {[(98)m x (20)]	rement in ents – Independents – Inde	econdar nain systemating systementar Apr calculate 134.26 100 ÷ (20 143.74	eating s y/supple tem(s) stem 1 em 1 y heatin May d above 37.97	ystems i ementary g system Jun) 0	ncluding y system n, % Jul 0	Total micro-C (202) = 1 - (204) = (2 Aug 0	CHP) - (201) = 02) × [1 -	(kWh/year (203)] = Oct 166.92	Nov 342.56	B) _{15,912} =	0 1 1 93.4 0 kWh/y	(99) (201) (202) (204) (206) (208) ear
9a. En Spac Fracti Fracti Efficie Space (211)m	ergy requirements e heating: ion of space he ion of space he ion of total heatency of main service of second Jan Feb e heating requirements 1 = {[(98)m x (2) 523.31 403.11	rement in ents – Independents – Inde	econdar nain systemain systementar Apr calculate 134.26 100 ÷ (20 143.74	eating s y/supple tem(s) stem 1 em 1 y heatin May d above 37.97	ystems i ementary g system Jun) 0	ncluding y system n, % Jul 0	Total micro-C (202) = 1 - (204) = (2 Aug 0	CHP) - (201) = 02) × [1 -	(kWh/year (203)] = Oct 166.92	Nov 342.56	B) _{15,912} =	0 1 1 93.4 0 kWh/y	(99) (201) (202) (204) (206) (208) ear
9a. En Spac Fracti Fracti Efficie Space (211)m	ergy requirements on of space he ion of space he ion of total heatency of main security of second Jan February 376.56 1 = {[(98)m x (2523.31 403.13 4	rement in ents – Independents – Inde	econdar nain systemain systementar Apr calculate 134.26 100 ÷ (20 143.74	eating s y/supple tem(s) stem 1 em 1 y heatin May d above 37.97	ystems i ementary g system Jun) 0	ncluding y system n, % Jul 0	Tota micro-C (202) = 1 - (204) = (2 Aug 0 Tota	CHP)	(kWh/year (203)] = Oct 166.92 178.72 ar) =Sum(2	Nov 342.56 366.77 211) _{15,1012}	Dec 499.23	0 1 1 93.4 0 kWh/y	(99) (201) (202) (204) (206) (208) ear
9a. En Spac Fracti Fracti Efficie Efficie Space (211)m	ergy requirements on of space he ion of space he ion of total heatency of main security of second Jan February 376.56 1 = {[(98)m x (2523.31 403.13 4	rement in ents – Independents – Inde	econdar nain systemating systementar Apr calculate 134.26 100 ÷ (20 143.74	eating s y/supple tem(s) stem 1 em 1 y heatin May d above 37.97 06) 40.65	ystems i ementary g system Jun 0	ncluding r system n, % Jul 0	Tota micro-C (202) = 1 - (204) = (2 Aug 0 Tota	CHP)	(kWh/year (203)] = Oct 166.92 178.72 ar) =Sum(2	Nov 342.56 366.77 211) _{15,1012}	Dec 499.23	0 1 1 93.4 0 kWh/y	(99) (201) (202) (204) (206) (208) ear

3 80.3 .7 152.05	136.11 80.3	137.61 80.3	156.7 85.21	167.27 86.82	181.04 87.47	80.3	(216)
	169.5		85.21	86.82	87.47	80.3	
	169.5		85.21	86.82	87.47		(217)
.7 152.05		171.37					
.7 152.05		171.37					
	Tota		183.89	192.67	206.97		
	TOla	I = Sum(2	19a) ₁₁₂ =			2180.46	(219
			k۱	Wh/year	. '	kWh/yeaı	<i>-</i>
						2505.97	
						2180.46	
					30		(230
					45		(230
	sum	of (230a).	(230g) =			75	(231
						292.21	(232
ncluding mi	cro-CHF)					
<u> </u>					tor		
(211) x			0.2	16	=	541.29	(261
(215) x			0.5	19	=	0	(263
(219) x			0.2	16	=	470.98	(264
(261) + (262)	+ (263) + (264) =				1012.27	(265
(231) x			0.5	19	=	38.93	
(232) x			0.5	19	=	151.66	(268
		sum o	f (265)(2	271) =		1202.85	
	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (263) + (263)	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	Energy kWh/year kg CO2 (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (0.519)	sum of (230a)(230g) = 1	30 45 75 292.21

TER =

(273)

18.48

		User [Details:						
Assessor Name: Software Name:	Stroma FSAP 2012	Description	Stroma	re Ve	rsion:		Versio	on: 1.0.4.16	
Address :		Property	Address:	Flat 07					
1. Overall dwelling dime	ensions:								
_		Are	ea(m²)		Av. He	ight(m)	_	Volume(m ²	<u> </u>
Basement			71.92	(1a) x	2	2.5	(2a) =	179.81	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	(1n)	71.92	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	179.81	(5)
2. Ventilation rate:									
	main secon heating heatir		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0] - [0	х	40 =	0	(6a)
Number of open flues	0 + 0	+ [0	ī - Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ns			, <u> </u>	3	x	10 =	30	(7a)
Number of passive vents	;			F	0	x	10 =	0	(7b)
Number of flueless gas fi				L	0	X	40 =	0	(7c)
	ys, flues and fans = (6a)+(6b)+(7a)+(7h)+	(7c) =					nanges per ho	our
	peen carried out or is intended, pro			ontinue fr	30 rom (9) to (÷ (5) =	0.17	(8)
Number of storeys in the								0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame			•	ruction			0	(11)
deducting areas of openii	resent, use the value correspondir ngs); if equal user 0.35	g to the grea	ter wall area	а (апег					
If suspended wooden to	floor, enter 0.2 (unsealed) o	r 0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
<u>-</u>	s and doors draught strippe	d						0	(14)
Window infiltration			0.25 - [0.2 (8) + (10) ·	. ,		. (1E) -		0	(15)
Infiltration rate	q50, expressed in cubic me	stroe par h			, , ,		aroa	0	$= \frac{(16)}{(17)}$
•	ity value, then (18) = [(17) ÷ 20	•	•	•	ielie di e	ilvelope	alea	0.42	(17)
·	es if a pressurisation test has been				is being u	sed		0.42	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 - [0.075 x (′	19)] =			1	(20)
Infiltration rate incorporat	-		(21) = (18)	x (20) =				0.42	(21)
Infiltration rate modified f					T _	1	Ι_	1	
Jan Feb	Mar Apr May Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			1 , - 1		1 40	1 4 5	1 4 -	1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	J	
Wind Factor (22a)m = (2	2)m ÷ 4								

djusted infiltr	0.52	<u> </u>	0.46	0.45	0.4	` 	`´	`	0.45	0.47	0.40	1	
alculate effe		0.51 change i				0.4 se	0.39	0.42	0.45	0.47	0.49	İ	
If mechanica		-										0	(2
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(2
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(2
a) If balance	d mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0	j	(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	ЛV) (24b)m = (22	2b)m + (23b)	,	,	
lb)m= 0	0	0	0	0	0	0	0	0	0	0	0	ļ	(
c) If whole h				•									
if (22b)n		<u> </u>	<u> </u>	<u> </u>	ŕ	· ` `	ŕ		· ·	ŕ		1	,
lc)m= 0	0	0		0	0	0	0	0	0	0	0	İ	(
d) If natural if (22b)n					ve input erwise (2				0.5]			_	
d)m= 0.64	0.64	0.63	0.61	0.6	0.58	0.58	0.57	0.59	0.6	0.61	0.62		(
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.64	0.64	0.63	0.61	0.6	0.58	0.58	0.57	0.59	0.6	0.61	0.62		(
. Heat losse	s and he	eat loss r	paramete	er.							_		
EMENT	Gros		Openin		Net Ar	ea	U-valı	ue	AXU		k-value	a	ΑΧk
	area	(m ²)	, u		A ,r	n²	W/m2		(W/I	K)	kJ/m²·l	K	kJ/K
indows Type	e 1				11.8	x1	/[1/(1.4)+	0.04] =	15.64				(
in <mark>dows</mark> Type	2				3.09	x1	/[1/(1.4)+	0.04] =	4.1				(
ndows Type	: 3				3.09	x1	/[1/(1.4)+	0.04] =	4.1				(
alls Type1	68.6	66	17.9	3	50.68	x	0.18		9.12				(
alls Type2	17.7	76	0		17.76	3 X	0.18	= [3.2				(
tal area of e	lements	, m²			86.42	2							(
or windows and						ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
nclude the area bric heat los				is and pan	uuons		(26)(30)) + (32) =				36.16	5 (
eat capacity		•	O)						(30) + (32	2) + (32a)	(32e) =	13003.	
ermal mass		,	P = Cm ÷	- TFA) ir	n k.l/m²K				tive Value		(020)	250	(
r design assess	•	`		,			ecisely the				able 1f	230	(
n be used inste						,							
ermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<						5.48	(
etails of therma		are not kn	own (36) =	= 0.15 x (3	1)			(22)	(26) -				
ital fabric he		aloudoto -	l manthi	,					(36) =	25\m \: (5)		41.64	1 (
entilation hea		1			lun	1, ,1	۸۰۰۰	1	= 0.33 × (i	1	
Jan 38.05	Feb 37.72	Mar 37.4	Apr 35.91	May 35.63	Jun 34.32	Jul 34.32	Aug 34.08	Sep 34.82	Oct 35.63	Nov 36.19	36.79		(
		<u> </u>	00.31	00.00	1 04.02	07.02	J 54.00	<u> </u>	<u> </u>	ļ	1 30.79	i	(
eat transfer o	coefficie	nt, W/K						(39)m	= (37) + (37)	38)m			
9)m= 79.69	79.36	79.04	77.54	77.26	75.96	75.96	75.72	76.46	77.26	77.83	78.42	1	

Heat Ic	ss para	meter (F	ILP), W/	m²K					(40)m	= (39)m ÷	(4)			
40)m=	1.11	1.1	1.1	1.08	1.07	1.06	1.06	1.05	1.06	1.07	1.08	1.09		
Jumbe	ar of day	e in mor	nth (Tabl	(12 م					,	Average =	Sum(40) _{1.}	12 /12=	1.08	(40)
v uiiibe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
	<u> </u>		<u> </u>				<u> </u>	<u> </u>	l .		!			
4. Wa	ter heat	ing ener	gy requi	rement:								kWh/yea	r:	
\eeum	ed occu	nancy I	NI.									00		(40)
if TF), N = 1	+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		29		(42)
Reduce	the annua	l average	ater usag hot water	usage by	5% if the d	welling is	designed t			se target o		3.63		(43)
ot more			person per						_		T			
lot wate	Jan er usage in	Feb	Mar day for ea	Apr	May Vd.m = fac	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
44)m=	97.5	93.95	90.41	86.86	83.31	79.77	79.77	83.31	86.86	90.41	93.95	97.5		
,	07.0	00.00	00.11	00.00	00.01	70.77	10.77				m(44) ₁₁₂ =		1063.6	(44
nergy o	content of	hot water	used - cal	culated mo	onthly $= 4.$	190 x Vd,r	n x nm x E	Tm / 3600	kWh/mon	oth (see Ta	ables 1b, 1	c, 1d)		_
45)m=	144.58	126.45	130.49	113.76	109.16	94.2	87.29	100.16	101.36	118.12	128.94	140.02		_
instan	aneous w	ater heatii	ng at point	of use (no	hot water	storage)	enter 0 in	hoxes (46		Total = Su	m(45) ₁₁₂ =		1394.54	(45
46)m=		18.97	19.57	17.06	16.37	14.13	13.09	15.02	15.2	17.72	19.34	21		(46
	storage		10.01	11.00	10.07	11.10	.0.00	10.02	10.2	2	10.01			
Storag	e volum	e (litres)	includin	g any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47
	•	•	nd no ta		•			` '	, ,	(0)				
	/ise if no storage		hot wate	er (this in	iciudes II	nstantar	eous co	mbi boil	ers) ente	er 'O' in (47)			
	•		eclared lo	oss facto	or is knov	wn (kWł	n/day):					0		(48
empe	rature fa	actor fro	m Table	2b			• ,					0		(49
nergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(50
,			eclared o	-										
		_	factor from the factor from th		e z (KVVI	i/iitie/ua	iy)					0		(51
	e factor	_										0		(52
empe	rature fa	actor fro	m Table	2b								0		(53
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
Enter	(50) or (54) in (5	55)									0		(55
Vater	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56
cylinde	er contains	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 Appendix	Н	
57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57
rimar	y circuit	loss (an	nual) fro	m Table	3							0		(58
	-		culated f			•	. ,	, ,						
(mod			om Tabl				i	<u> </u>						
59)m=	0	0	0	0	0	0	l 0	0	0	0	0	0		(59

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$ (61)m= 49.68 43.24 46.07 42.84 42.46 39.34 40.65 42.46 42.84 46.07 46.33 49.68 (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= 194.27 169.7 176.56 156.6 151.62 133.53 127.94 142.62 144.19 164.19 175.27 189.71 (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 0 0 0 0 0 0 (63) Output from water heater (64)m= 194.27 169.7 176.56 156.6 151.62 133.53 127.94 142.62 144.19 164.19 175.27 189.71 Output from water heater (annual) 112 1926.19 Heat gains from water heating, kWh/month 0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 194.27
(62)m= 194.27 169.7 176.56 156.6 151.62 133.53 127.94 142.62 144.19 164.19 175.27 189.71 (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 0 0 0 0 0 0 0
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 0 0 0 0 0 0 0
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Output from water heater (64)m= 194.27 169.7 176.56 156.6 151.62 133.53 127.94 142.62 144.19 164.19 175.27 189.71 Output from water heater (annual) ₁₁₂ 1926.19 (64)
(64)m= 194.27 169.7 176.56 156.6 151.62 133.53 127.94 142.62 144.19 164.19 175.27 189.71 Output from water heater (annual) ₁₁₂ 1926.19 (64)
Output from water heater (annual) ₁₁₂ 1926.19 (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]
(05)
(65)m= 60.49 52.86 54.91 48.54 46.91 41.15 39.19 43.92 44.41 50.79 54.46 58.98 (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= 114.6 114.6 114.6 114.6 114.6 114.6 114.6 114.6 (66)
Ligh <mark>ting gains (calculated in Append</mark> ix L, equation L9 or L9a), <mark>also see T</mark> able 5
(67)m= 17.99 15.97 12.99 9.84 7.35 6.21 6.71 8.72 11.7 14.86 17.34 18.49 (67)
App <mark>liance</mark> s gains (ca <mark>lculat</mark> ed in Appendix L, equation L13 or L13a), also see Table 5
(68)m= 201.75 203.84 198.56 187.33 173.16 159.83 150.93 148.84 154.11 165.34 179.52 192.84 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(69)m= 34.46 34.46 34.46 34.46 34.46 34.46 34.46 34.46 34.46 (69)
Pumps and fans gains (Table 5a)
(70)m= 3 3 3 3 3 3 3 3 3 3 3 (70)
Losses e.g. evaporation (negative values) (Table 5)
(71)m= -91.68 -91.68 -91.68 -91.68 -91.68 -91.68 -91.68 -91.68 -91.68 -91.68 -91.68 (71)
Water heating gains (Table 5)
(72)m= 81.31 78.66 73.8 67.41 63.05 57.16 52.67 59.03 61.68 68.27 75.63 79.27 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$
(73)m= 361.42 358.85 345.73 324.96 303.94 283.58 270.68 276.96 287.87 308.85 332.87 350.98 (73)
6. Solar gains:
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Orientation: Access Factor Area Flux g_ FF Gains
Table 6d m² Table 6a Table 6b Table 6c (W)
Northeast 0.9x 0.77 x 3.09 x 11.28 x 0.63 x 0.7 = 10.65 (75)
Northeast 0.9x 0.77 x 3.09 x 22.97 x 0.63 x 0.7 = 21.69 (75)
Northeast 0.9x 0.77 x 3.09 x 41.38 x 0.63 x 0.7 = 39.08 (75)
Northeast 0.9x 0.77 x 3.09 x 67.96 x 0.63 x 0.7 = 64.17 (75)
Northeast 0.9x 0.77 x 3.09 x 91.35 x 0.63 x 0.77 = 86.26 (75)

Northeast 0.9x 0.77	\neg ,	2.00	1 .	07.00	1 .	0.00	ا پ ٦	0.7		04.00	(75)
North and a second	X x	3.09	x x	97.38] x] x	0.63		0.7		91.96	(75)
Northoastas	=	3.09	1	91.1]]	0.63	╡	0.7		86.03	(75)
North and an	= ×	3.09] X] v	72.63] X] v	0.63	_	0.7		68.58	╡` `
Northeast	×	3.09] X]	50.42] X] .,	0.63	_	0.7	=	47.61	(75)
Nedless	= ×	3.09] X]	28.07	X 1	0.63		0.7	=	26.51	(75)
No division to a second	×	3.09	X	14.2] X]	0.63	X	0.7	=	13.41	(75)
Northeast 0.9x 0.77	×	3.09] X]	9.21	X	0.63	_	0.7	=	8.7	(75)
Southeast 0.9x 0.77	×	11.8	X	36.79	X	0.63	_	0.7	=	132.69	(77)
Southeast 0.9x 0.77	×	11.8	X	62.67	X I	0.63	_	0.7		226.02	(77)
Southeast 0.9x 0.77 Southeast 0.9x 0.77	×	11.8	X]	85.75	J X I	0.63	_	0.7	=	309.24	(77)
0	×	11.8] X]	106.25	X	0.63	_	0.7	=	383.17	= (77)
Southeast 0.9x 0.77	×	11.8	J X 1	119.01	X	0.63	_	0.7	=	429.18	(77)
Southeast 0.9x 0.77	×	11.8	X	118.15	X	0.63		0.7	=	426.08	(77)
Southeast 0.9x 0.77	X	11.8	X	113.91	X	0.63	x [0.7	=	410.78	(77)
Southeast 0.9x 0.77	X	11.8	X	104.39	X	0.63	x [0.7	•	376.46	(77)
Southeast 0.9x 0.77	X	11.8	X	92.85	X	0.63	× [0.7	=	334.85	(77)
Southeast 0.9x 0.77	×	11.8	X	69.27	X	0.63	×	0.7	= _	249.8	(77)
Southeast 0.9x 0.77	×	11.8	X	44.07	Х	0.63	X	0.7	-	158.93	(77)
Southeast 0.9x 0.77	×	11.8	X	31.49	x	0.63	X	0.7		113.55	(77)
Southwest _{0.9x} 0.77	X	3.09	X	36.79		0.63	Х	0.7	=	34.75	(79)
Southwest _{0.9x} 0.77	X	3.09	X	62.67		0.63	x	0.7	=	59.19	(79)
Southwest _{0.9x} 0.77	X	3.09	Х	85.75		0.63	X	0.7	=	80.98	(79)
Southwest _{0.9x} 0.77	X	3.09	Х	106.25		0.63	X	0.7	=	100.34	(79)
Southwest _{0.9x} 0.77	X	3.09	X	119.01		0.63	X	0.7	=	112.39	(79)
Southwest _{0.9x} 0.77	X	3.09	X	118.15		0.63	x	0.7	=	111.57	(79)
Southwest _{0.9x} 0.77	X	3.09	X	113.91]	0.63	x	0.7	=	107.57	(79)
Southwest _{0.9x} 0.77	X	3.09	X	104.39]	0.63	x	0.7	=	98.58	(79)
Southwest _{0.9x} 0.77	X	3.09	X	92.85]	0.63	x [0.7	=	87.68	(79)
Southwest _{0.9x} 0.77	X	3.09	X	69.27]	0.63	x	0.7	=	65.41	(79)
Southwest _{0.9x} 0.77	X	3.09	X	44.07]	0.63	x [0.7	=	41.62	(79)
Southwest _{0.9x} 0.77	X	3.09	X	31.49]	0.63	X	0.7	=	29.74	(79)
Solar gains in watts, calc			_		<u>`</u>	n = Sum(74)m .					
` '	429.3	547.68 627.8		629.62 604.38	543	.62 470.14	341.71	213.95	151.99		(83)
Total gains – internal and		```	_	· <i>'</i>				T - 10 00			(0.4)
(84)m= 539.51 665.74 7	775.03	872.64 931.7	7	913.19 875.07	820	.58 758.02	650.56	546.82	502.97		(84)
7. Mean internal temper	rature	(heating seaso	on)								_
Temperature during hea	ating p	eriods in the li	ving	area from Tab	ole 9	, Th1 (°C)				21	(85)
Utilisation factor for gain		iving area, h1	m (see Table 9a)							
Jan Feb	Mar	Apr Ma	у	Jun Jul		ug Sep	Oct	Nov	Dec		
(86)m= 0.99 0.98	0.95	0.87 0.72		0.52 0.38	0.4	0.66	0.92	0.99	1		(86)
Mean internal temperat	ure in I	iving area T1	(foll	ow steps 3 to 7	7 in T	able 9c)					
(87)m= 19.95 20.18	20.46	20.76 20.93	3	20.99 21	2	1 20.97	20.72	20.28	19.92		(87)

r gains, hr 8	m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 dividual h secondar main system of main system	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71 2/year leating s ry/supple tem(s) stem 1 em 1 ry heating May d above 27.71 06) 29.67	0.48 438.24 able 8 14.6 Lm , W = 442.93 Wh/moni 0 ystems i	291.54 th = 0.02 0	305.82 24 x [(97 0 Total micro-C (202) = 1 - (204) = (2 Aug 0 Total	482.31)m – (95 0 I per year	737.36)m] x (4 118.22 (kWh/year (203)] = Oct 118.22 126.57 ar) =Sum(2	315.15 Nov 315.15 337.42 211) _{15,1012}	500.03 535.37	2128.93 29.6 0 1 1 93.4 0 kWh/y	(94) (95) (96) (97) (98) (99) (201 (204 (206 (208 ear (211
r gains, hr 8	m: 0.84 0.84 734.85 mperature 8.9 nal temper 7 874.68 for each nal 100.68 n kWh/m² dividual hasecondar main system main system main system entare Apr (calculate 100.68 100 ÷ (20 107.79 nry), kWh/ 08)	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71 2/year leating s ry/supple tem(s) stem 1 em 1 ry heating May ed above 27.71 29.67	0.48 438.24 able 8 14.6 Lm , W = 442.93 Wh/mon 0 ystems i ementary g system Jun 0	291.02 16.6 =[(39)m; 291.54 th = 0.02 0 ncluding r system 1, % Jul 0	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Total micro-C (202) = 1 - (204) = (2 Aug 0 Total	14.1 - (96)m 482.31)m - (95 0 I per year 0 CHP) - (201) = 02) × [1 - (578.46 10.6] 737.36)m] x (4 118.22 (kWh/year 118.22 126.57 ar) = Sum(2	535.06 7.1 972.77 1)m 315.15 Sum(9) Nov 315.15 337.42	499.55 4.2 1171.64 500.03 8) _{15,912} = Dec 500.03	0 1 1 93.4 0 kWh/y	(95) (96) (97) (98) (99) (201 (202 (204 (206 (208 ear
r gains, hr 8	m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 dividual h secondar main system of main system	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71 2/year leating s ry/supple tem(s) stem 1 em 1 ry heating May d above 27.71 06) 29.67	0.48 438.24 able 8 14.6 Lm , W = 442.93 Wh/mon 0 ystems i	291.02 16.6 =[(39)m; 291.54 th = 0.02 0 ncluding r system 1, % Jul 0	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Total micro-C (202) = 1 - (204) = (2 Aug 0	465.79 14.1 — (96)m 482.31)m — (95 0 I per year CHP) CHP Sep 0	578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15 Sum(9) Nov 315.15	499.55 4.2 1171.64 500.03 8) _{15,912} =	0 1 1 93.4 0 kWh/y	(95) (96) (97) (98) (99) (201 (202 (204 (206 (208 ear
m, W = (9) 11 726.28 11 726.28 11 726.28 11 726.28 11 726.28 10 6.5 10 1052.37	m: 0.84 0.84 734.85 mperature 8.9 mail temper 7 874.68 for each n 100.68 dividual h secondar main system a main system blementar Apr calculate 100.68 100.68	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71 2/year leating s ry/supple tem(s) stem 1 ry heating May d above 27.71 06) 29.67	0.48 438.24 able 8 14.6 Lm , W = 442.93 Wh/mon 0 ystems i	291.02 16.6 =[(39)m; 291.54 th = 0.02 0 ncluding r system 1, % Jul 0	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Total micro-C (202) = 1 - (204) = (2 Aug 0	465.79 14.1 — (96)m 482.31)m — (95 0 I per year CHP) CHP Sep 0	578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15 Sum(9) Nov 315.15	499.55 4.2 1171.64 500.03 8) _{15,912} =	0 1 1 93.4 0 kWh/y	(95) (96) (97) (98) (99) (201 (202 (204 (206 (208 ear
or gains, hr 8 0.94 cm, W = (9 11 726.28 external ter 6.5 mean inter 47 1052.37 uirement inter 27 242.61 heat from seating from space heat dary/supp b Mar uirement (27 242.61 (204)] } x	m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 n kWh/m² dividual h secondar main system main	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71 2/year leating s ry/supple tem(s) stem 1 em 1 ry heating d above 27.71 06)	0.48 438.24 able 8 14.6 Lm , W = 442.93 Wh/mon 0 ystems i	291.02 16.6 =[(39)m; 291.54 th = 0.02 0 ncluding r system 1, % Jul 0	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Total micro-C (202) = 1 - (204) = (2 Aug 0	465.79 14.1 — (96)m 482.31)m — (95 0 I per year CHP) CHP Sep 0	578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15 Sum(9) Nov 315.15	499.55 4.2 1171.64 500.03 8) _{15,912} =	0 1 1 93.4 0 kWh/y	(95) (96) (97) (98) (99) (201 (202 (204 (206 (208 ear
or gains, hr 8 0.94 cm, W = (9 11 726.28 external ter 6.5 mean inter 47 1052.37 uirement inter 27 242.61 heat from seating from space heat dary/supp b Mar uirement (27 242.61 (204)] } x	m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 n kWh/m² dividual h secondar main system main	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71 2/year leating s ry/supple tem(s) stem 1 em 1 ry heating d above 27.71 06)	0.48 438.24 able 8 14.6 Lm , W = 442.93 Wh/mon 0 ystems i	291.02 16.6 =[(39)m; 291.54 th = 0.02 0 ncluding r system 1, % Jul 0	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Total micro-C (202) = 1 - (204) = (2 Aug 0	14.1 - (96)m 482.31)m - (95 0 I per year CHP) - (201) = 02) × [1 - (578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15 Sum(9)	499.55 4.2 1171.64 500.03 8) ₁₅₉₁₂ =	29.6 0 1 1 93.4 0	(95) (96) (97) (98) (99) (201 (202 (204 (206 (208 ear
or gains, hr 8 0.94 om, W = (9) 11 726.28 12 726.28 13 12 1052.37 105	m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 dividual h secondar main system of main system of system of temper calculate 100.68	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, kl 27.71 2/year eating s extem(s) stem 1 em 1 ry heating May ed above 27.71	0.48 438.24 able 8 14.6 Lm W = 442.93 Wh/mon 0 ystems i	291.02 16.6 =[(39)m; 291.54 th = 0.02 0 ncluding y system	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Total micro-C (202) = 1 - (204) = (2	465.79 14.1 — (96)m 482.31)m — (95 0 I per year (1) — (201) = 02) × [1 — (1)	578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15 Sum(9)	499.55 4.2 1171.64 500.03 8) _{15,912} =	29.6 0 1 1 93.4 0	(95) (96) (97) (98) (99) (201 (202 (204 (206 (208 ear
or gains, hr 8 0.94 om, W = (9 11 726.28 external ter 6.5 mean inter 27 1052.37 uirement inter 27 242.61 uirement inter eat from seat from seat from seat from seat from seat from seat indery/supp b Mar uirement (m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 dividual h secondar main system ating system blementar Apr	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71 2/year eating s extra 1 em 1 ry heating May ed above	0.48 438.24 able 8 14.6 Lm W = 442.93 Wh/mon 0 ystems i	291.02 16.6 =[(39)m; 291.54 th = 0.02 0 ncluding y system	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Total micro-C (202) = 1 - (204) = (2	465.79 14.1 — (96)m 482.31)m — (95 0 I per year (1) — (201) = 02) × [1 — (1)	578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15 Sum(9)	499.55 4.2 1171.64 500.03 8) _{15,912} =	29.6 0 1 1 93.4 0	(95) (96) (97) (98) (99) (201 (202 (204 (206 (208
or gains, hr 8 0.94 Im , W = (9) 11 726.28 External ter 6.5 Mean inter 47 1052.37 uirement fr 27 242.61 uirement inter heat from inter eating from space head hadary/supp	m: 0.84 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 n kWh/m² dividual h secondar main system main system ating system blementar Apr	0.68 4)m 632.42 e from 7 11.7 erature, 669.66 month, kl 27.71 2/year leating s ry/supple tem(s) stem 1 em 1 ry heating May	0.48 438.24 able 8 14.6 Lm , W = 442.93 Wh/moni 0 ystems i	291.02 16.6 =[(39)m: 291.54 th = 0.02 0	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Total micro-C (202) = 1 - (204) = (2	465.79 14.1 — (96)m 482.31)m — (95 0 I per year (201) = 02) × [1 — (201)	578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15 = Sum(9	499.55 4.2 1171.64 500.03 8) _{15,912} =	29.6 0 1 1 93.4 0	(95) (96) (97) (98) (99) (201 (202 (204 (206 (208
or gains, hr 8 0.94 cm, W = (9 11 726.28 external ter 6.5 mean inter 47 1052.37 uirement f 27 242.61 uirement inter heat from seating from space head	m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 dividual h secondar main system main system ating system	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, kl 27.71 2/year eating s extem 1 em 1 ry heating	0.48 438.24 able 8 14.6 Lm, W = 442.93 Wh/mon 0	291.02 16.6 =[(39)m: 291.54 th = 0.02 0	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Total micro-C (202) = 1 - (204) = (2	465.79 14.1 — (96)m 482.31)m — (95 0 I per year (201) = 02) × [1 — (201)	578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15 = Sum(9	499.55 4.2 1171.64 500.03 8) _{15,912} =	29.6 0 1 1 93.4 0	(95) (96) (97) (98) (99) (201 (202 (204 (206 (208
or gains, hr 8 0.94 cm, W = (9 11 726.28 external ter 6.5 mean inter 47 1052.37 uirement f 27 242.61 uirement inter heat from seating from space hear	m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 dividual h secondar main system main system	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71 2/year eating s y/supple tem(s) stem 1 em 1	0.48 438.24 able 8 14.6 Lm , W = 442.93 Wh/mon 0	291.02 16.6 =[(39)m: 291.54 th = 0.02 0	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Tota micro-C	465.79 14.1 — (96)m 482.31)m — (95 0 I per year	578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15	499.55 4.2 1171.64 500.03	29.6 0 1 1 93.4	(95) (96) (97) (98) (99) (201 (202 (204 (206
or gains, hr or	m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 n kWh/m² dividual h secondar main system main system	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, kl 27.71 2/year eating s ry/supple tem(s) stem 1	0.48 438.24 able 8 14.6 Lm, W = 442.93 Wh/mon	291.02 16.6 =[(39)m; 291.54 th = 0.02 0	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Tota micro-C	465.79 14.1 — (96)m 482.31)m — (95 0 I per year	578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15	499.55 4.2 1171.64 500.03	29.6 0 1	(95) (96) (97) (98) (99) (201 (202 (204
or gains, hr 8 0.94 om, W = (9) 11 726.28 external ter 6.5 mean inter 47 1052.37 uirement fr 27 242.61 meat from series from ser	m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 n kWh/m² dividual h secondar main syst	0.68 4)m 632.42 e from 7 11.7 erature, 669.66 month, kl 27.71 2/year leating s ry/supple tem(s)	0.48 438.24 able 8 14.6 Lm, W = 442.93 Wh/mon	291.02 16.6 =[(39)m; 291.54 th = 0.02 0	304.89 16.4 x [(93)m 305.82 24 x [(97 0 Tota micro-C	465.79 14.1 — (96)m 482.31)m — (95 0 I per year	578.46 10.6] 737.36)m] x (4 118.22 (kWh/year	535.06 7.1 972.77 1)m 315.15	499.55 4.2 1171.64 500.03	29.6 0 1	(95) (96) (97) (98) (99) (201
or gains, hr 8	m: 0.84 0.84 734.85 mperature 8.9 mal temper 7 874.68 for each n 100.68 n kWh/m² dividual h	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, kl 27.71 2/year eating s	0.48 438.24 able 8 14.6 Lm, W = 442.93 Wh/mon	291.02 16.6 =[(39)m; 291.54 th = 0.02 0	304.89 16.4 x [(93)m 305.82 24 x [(97) 0 Total	465.79 14.1 — (96)m 482.31)m — (95 0 I per year (578.46 10.6] 737.36)m] x (4 118.22	535.06 7.1 972.77 1)m 315.15	499.55 4.2 1171.64 500.03	29.6	(95) (96) (97) (98) (99)
m, W = (9 11 726.28 external ter 6.5 mean inter .47 1052.37 uirement f 27 242.61 uirement i	m:	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71 2/year leating s	0.48 438.24 able 8 14.6 Lm, W = 442.93 Wh/mon	291.02 16.6 =[(39)m : 291.54 th = 0.02 0	304.89 16.4 x [(93)m 305.82 24 x [(97) 0 Total	465.79 14.1 — (96)m 482.31)m — (95 0 I per year	578.46 10.6] 737.36)m] x (4 118.22	535.06 7.1 972.77 1)m 315.15	499.55 4.2 1171.64 500.03	29.6	(95) (96) (97) (98)
or gains, hr 0.94 om , W = (9) 11	0.84 0.84 0.84 0.84 0.84 734.85 mperature 8.9 mal temperature 7 874.68 for each n 100.68	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71	0.48 438.24 able 8 14.6 Lm , W = 442.93 Wh/mon	291.02 16.6 =[(39)m : 291.54 th = 0.02	304.89 16.4 x [(93)m 305.82 24 x [(97 0	465.79 14.1 — (96)m 482.31)m — (95 0 I per year	578.46 10.6] 737.36)m] x (4 118.22	535.06 7.1 972.77 1)m 315.15	499.55 4.2 1171.64 500.03		(95) (96) (97)
or gains, hr 0.94 om , W = (9) 11	0.84 0.84 0.84 0.84 0.84 734.85 mperature 8.9 mal temperature 7 874.68 for each n 100.68	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k 27.71	0.48 438.24 able 8 14.6 Lm , W = 442.93 Wh/mon	291.02 16.6 =[(39)m : 291.54 th = 0.02	304.89 16.4 x [(93)m 305.82 24 x [(97 0	465.79 14.1 — (96)m 482.31)m — (95 0 I per year	578.46 10.6] 737.36)m] x (4 118.22	535.06 7.1 972.77 1)m 315.15	499.55 4.2 1171.64 500.03		(95) (96) (97)
or gains, hr 8 0.94 om , W = (9 11 726.28 external ter 6.5 mean inter 47 1052.37 uirement f 27 242.61	0.84 0.84 0.84 0.84 734.85 perature 8.9 nal temper 7 874.68 for each nall 100.68	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k	0.48 438.24 able 8 14.6 Lm, W = 442.93	291.02 16.6 =[(39)m : 291.54 th = 0.02	304.89 16.4 x [(93)m 305.82 24 x [(97 0	465.79 14.1 — (96)m 482.31)m — (95 0	578.46 10.6] 737.36)m] x (4 118.22	535.06 7.1 972.77 1)m 315.15	499.55 4.2 1171.64 500.03		(95) (96) (97)
or gains, hr 8 0.94 11 726.28 12 726.28 14 726.28 15 726.28 16 75 16 75 16 75 16 75 17 76 76 17 76 76 76 17 76 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 76 17 76 76 76 17 76 76 76 17 76 76 76 17 76 76 76 17 76 76 76 76 17 76 76 76 76 17 76 76 76 76 17 76 76 76 76 76 76 76 76 76 76 76 76 76	m: 0.84 04)m x (8-734.85 mperature 8.9 mal temper 87 874.68 for each n	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k	0.48 438.24 able 8 14.6 Lm, W = 442.93	291.02 16.6 =[(39)m : 291.54 th = 0.02	304.89 16.4 x [(93)m 305.82 24 x [(97 0	465.79 14.1 — (96)m 482.31)m — (95 0	578.46 10.6] 737.36)m] x (4 118.22	535.06 7.1 972.77 1)m 315.15	499.55 4.2 1171.64 500.03	2128.93	(95) (96) (97)
or gains, hr 8 0.94 11 726.28 12 726.28 14 726.28 15 726.28 16 75 16 75 16 75 16 75 17 76 76 17 76 76 76 17 76 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 76 17 76 76 76 17 76 76 76 17 76 76 76 17 76 76 76 17 76 76 76 76 17 76 76 76 76 17 76 76 76 76 17 76 76 76 76 76 76 76 76 76 76 76 76 76	m: 0.84 04)m x (8-734.85 mperature 8.9 mal temper 87 874.68 for each n	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66 month, k	0.48 438.24 able 8 14.6 Lm, W = 442.93	291.02 16.6 =[(39)m : 291.54 th = 0.02	304.89 16.4 x [(93)m 305.82 24 x [(97	14.1 — (96)m 482.31)m — (95	578.46 10.6] 737.36)m] x (4	535.06 7.1 972.77 1)m	499.55 4.2 1171.64		(95) (96)
or gains, hr 8 0.94 11 726.28 12 726.28 14 726.28 15 726.28 16 75 16 75 16 75 16 75 17 76 76 17 76 76 76 17 76 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 17 76 76 76 17 76 76 76 17 76 76 76 17 76 76 76 17 76 76 76 17 76 76 76 76 17 76 76 76 76 17 76 76 76 76 17 76 76 76 76 76 76 76 76 76 76 76 76 76	m: 0.84 04)m x (8-734.85 mperature 8.9 mal temper 87 874.68 for each n	0.68 4)m 632.42 e from Ta 11.7 erature, 669.66	0.48 438.24 able 8 14.6 Lm , W =	291.02 16.6 =[(39)m : 291.54	304.89 16.4 x [(93)m 305.82	465.79 14.1 – (96)m 482.31	578.46 10.6]	535.06 7.1 972.77 1)m	499.55		(95) (96)
or gains, hr 8 0.94 6m, W = (9 11 726.28 external ter 6.5 mean inter	0.84 0.84 0.84 0.84 0.84 0.85 734.85 mperature 8.9	0.68 4)m 632.42 e from Ta 11.7 erature,	0.48 438.24 able 8 14.6 Lm W =	291.02 16.6 =[(39)m :	304.89 16.4 x [(93)m	465.79 14.1 – (96)m	578.46	535.06	499.55		(95) (96)
or gains, hr 8 0.94 m , W = (9 11 726.28 external ter 6.5	0.84 0.84 94)m x (8 734.85 mperature 8.9	0.68 4)m 632.42 e from Ta	0.48 438.24 able 8	291.02	304.89	465.79	578.46	535.06	499.55		(95)
m, W = (9 11 726.28	0.84 0.84 04)m x (8- 734.85 mperature	0.68 4)m 632.42 e from Ta	0.48 438.24 able 8	291.02	304.89	465.79	578.46	535.06	499.55		(95)
or gains, hr 8 0.94 m , W = (9 11 726.28	0.84 0.84 0.84 0.84 0.85	0.68 4)m 632.42	0.48								, ,
or gains, hr 8 0.94 om , W = (9	0.84 94)m x (8	0.68 4)m	0.48								, ,
or gains, hr	m: 0.84	0.68	-	0.33	0.37	0.61	0.89	0.98	0.99		(94)
r gains, hr	m:		-	0.33	_0.37_	0.61	0.89	0.98	0.99		(94)
	<u> </u>	I Way	1 0011	•							
	1 711			Jui	Aug	Sep	OCI	INOV	Dec		
or for gains b Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
internal te	•		ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
equiremer	nt										
6 19.81	20.18	20.37	20.43	20.44	20.44	20.41	20.14	19.6	19.14		(93)
o the mea	n interna	l temper	ature fro	m Table	4e, whe	ere appro	priate				
6 19.81	20.18	20.37	20.43	20.44	20.44	20.41	20.14	19.6	19.14		(92)
perature (f	or the wh	nole dwe	elling) = fl	LA × T1	+ (1 – fL	.A) × T2					
						f	LA = Livin	g area ÷ (4	4) =	0.42	(91)
19.35	19.76	19.96	20.03	20.04	20.04	20.01	19.73	19.11	18.58		(90)
perature ir	the rest	of dwell	ing T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
8 0.94	0.84	0.66	0.45	0.3	0.34	0.58	0.88	0.98	0.99		(89)
r gains for	rest of d	welling,	h2,m (se	ee Table	9a)						
20	20.02	20.02	20.04	20.04	20.04	20.03	20.02	20.02	20.01		(88)
0 0 0 0 1 1 9	0 20 or gains for 98 0.94 nperature in 94 19.35 nperature (f	20 20.02 or gains for rest of do 08 0.94 0.84 nperature in the rest 94 19.35 19.76 nperature (for the whale 19.81 20.18	20 20.02 20.	20 20.02 20.02 20.04 20.04 20.02 20.04 20.02 20.04 20.02 20.04 20.04 20.05 20.05 20.04 20.05 20.	20 20.02 20.02 20.04 20.04 20.04 or gains for rest of dwelling, h2,m (see Table 0.84 0.84 0.66 0.45 0.3 apperature in the rest of dwelling T2 (follow stee 19.35 19.76 19.96 20.03 20.04 apperature (for the whole dwelling) = fLA × T1 19.81 20.18 20.37 20.43 20.44	or gains for rest of dwelling, h2,m (see Table 9a) 98	20 20.02 20.02 20.04 20.04 20.04 20.03 or gains for rest of dwelling, h2,m (see Table 9a) 80 0.94 0.84 0.66 0.45 0.3 0.34 0.58 or perature in the rest of dwelling T2 (follow steps 3 to 7 in Table 19.35 19.76 19.96 20.03 20.04 20.04 20.01 or perature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 19.81 20.18 20.37 20.43 20.44 20.44 20.41	or gains for rest of dwelling, h2,m (see Table 9a) 98 0.94 0.84 0.66 0.45 0.3 0.34 0.58 0.88 1098 0.94 0.84 0.66 0.45 0.3 0.34 0.58 0.88 1099 0.84 0.84 0.84 0.88 0.88 1099 0.84 0.84 0.84 0.88 0.88 1099 0.84 0.84 0.84 0.84 0.88 1099 0.94 0.94 0.94 0.94 0.94 0.94 1090 0.94 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.94 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98 0.98 1090 0.94 0.94 0.98	or gains for rest of dwelling, h2,m (see Table 9a) 98 0.94 0.84 0.66 0.45 0.3 0.34 0.58 0.88 0.98 1098 0.94 0.84 0.66 0.45 0.3 0.34 0.58 0.88 0.98 1099 0.94 19.35 19.76 19.96 20.03 20.04 20.04 20.01 19.73 19.11 1109 19.35 19.76 19.96 20.03 20.04 20.04 20.01 19.73 19.11 1110 19.81 19.81 19.81 20.18 20.37 20.43 20.44 20.44 20.41 20.14 19.6	or gains for rest of dwelling, h2,m (see Table 9a) 98 0.94 0.84 0.66 0.45 0.3 0.34 0.58 0.88 0.98 0.99 99 19.35 19.76 19.96 20.03 20.04 20.04 20.01 19.73 19.11 18.58 90 19.35 19.76 19.96 20.03 20.04 20.04 20.01 19.73 19.11 18.58 91 19.81 19.81 20.18 20.37 20.43 20.44 20.44 20.41 20.14 19.6 19.14	20 20.02 20.02 20.04 20.04 20.04 20.03 20.02 20.02 20.01 or gains for rest of dwelling, h2,m (see Table 9a) or gains for rest of dwelling, h2,m (see Table 9a) or perature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 94 19.35 19.76 19.96 20.03 20.04 20.04 20.01 19.73 19.11 18.58 fLA = Living area + (4) = 0.42 or perature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 46 19.81 20.18 20.37 20.43 20.44 20.44 20.41 20.14 19.6 19.14

Water heating												
Output from water he	ater (calc	ulated a	bove) 151.62	133.53	127.94	142.62	144.19	164.19	175.27	189.71	1	
Efficiency of water he	l .	130.0	151.02	133.33	127.94	142.02	144.19	104.19	173.27	109.71	80.3	(216)
(217)m= 87.26 86.77	85.85	83.97	81.71	80.3	80.3	80.3	80.3	84.24	86.51	87.38	00.5	(217)
Fuel for water heating		ļ									J	` ,
$(219)m = (64)m \times 10^{-1}$	00 ÷ (217))m									1	
(219)m= 222.64 195.58	205.66	186.49	185.55	166.29	159.32	177.61	179.57	194.91	202.6	217.11		7
						lota	ıl = Sum(2				2293.33	(219)
Annual totals Space heating fuel us	sed main	system	1					K	Wh/year	•	kWh/year 2279.37	٦
		oyoto	•									_
Water heating fuel us											2293.33	
Electricity for pumps,	tans and	electric	keep-ho	t								
central heating pum	p:									30		(230c)
boiler with a fan-ass	isted flue									45]	(230e)
Total electricity for th	e above, l	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting											317.63	(232)
12a. CO2 emissions	– Individ	ual heat	ing syste	ms inclu	uding mi	cro-CHF				_		
					ergy /h/year			kg CO:	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main	evetem 1			(21						=	492.34	(261)
		,						0.2				_
Space heating (second	ndary)			(21				0.5	19	=	0	(263)
Water heating				(219	9) x			0.2	16	=	495.36	(264)
Space and water hea	ting			(26	1) + (262)	+ (263) + ((264) =				987.7	(265)
Electricity for pumps,	fans and	electric	keep-ho	t (23	1) x			0.5	19	=	38.93	(267)
Electricity for lighting				(232	2) x			0.5	19	=	164.85	(268)
Total CO2, kg/year							sum o	of (265)(2	271) =		1191.48	コ コ (272)

TER =

(273)

16.57

			User D	etail <u>s:</u>						
Assessor Name: Software Name:	Stroma FSAP 20)12		Strom Softwa				Versio	on: 1.0.4.16	
		Р	roperty .	Address	: Flat 08	3				
Address :										
1. Overall dwelling dimer	nsions:		_							
Basement				a(m²) 65.1	(1a) x		2.5	(2a) =	Volume(m)	3) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	1e)+(1n	1) (35.1	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	162.74	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	у] + [other 0	7 = F	total 0	x	40 =	m³ per hou	ır ─ _(6a)
Number of open flues	0 +	0		0	 	0	X	20 =	0	(6b)
Number of intermittent fan					J -	2	x	10 =	20	(7a)
Number of passive vents					L			10 =		(7b)
·					L	0		40 =	0	
Number of flueless gas fire	25				L	0	^		nanges per he	(7c)
Infiltration due to chimney	s flues and fans =	(6a)+(6b)+(7	a)+(7b)+(7c) =	Г	20	_	÷ (5) =	-	(8)
If a pressurisation test has be					continue f	20 rom (9) to		+ (5) -	0.12	(0)
Number of storeys in the									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2					•	ruction			0	(11
if both types of wall are pre deducting areas of opening		esponding to	the great	er wall are	a (after					
If suspended wooden flo		aled) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente	er 0.05, else enter 0)							0	(13
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	` '	-			0	(15)
Infiltration rate						12) + (13)			0	(16)
Air permeability value, o			•	•	•	netre of e	envelope	area	5	(17)
If based on air permeabilit Air permeability value applies	-					ris heina u	ısad		0.37	(18)
Number of sides sheltered		, ao 20071 ao 71	0 0, 4 405	groo an po	modemity	io boilig a	Jood		0	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.37	(21)
Infiltration rate modified fo	r monthly wind spee	ed						,		
Jan Feb M	Mar Apr May	y Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	1.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Eactor (22a)m = (22)m ÷ 4								-	
Wind Factor (22a)m = (22 $(22a)$ 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 1.00	1 0.00	3.00		<u> </u>	1	1,2	Lo	I	

Continued the active air change rate for the applicable case ff mechanical ventilation:				0.44	0.42		0.4	.37		0.34	0.35	0.35	0.4	0.41	0.46	0.47	0.48
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) 0 If balanced with heat recovery: efficiency in % allowing for in-user factor (from Table 4h) = 0 a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] ### Appin	_										se	cable ca	he appli	rate for t	•		
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] 24ajm* 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(2:	0															
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] 24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 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 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 0.61 0.61 0.6 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25ims 0.61 0.61 0.6 0.58 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25ims 0.61 0.61 0.6 0.58 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25ims 0.61 0.61 0.6 0.58 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25ims 0.61 0.61 0.6 0.58 0.58 0.58 0.56 0.56 0.56 0.57 0.58 0.59 0.6 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25ims 0.61 0.61 0.6 0.58 0.58 0.58 0.58 0.56 0.56 0.57 0.58 0.59 0.59 0.6 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25ims 0.61 0.61 0.6 0.58 0.58 0.58 0.58 0.56 0.56 0.57 0.58 0.59 0.59 0.6 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25ims 0.61 0.61 0.61 0.6 0.58 0.58 0.58 0.58 0.58 0.59 0.57 0.58 0.59 0.6 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25ims 0.61 0.61 0.61 0.6 0.58 0.58 0.58 0.58 0.58 0.59 0.57 0.58 0.59 0.6 Effective air change rate or enter (24a) or (24b) or (24b) or (24b) or (24b) or (24b) or (24b) or (24b) or (24b) or	(2:	0)	i = (23a)	(23b)		,, .	. `	,	, ,		0		
24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(2	0							1) =	Table 4h	actor (from	or in-use f	allowing f	iency in %	very: effici	heat reco	anced with
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 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 0 0]) ÷ 1	``		(23		`	a)m		• •	·					
24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24			0		丄			上								
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) 4c/m* 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			,		3b)	(23	:b)m +	= (22	<u>)m</u>	1V) (24k	overy (N	heat rec	without	ntilation	anical ve	d mecha	
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) 4c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24			0	0	丄	0	0	\perp	0	0	0	0	0	0	0	0
Adjin 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						 \	- (00						•				
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] Eddym= 0.61	(2)		1			3b) —			b) n	<u> </u>		ŕ	<u> </u>	<u> </u>	<u> </u>		<u> </u>
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] Eddym	(24			0	0	\bot		0	_								
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 15			-				0.5]	n² x (
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Vindows Type 1 Vindows Type 2 Vindows Type 2 Vindows Type 2 Vindows Type 2 Vindows Type 2 Vindows Type 2 Vindows Type 2 Vindows Type 2 Vindows Type 2 Vindows Type 2 Vindows Type 3 Vindows Type 2 Vindows Type 3 Vindows Type 2 Vindows Type 3 Vindows Type 4 Vindows Type 3 Vindows Type 3 Vindows Type 4 Vindows Type 3 Vindows Type 3 Vindows Type 4 Vindows Type 4 Vindows Type 4 Vindows Type 1 10.68 Vindows Ty	(24			0.6	0.59		0.58	57		0.56	0.56	0.56	0.58	0.58	0.6	0.61	0.61
State Stat			_					5)	x (2	d) in bo	c) or (24	o) or (24) or (24b	iter (24a	rate - en	change	ctive air
Net Area A	(2			0.6	0.59		0.58	57		0.56	0.56	0.56	0.58	0.58	0.6	0.61	0.61
Net Area A													or.	naramete	eat loss r	and he	at Insse
A , m²	X k	Α :	<u> </u>	k-value		U	AXI		ue	U-val	ea	Net Ar					
Sindows Type 2		kJ/															
Alls Type 1 61.76 16.28 45.48 × 0.18 = 8.19	(2					6	14.16] = [- 0.0	[1/(1.4)+	x1	10.68				1	ws Type
Aalls Type1	(2				7	1	3.71] = [- 0.0	[1/(1.4)+	x1	2.8				2	ws Type
Valls Type2	(2				Ī	1	3.71] =	+ O.O	[1/(1.4)+	×1.	2.8				3	ws Type
otal area of elements, m² I53.22 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 abric heat loss, W/K = S (A x U) (26)(30) + (32) = (28)(30) + (32) + (32a)(32e) = (14293.08) hermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 or design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f an be used instead of a detailed calculation. hermal bridges: S (L x Y) calculated using Appendix K details of thermal bridging are not known (36) = 0.15 x (31) otal fabric heat loss (33) + (36) = entilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 32.92 32.69 32.46 31.37 31.17 30.22 30.22 30.05 30.59 31.17 31.58 32.01	(2				ī r	== =	8.19	=		0.18	X	45.48	3	16.2	6	61.7	Гуре1
otal area of elements, m²	<u> </u>				īī	_	4.8	<u> </u>	_	0.18	X	26.68		0	8	26.6	Гуре2
total area of elements, m²	(3		=		i i	=	8 42	<u> </u>		0.13	X	64 78		0	78	64.7	
tor 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 abric heat loss, W/K = S (A x U) (26)(30) + (32) = (28)(30) + (32) + (32a)(32e) = (28)(30) + (32) + (32a)(32e) = (29) (28)(30) + (32) + (32a)(32e) = (29) (29) (29) (20) (20) (20) (20) (21) (20) (20) (21) (22) (23) (23) (24) (25) (26) (26) (27) (28) (28) (28) (28) (29) (29) (20)	(3							L			=						rea of e
abric heat loss, W/K = S (A x U) (26)(30) + (32) = 42.99 eat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 14293.08 thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 or design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f an be used instead of a detailed calculation. thermal bridges: S (L x Y) calculated using Appendix K (33) + (36) = 48.32 details of thermal bridging are not known (36) = 0.15 x (31) ortal fabric heat loss (33) + (36) = 48.32 entillation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 32.92 32.99 32.46 31.37 31.17 30.22 30.22 30.05 30.59 31.17 31.58 32.01	(0		n 3.2	paragraph	aiven in	l as	e)+0.041	J-valu	1/[(1.	formula :			ndow U-va	ffective wi			
the eat capacity Cm = S(A x k) The eat capacity Cm = S(A x k				7	J	, ,	,		21								
nermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 or design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f or be used instead of a detailed calculation. Inermal bridges: S (L x Y) calculated using Appendix K Indicative Value: Medium 250 Indicative Value: Medium 260 Indicative Value: Medium 260 Indicative Value: Medium 260 I	(3	12.99						2) =) + ((26)(30				U)	= S (A x	s, W/K =	heat los
the design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f and be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K The details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss The details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss calculated monthly The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging are not known (36) = 0.15 x (31) The details of thermal bridging a	(3	293.08		(32e) =	+ (32a).	(32)	.(30) + (3	(28)							Axk)	Cm = S(apacity (
## be used instead of a detailed calculation. ## hermal bridges : S (L x Y) calculated using Appendix K ## details of thermal bridging are not known (36) = 0.15 x (31) ## otal fabric heat loss ## entilation heat loss calculated monthly ## Jun Jul Aug Sep Oct Nov Dec ## 8)m= 32.92 32.69 32.46 31.37 31.17 30.22 30.22 30.05 30.59 31.17 31.58 32.01	(3	250			/ledium	ıe: N	tive Value	ndicat				ı kJ/m²K	- TFA) ir	P = Cm ÷	ter (TMF	parame	al mass
hermal bridges : S (L x Y) calculated using Appendix K details of thermal bridging are not known (36) = 0.15 x (31) otal fabric heat loss entilation heat loss calculated monthly 38)m = 0.33 × (25)m × (5)	_			able 1f	MP in Ta	of TI	values c	cative	e inc	ecisely the	known pr	ion are no	construct				0
details of thermal bridging are not known (36) = 0.15 x (31) otal fabric heat loss (33) + (36) = 48.32 entilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	–										,						
total fabric heat loss calculated monthly (33) + (36) = 48.32 48.32 48.32 entilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 8)m= 32.92 32.69 32.46 31.37 31.17 30.22 30.22 30.05 30.59 31.17 31.58 32.01	(3	5.32									`	•	• .		•	•	_
entilation heat loss calculated monthly Sep Oct Nov Dec	(3	18 32					(36) =	33) +				1)	= 0.15 X (3	own (36) =	are not kn		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 8)m= 32.92 32.69 32.46 31.37 31.17 30.22 30.05 30.59 31.17 31.58 32.01	(`	0.02)	5)m x (5)	× (25							/	l monthly	alculated		
8)m= 32.92 32.69 32.46 31.37 31.17 30.22 30.05 30.59 31.17 31.58 32.01			1			Ť	_		Т	Aug	Jul	,lun		_			
	(3			 		+		-	+								
eat transfer coefficient, vv/N (39)m = (37) + (38)m			J	I								L					
9)m= 81.24 81 80.77 79.69 79.48 78.54 78.54 78.36 78.9 79.48 79.9 80.32			1	00.00		_			Τ.	70.00	70.54	70.54	70.40	70.00			

Heat Ic	ss para	meter (F	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.25	1.24	1.24	1.22	1.22	1.21	1.21	1.2	1.21	1.22	1.23	1.23		_
Numbe	er of day	e in mor	nth (Tabl	e 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.22	(40)
r varribe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
l														
4. Wa	ter heat	ing ener	gy requi	rement:								kWh/yea	ar:	
if TF			N + 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		12		(42)
Reduce	the annua	l average	ater usag hot water person per	usage by	5% if the d	welling is	designed t			se target o		.59		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
i			day for ea				1	, ,						
(44)m=	93.04	89.66	86.28	82.89	79.51	76.13	76.13	79.51	82.89	86.28	89.66	93.04	1017.00	
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1015.03	(44)
(45)m=	137.98	120.68	124.53	108.57	104.17	89.9	83.3	95.59	96.73	112.73	123.05	133.63		
										Total = Su	m(45) ₁₁₂ =		1330.87	(45)
			ng at point											
(46)m= Water	20.7 storage	18.1 loss:	18.68	16.29	15.63	13.48	12.5	14.34	14.51	16.91	18.46	20.04		(46)
	_		includin	g any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
lf comr	nunity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)				_		
			hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage anufact		eclared lo	nss facto	or is kno	wn (k\//h	n/day).					0		(48)
,			m Table) 10 KHO	vvii (ixvvi	"day).					0		(49)
-			storage		ear			(48) x (49)) =			0		(50)
			eclared c	-										
		•	factor fr ee section		e 2 (kWl	n/litre/da	ıy)					0		(51)
	-	from Tal		JII 4 .5								0		(52)
Tempe	rature fa	actor fro	m Table	2b							-	0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or (54) in (5	55)									0		(55)
Water	storage	loss cal	culated f	or each	month		_	((56)m = (55) × (41)ı	m				
56)m= f cylinde	0 er contains	0 dedicated	0 d solar sto	0 rage, (57)ı	0 m = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (0 H11) is fro	0 m Appendix	Н	(56)
57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (an	inual) fro	m Table	3							0		(58)
	-		culated f		,	•	. ,	, ,						
`			om Tabl				i							(50)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss c		1				1	ı —	1	T	T	1 .	1	(04)
(61)m= 47.41		43.97	40.88	40.52	37.54	38.79	40.52	40.88	43.97	44.22	47.41	J	(61)
							`		(45)m +	(46)m +	` 	(59)m + (61)m	
(62)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.11	137.61	156.7	167.27	181.04]	(62)
Solar DHW inpu									r contribu	tion to wate	er heating)		
(add addition	al lines if	FGHRS			applies	, see Ap	pendix	 		,	1	1	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(63)
Output from	water hea	iter										1	
(64)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.11	137.61	156.7	167.27	181.04		7
							Ou	tput from w	ater heate	er (annual)	12	1838.24	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	[]	
(65)m= 57.73	50.44	52.4	46.32	44.77	39.28	37.4	41.91	42.38	48.47	51.97	56.29		(65)
include (57	m in cal	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ins (Table	e 5). Wat	ts										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m= 106.08	3 106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08		(66)
Ligh <mark>ting gain</mark>	s (calcula	ted in A	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 16.55	<u> </u>	11.95	9.05	6.76	5.71	6.17	8.02	10.76	13.67	15.95	17.01]	(67)
Appliances g	ains (calc	culated in	Append	dix L. ea	uation L	13 or L1	3a), als	o see Ta	ble 5			1	
(68)m= 185.6	,	182.67	172.34	159.3	147.04	138.85	136.92		152.11	165.15	177.41]	(68)
Cooking gair			nnendix	l equat	ion I 15	or I 15a	L also s	see Table	5		ļ	1	
(69)m= 33.61		33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61	1	(69)
Pumps and f													, ,
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
							_	<u> </u>		<u> </u>		l	()
Losses e.g. 6 (71)m= -84.86		-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	1	(71)
` ′	_!	ļ	-04.00	-04.00	-04.00	-04.00	-04.00	-04.00	-04.00	-04.00	-04.00	J	(7-1)
Water heatin	``		04.00	00.47	54.55	T 50.00	50.00	T 50.00	05.45	T 70.40	T 75.05	1	(72)
(72)m= 77.6	75.06	70.43	64.33	60.17	54.55	50.26	56.33	58.86	65.15	72.18	75.65	J	(72)
Total interna	_					, , , ,		+ (69)m +		· · ·		1	(70)
(73)m= 337.56		322.87	303.54	284.05	265.12	253.11	259.1	269.23	288.75	311.11	327.89		(73)
6. Solar gai				T-61- 0-		:-41	4: 4-		!!		·		
Solar gains are		•					itions to t		ie applica		uon.	Caina	
Orientation:	Table 6d		Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
Northeast 0.9x				_							_		7,,
		_	2.		-	11.28	X	0.63		0.7	_ = -	9.65	(75)
Northeast 0.9x			2.		-	22.97	X	0.63		0.7	_ =	19.65	[(75)
Northeast 0.9x			2.			11.38	X _	0.63		0.7	_ •	35.41	<u> </u> (75)
Northeast 0.9x			2.	8	X (67.96	X	0.63	x	0.7	=	58.15	(75)
Northeast 0.9x	0.77	X	2.	8	x	91.35	X	0.63	X	0.7	=	78.17	(75)

Northeast 0.9x 0.77	7 x	2.8) x	۵	7.38	1 x	0.63	×	0.7		83.33	(75)
Northeast 0.9x 0.77]	2.8] ^] _X		01.1] ^] _X	0.63		0.7	-	77.96	(75)
Northeast 0.9x 0.77] x	2.8] x		2.63] x	0.63	×	0.7	= =	62.15	(75)
Northeast 0.9x 0.77	」 】 x	2.8	」] _{_X}	<u> </u>	0.42]]	0.63	x	0.7	= -	43.15	(75)
Northeast 0.9x 0.77	」 】 x	2.8	」] _{_X}		8.07]] _x	0.63	x	0.7		24.02	(75)
Northeast 0.9x 0.77] x	2.8] x	-	4.2] x	0.63	×	0.7	= =	12.15	(75)
Northeast 0.9x 0.77] x	2.8] x		0.21] x	0.63	×	0.7	╡ .	7.88	(75)
Southwest _{0.9x} 0.77	」 】 x	2.8	」] _{_X}		6.79]]	0.63	x	0.7	= =	31.49	(79)
Southwest _{0.9x} 0.77	」 】 x	2.8	」] _{_x}		2.67]]	0.63	x	0.7	= -	53.63	(79)
Southwest _{0.9x} 0.77	」 】 x	2.8	」] _X		5.75]]	0.63	x	0.7		73.38	」、 / (79)
Southwest _{0.9x} 0.77] 	2.8	」] x		06.25	<u> </u> 	0.63	x	0.7		90.92	(79)
Southwest _{0.9x} 0.77	X	2.8] 	-	9.01	,]	0.63	x	0.7		101.84	(79)
Southwest _{0.9x} 0.77	X	2.8	」] _X		18.15	<u> </u> 	0.63		0.7		101.1	(79)
Southwest _{0.9x} 0.77	X	2.8	」 	-	3.91]]	0.63	x	0.7		97.47	(79)
Southwest _{0.9x} 0.77	X	2.8]])4.39	<u>.</u>	0.63	x	0.7		89.33	(79)
Southwest _{0.9x} 0.77	X	2.8	י x		2.85	<u>,</u>]	0.63	×	0.7		79.45	(79)
Southwest _{0.9x} 0.77	J x	2.8	ј] х	6	9.27	j	0.63	×	0.7		59.27	(79)
Southwest _{0.9x} 0.77] x	2.8	X	4	4.07		0.63	Х	0.7	-	37.71	(79)
Southwest _{0.9x} 0.77	i x	2.8	X	3	1.49	i	0.63	x	0.7	=	26.94	(79)
Northwest _{0.9x} 0.77	X	10.68	X	1	1.28	×	0.63	x	0.7		36.83	(81)
Northwest _{0.9x} 0.77	X	10.68	X	2	2.97	x	0.63	x	0.7	=	74.96	(81)
Northwest _{0.9x} 0.77	X	10.68	X	4	1.38	×	0.63	x	0.7	=	135.06	(81)
Northwest 0.9x 0.77	X	10.68	Х	6	7.96	х	0.63	X	0.7	=	221.8	(81)
Northwest 0.9x 0.77	j x	10.68	X	9	1.35	x	0.63	x	0.7	=	298.15	(81)
Northwest 0.9x 0.77	j ×	10.68	×	9	7.38	x	0.63	×	0.7	=	317.86	(81)
Northwest 0.9x 0.77	X	10.68	X	9)1.1	x	0.63	x	0.7	=	297.35	(81)
Northwest 0.9x 0.77	X	10.68	j×	7.	2.63	x	0.63	x	0.7		237.05	(81)
Northwest 0.9x 0.77	X	10.68	j×	5	0.42	x	0.63	x	0.7	=	164.57	(81)
Northwest 0.9x 0.77	×	10.68	x	2	8.07	x	0.63	x	0.7	=	91.61	(81)
Northwest 0.9x 0.77	X	10.68	X	1	4.2	x	0.63	x	0.7	=	46.34	(81)
Northwest 0.9x 0.77	X	10.68	j×	9).21	x	0.63	x	0.7	=	30.07	(81)
	_		_			•						_
Solar gains in watts, calcu	lated	for each mon	th			(83)m	n = Sum(74)m	(82)m	1			
` ′	3.85	370.88 478.1		502.29	472.78	388	.53 287.17	174.	9 96.2	64.9		(83)
Total gains – internal and		` 	_	` 							1	
(84)m= 415.53 483.35 56	6.72	674.42 762.2	1	767.41	725.89	647	556.4	463.6	407.3	392.79		(84)
7. Mean internal tempera	ture	(heating seaso	on)									
Temperature during heat	ing p	eriods in the li	ving	g area f	rom Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation factor for gains	for I	iving area, h1,	,m (see Ta	ble 9a)			,			1	
Jan Feb M	/lar	Apr Ma	у	Jun	Jul	Α	ug Sep	Oc	t Nov	Dec		
(86)m= 1 0.99 0.	98	0.94 0.81		0.62	0.47	0.5	0.82	0.97	0.99	1		(86)
Mean internal temperatur	e in I	iving area T1	(foll	low ste	os 3 to 7	in T	able 9c)					
(87)m= 19.66 19.83 20	.13	20.53 20.83	3	20.97	20.99	20.	99 20.87	20.4	6 20	19.64		(87)

Temperature during heating periods in rest of dwelling from Table 9,	
(88)m= 19.88 19.88 19.89 19.9 19.9 19.91 19.91 19.92	2 19.91 19.9 19.9 19.89 (88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
(89)m= 1 0.99 0.98 0.92 0.76 0.53 0.36 0.42	0.74 0.96 0.99 1 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to	o 7 in Table 9c)
(90)m= 18.11 18.36 18.79 19.36 19.75 19.89 19.91 19.91	19.81 19.29 18.61 18.08 (90)
	$fLA = Living area \div (4) = 0.42$ (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 -$	fl A) × T2
(92)m= 18.77 18.98 19.36 19.85 20.21 20.35 20.37 20.37	
Apply adjustment to the mean internal temperature from Table 4e, w	here appropriate
(93)m= 18.77 18.98 19.36 19.85 20.21 20.35 20.37 20.37	
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	g Sep Oct Nov Dec
Utilisation factor for gains, hm:	
(94)m= 1 0.99 0.97 0.91 0.77 0.57 0.4 0.47	0.77 0.96 0.99 1 (94)
Useful gains, hmGm , W = (94)m x (84)m	0 107 00 110 01 100 10 100 10 100 100 10
(95)m= 413.52 478.48 551.58 616.79 590.17 436.4 293.74 306.1	3 427.28 442.94 403.46 391.32 (95)
Monthly average external temperature from Table 8	14.1 10.6 7.1 4.2 (96)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4	
Heat loss rate for mean internal temperature, Lm , W = $[(39)\text{m} \times [(93)\text{m}]$ = $[(97)\text{m}]$ = $[(39)\text{m} \times [(93)\text{m}]$ = $[(97)\text{m}]$ = $[(39)\text{m} \times [(93)\text{m}]$ = $[(97)\text{m}]$ = $[(39)\text{m} \times [(93)\text{m}]$ = $[(97)\text{m}]$ = $[(39)\text{m} \times [(93)\text{m}]$ = $[(97)\text{m}]$	
Space heating requirement for each month, kWh/month = 0.024 x [(9)	
(98)m= 566.91 445.02 362.24 184.41 63.9 0 0 0	97)m - (95)m] x (41)m 0 213.6 405.35 577.93
	total per year (kWh/year) = Sum(98) ₁₆₉₁₂ = 2819.35 (98)
Space heating requirement in kWh/m²/year	43.31 (99)
9a. Energy requirements – Individual heating systems including micro	-CHP)
Space heating:	
Fraction of space heat from secondary/supplementary system	0 (201)
Fraction of space heat from main system(s) (202) =	1 – (201) =
Fraction of total heating from main system 1 (204) =	$(202) \times [1 - (203)] = $ 1 (204)
Efficiency of main space heating system 1	93.4 (206)
Efficiency of secondary/supplementary heating system, %	0 (208)
Jan Feb Mar Apr May Jun Jul Aug	g Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above)	
566.91 445.02 362.24 184.41 63.9 0 0 0	0 213.6 405.35 577.93
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	(211)
606.97 476.46 387.83 197.44 68.42 0 0 0	0 228.69 433.99 618.77
To the state of th	otal (kWh/year) =Sum(211) _{15,1012} = 3018.58 (211)
Space heating fuel (secondary), kWh/month	
$= \{[(98) \text{m x } (201)] \} \times 100 \div (208)$	
(215)m =	0 0 0 0
To the state of th	otal (kWh/year) =Sum(215) _{15,1012} = 0 (215)
	` '

Water heating									
Output from water heater (calculated above) 185.4 161.95 168.5 149.45 144.69	407.44	122.09	100 11	407.04	450.7	407.07	404.04	1	
185.4 161.95 168.5 149.45 144.69 Efficiency of water heater	127.44	122.09	136.11	137.61	156.7	167.27	181.04	80.3	(216)
(217)m= 87.68 87.46 86.93 85.58 83.15	80.3	80.3	80.3	80.3	85.83	87.2	87.77	80.3	(217)
Fuel for water heating, kWh/month	00.5	00.5	00.3	00.5	05.05	07.2	07.77		(217)
(219) m = (64) m × $100 \div (217)$ m									
(219)m= 211.44 185.16 193.83 174.63 174.02	158.7	152.05	169.5	171.37	182.56	191.83	206.28		
			Tota	I = Sum(2	19a) ₁₁₂ =			2171.38	(219)
Annual totals					k'	Wh/year	•	kWh/year	_
Space heating fuel used, main system 1								3018.58	╛
Water heating fuel used								2171.38	
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								292.21	(232)
12a. CO2 emissions – Individual heating system	ns inclu	ıding mi	cro-CHP)			_		
		ergy h/year			kg CO	ion fac	tor	Em <mark>issio</mark> ns kg CO2/yea	
Space heating (main system 1)) x					=		_
Space heating (main system 1)					0.2	16		652.01	(261)
Space heating (secondary)	(215	(i) X			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	469.02	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1121.03	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232	!) x			0.5	19	=	151.66	(268)
Total CO2, kg/year				sum o	f (265)(2	271) =		1311.61	(272)
									_

TER =

20.15

(273)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20)12		Strom Softwa				Versic	on: 1.0.4.16	
		Pi	roperty .	Address	: Flat 09					
Address :										
1. Overall dwelling dimer	nsions:		_							->
Basement				a(m²) 88.5	(1a) x		2.5	(2a) =	Volume(m 221.25	3) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	le)+(1n	1) [88.5	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	221.25	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	у 	other 0	7 = F	total	x	40 =	m³ per hou	ır ─_ _(6a)
Number of open flues	0 +	0	- - - - -	0]	0	x	20 =	0	(6b)
Number of intermittent fan					J	3	x	10 =	30	(7a)
Number of passive vents	.0				L			10 =		(7b)
	00				L	0		40 =	0	
Number of flueless gas fin	es				L	0	^		nanges per h	(7c)
Infiltration due to chimney	o fluor and fans =	(62)±(6b)±(7	'a)+(7h)+(70) =			_			_
If a pressurisation test has be					continue f	30 rom (9) to		÷ (5) =	0.14	(8)
Number of storeys in the									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening		esponding to	the great	er wall are	a (atter					
If suspended wooden flo		aled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	. ,	-	. (45)		0	(15)
Infiltration rate		da la constant				12) + (13)			0	(16)
Air permeability value, or If based on air permeability	• •		•	•	•	ietre of e	envelope	area	5	(17)
Air permeability value applies	-					is beina u	sed		0.39	(18)
Number of sides sheltered				, · · · · · · ·	,				0	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.39	(21)
Infiltration rate modified for	or monthly wind spec	ed							_	
Jan Feb I	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	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 = (22)m ÷ 4									
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
1.20			3.00			1			J	

djusted infiltr		e (allowi				peed) =	(21a) x	(22a)m	T	1		1	
0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.39	0.41	0.43	0.45		
<i>alcul<mark>ate effed</mark></i> If mechanica		-	ale ioi l	пе арріі	cable ca	Se						0	
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	wise (23b) = (23a)			0	
If balanced with	heat reco	very: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	
a) If balance		-	•	_					2h)m + (23h) x [1 – (23c)		
la)m= 0	0	0	0	0	0	0	0	0	0	0	0]	
b) If balance	d mecha	anical ve	ntilation	without	heat rec	:overv (N	//V) (24b	lm = (2)	2b)m + (:	L 23b)		J	
lb)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	
c) If whole h	ouse ex	tract ver	tilation o	or positiv	re input v	rentilatio	n from o	utside			<u> </u>	J	
if (22b)n				•	•				.5 × (23b)			
c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	
d) If natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilatio	on from I	oft				•	
if (22b)n	n = 1, the	en (24d)	m = (22l)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			-	
ld)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6		
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)					
)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6		
. Heat losse	s and he	eat loss	paramete	er:					_		_	_	
EMENT	Gros		Openin		Net Ar		U-valı		AXU		k-value		ΑХ
	area	(m²)	m	2	A ,r	<u> </u>	W/m2		(W/I	K)	kJ/m²·	K	kJ/K
ndows Type					10.09	_	/[1/(1.4)+		13.38				
ndows Type	2				2.64	x1	/[1/(1.4)+	0.04] =	3.5	L			
ndows Type	3				2.64	x1	/[1/(1.4)+	0.04] =	3.5				
ndows Type	4				6.75	х1	/[1/(1.4)+	0.04] =	8.95				
oor					16.16	7 ×	0.13	=	2.1017	1 [
alls Type1	76.3	3	22.12	2	54.21	X	0.18		9.76				
alls Type2	23.6	34	0		23.64	x	0.18	=	4.25	\neg [\neg	
of	88.	5	0		88.5	X	0.13	<u> </u>	11.5	Ħ i		7 F	
tal area of e	lements	, m²			204.6	4							
or windows and	roof winde	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2	
nclude the area				s and part	titions								
bric heat los		•	U)				(26)(30)	+ (32) =				56.9)5
eat capacity		•						,	(30) + (32	, , ,	(32e) =	16800	.33
ermal mass	parame	ter (TMF	P = Cm ÷	· TFA) ir	ı kJ/m²K			Indica	tive Value	: Medium		25)
r design assess n be used inste				constructi	ion are not	known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
ermal bridge				ısina An	pendix k	<						4.8	 6
etails of therma	,	•		• .	•							4.0	
tal fabric he			, ,	,	,			(33) +	(36) =			61.	8
ntilation hea	it loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 45.33	44.99	44.65	43.07	42.78	41.4	41.4	41.15	41.93	42.78	43.38	44		
at transfer o	oefficier	nt, W/K						(39)m	= (37) + (37)	38)m		-	
												1	
0)m= 107.13	106.79	106.46	104.88	104.58	103.21	103.21	102.95	103.74	104.58	105.18	105.8		

Heat Ic	ss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.21	1.21	1.2	1.19	1.18	1.17	1.17	1.16	1.17	1.18	1.19	1.2		_
Numbe	er of day	e in mor	nth (Tabl	e 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.19	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
	ļ.		<u> </u>				<u> </u>	<u> </u>			<u> </u>			
4. Wa	iter heat	ing ener	gy requi	rement:								kWh/yea	r:	
if TF			ч + 1.76 х	[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		.6		(42)
Reduce	the annua	l average	ater usag	usage by	5% if the d	welling is	designed t			se target o		.06		(43)
not more			person per	- '				A	0	0-4				
Hot wate	Jan er usage ir	Feb i litres per	Mar day for ea	Apr ach month	May Vd,m = fa	Jun	Jul Fable 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	105.67	101.82	97.98	94.14	90.3	86.45	86.45	90.3	94.14	97.98	101.82	105.67		
` _									_	Γota <mark>l = S</mark> u	M(44) ₁₁₂ =		1152.72	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	Tm / 3600	kWh/mon	th (see Ta	ables 1b, 1	c, 1d)		
(45)m=	156.7	137.05	141.42	123.3	118.31	102.09	94.6	108.56	109.85	128.02	139.75	151.76		
lf instanı	taneous w	ater heatir	ng at point	of use (no	hot water	storage).	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =		1511.4	(45)
(46)m=	23.5	20.56	21.21	18.49	17.75	15.31	14.19	16.28	16.48	19.2	20.96	22.76		(46)
` ′	storage			100										` '
Storag	e volum	e (litres)	includin	g any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
	•	•	nd no ta		•			` '	, ,	(01: /	(4 - 7)			
	vise if no storage		hot wate	er (this in	iciudes ii	nstantar	ieous co	mbi boil	ers) ente	er 'U' in ((47)			
	•		eclared lo	oss facto	or is kno	wn (kWł	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 from the factor from th		e 2 (kWl	n/litre/da	ıy)					0		(51)
	-	from Tal		JII 4 .J								0		(52)
			m Table	2b							-	0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
		54) in (5	_	,								0		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
	er contains	dedicated	d solar sto	rage, (57)r	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendix	Н	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (an	nual) fro	m Table	 e 3	-		-				0		(58)
	-	•	culated f			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor fr	om Tabl	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	thermo	stat)			

Combi loss calculated			 		r	· -	T		T	T	1	(04)
(61)m= 50.96 46.03	49.93	46.42	46.01	42.63	44.06	46.01	46.42	49.93	49.32	50.96	J	(61)
Total heat required for			·			` 		` 	ì 	`	(59)m + (61)m	
(62)m= 207.66 183.08		169.72	164.32	144.72	138.66	154.57		177.95	189.06	202.71	J	(62)
Solar DHW input calculate								r contribut	tion to wate	er heating)		
(add additional lines i					·		- 				1	(00)
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0	J	(63)
Output from water he		i	i								1	
(64)m= 207.66 183.08	191.35	169.72	164.32	144.72	138.66	154.57		177.95	189.06	202.71		1
						Ou	tput from w	ater heate	er (annual) ₁	112	2080.08	(64)
Heat gains from water				5 ′ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	.] •	
(65)m= 64.84 57.08	59.51	52.6	50.84	44.6	42.47	47.6	48.13	55.05	58.79	63.2]	(65)
include (57)m in ca	lculation (of (65)m	only if c	ylinder i	s in the	dwelling	g or hot w	ater is f	rom com	munity h	ıeating	
5. Internal gains (se	e Table 5	and 5a):									
Metabolic gains (Tab	e 5), Wat	ts									_	
Jan Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 130.23 130.23	130.23	130.23	130.23	130.23	130.23	130.23	130.23	130.23	130.23	130.23		(66)
Lighting gains (calcul	ated in Ap	pendix	L, equat	ion L9 o	r L9a), <mark>a</mark>	lso see	Table 5					
(67)m= 21.07 18.71	15.22	11.52	8.61	7.27	7.86	10.21	13.7	17.4	20.31	21.65		(67)
App <mark>liance</mark> s gains (ca	culated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5				
(68)m= 236.29 238.74	232.56	219.41	202.81	187.2	176.77	174.32	180.5	193.65	210.26	225.87		(68)
Cooking gains (calcu	ated in A	ppendix	L, equat	ion L15	or L15a), also s	see Table	5		•		
(69)m= 36.02 36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02		(69)
Pumps and fans gain	s (Table 5	 Ба)				•				•	'	
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g. evaporat	on (nega	tive valu	es) (Tab	le 5)			•			•	•	
(71)m= -104.19 -104.19	-104.19	-104.19	-104.19	-104.19	-104.19	-104.19	-104.19	-104.19	-104.19	-104.19	1	(71)
Water heating gains (Table 5)	ı	ı				_ !				ı	
(72)m= 87.15 84.93	79.98	73.06	68.33	61.95	57.08	63.98	66.85	73.99	81.66	84.94]	(72)
Total internal gains	_ =	<u>I</u>	<u>I</u>	(66))m + (67)m	ı + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m	ı	
(73)m= 409.58 407.46	-	369.06	344.82	321.49	306.78	313.58	326.12	350.12	377.3	397.53	1	(73)
6. Solar gains:												
Solar gains are calculate	d using sola	r flux from	Table 6a	and assoc	iated equa	itions to d	convert to th	ne applical	ble orientat	tion.		
Orientation: Access	Factor	Area		Flu	ıx		g_		FF		Gains	
Table 6	d	m²		Tal	ble 6a		Table 6b	Т	able 6c		(W)	
Northeast _{0.9x} 0.7	7 ×	2.6	64	x 1	1.28	x	0.63	х	0.7	=	9.1	(75)
Northeast _{0.9x} 0.7	7 ×	2.6	64	x 2	22.97	x	0.63	_ x [0.7	-	18.53	(75)
Northeast 0.9x 0.7	7 ×	2.6	64	x 2	1.38	x	0.63	_ x [0.7		33.39	(75)
Northeast 0.9x 0.7	7 X	2.6	64	x 6	67.96	×	0.63	_ × [0.7		54.83	(75)
Northeast _{0.9x} 0.7	7 ×	2.6	64	x 9	91.35	x	0.63	x	0.7	-	73.7	(75)
												_

Northeast _{0.9x}	0.77] x	2.64	l x	97.38] _x	0.63	X	0.7	1 =	78.57	(75)
Northeast 0.9x	0.77] ^] _X	2.64] ^] x	91.1] ^] _x	0.63	X	0.7] =	73.5	(75)
Northeast 0.9x	0.77] ^] _X	2.64] ^] x	72.63] ^] x	0.63	X	0.7]	58.6	(75)
Northeast 0.9x	0.77] ^] x	2.64] ^] x	50.42] ^] x	0.63	X	0.7]] =	40.68	(75)
Northeast 0.9x	0.77] ^] x	2.64] ^] x	28.07] ^] x	0.63	X	0.7]] =	22.65	(75)
Northeast 0.9x	0.77] ^] x	2.64] ^] x	14.2] ^] x	0.63	X	0.7] =	11.45	(75)
Northeast 0.9x	0.77] ^] x	2.64] ^] x	9.21] ^] x	0.63	X	0.7]	7.43](75)
Southeast 0.9x	0.77] ^] x	10.09] ^] x	36.79] ^] x	0.63	X	0.7]] =	113.46] ₍₇₇₎
Southeast 0.9x	0.77] ^] x	10.09] ^ x	62.67] ^] x	0.63	X	0.7] =	193.26	(//) (77)
Southeast 0.9x	0.77] ^] x	10.09] ^] x	85.75] ^] x	0.63	X	0.7]] =	264.43](77)
Southeast 0.9x	0.77] ^] x	10.09	l ^ l x	106.25] ^] x	0.63	X	0.7]] =	327.64	(77)
Southeast 0.9x	0.77] ^] x	10.09] ^] x	119.01] ^] x	0.63	X	0.7]] =	366.99	(77)
Southeast 0.9x	0.77] ^] x	10.09] ^] x	118.15] ^] _x	0.63	X	0.7]] =	364.33	(77)
Southeast 0.9x	0.77] ^] x	10.09] ^] x	113.91] ^] _x	0.63	X	0.7]] =	351.25	(77)
Southeast 0.9x	0.77] ^] x	10.09] ^] x	104.39] ^] x	0.63	X	0.7]] =	321.9	(77)
Southeast 0.9x	0.77]	10.09] ^] _x	92.85] ^] _x	0.63	X	0.7]] =	286.32	(77)
Southeast 0.9x	0.77] ^] x	10.09] ^] x	69.27] ^] x	0.63	X	0.7]] =	213.6	(77)
Southeast 0.9x	0.77	」 ^] _x [10.09	X	44.07	X	0.63	X	0.7] 	135.9	(77)
Southeast 0.9x	0.77]	10.09	X	31.49	X	0.63	X	0.7		97.1	(77)
Southwest _{0.9x}	0.77]	2.64	X	36.79		0.63	X	0.7]]	29.69	(79)
Southwest _{0.9x}	0.77]] x	2.64	X	62.67	1	0.63	X	0.7	=	50.57	(79)
Southwest _{0.9x}	0.77]] x	2.64	X	85.75	i	0.63	X	0.7	=	69.19	 (79)
Southwest _{0.9x}	0.77	J X	2.64	X	106.25		0.63	X	0.7]] =	85.73	(79)
Southwest _{0.9x}	0.77	X	2.64	X	119.01	<u> </u> 	0.63	x	0.7]] =	96.02	(79)
Southwest _{0.9x}	0.77	X	2.64	x	118.15	İ	0.63	x	0.7] =	95.33	(79)
Southwest _{0.9x}	0.77	X	2.64	x	113.91	j	0.63	X	0.7	=	91.9	(79)
Southwest _{0.9x}	0.77	X	2.64	x	104.39	j	0.63	X	0.7	j =	84.22	(79)
Southwest _{0.9x}	0.77	x	2.64	x	92.85	i	0.63	X	0.7	j =	74.91	(79)
Southwest _{0.9x}	0.77	x	2.64	x	69.27	İ	0.63	x	0.7	j =	55.89	(79)
Southwest _{0.9x}	0.77	x	2.64	x	44.07	İ	0.63	X	0.7	i =	35.56	(79)
Southwest _{0.9x}	0.77	j x	2.64	x	31.49	j	0.63	x	0.7	j =	25.4	(79)
Northwest _{0.9x}	0.77	x	6.75	x	11.28	x	0.63	x	0.7	j =	23.28	(81)
Northwest 0.9x	0.77	x	6.75	x	22.97	x	0.63	X	0.7	j =	47.38	(81)
Northwest _{0.9x}	0.77	x	6.75	x	41.38	x	0.63	X	0.7	j =	85.36	(81)
Northwest _{0.9x}	0.77	x	6.75	x	67.96	x	0.63	x	0.7	=	140.19	(81)
Northwest 0.9x	0.77	x	6.75	x	91.35	x	0.63	x	0.7	j =	188.44	(81)
Northwest _{0.9x}	0.77	x	6.75	x	97.38	×	0.63	X	0.7] =	200.89	(81)
Northwest _{0.9x}	0.77	x	6.75	×	91.1	×	0.63	X	0.7	j =	187.93	(81)
Northwest _{0.9x}	0.77	x	6.75	×	72.63	×	0.63	X	0.7] =	149.82	(81)
Northwest _{0.9x}	0.77	x	6.75	x	50.42	×	0.63	X	0.7	j =	104.01	(81)
Northwest _{0.9x}	0.77	x	6.75	×	28.07	×	0.63	X	0.7	j =	57.9	(81)
_		-		•		•				•		_

Northwest 0.9x	0.77	х	6.7	75	x	14.2	x		0.63	х	0.7	=	29.29	(81)
Northwest _{0.9x}	0.77	×	6.7	75	x \lceil	9.21	×		0.63	- x -	0.7	=	19.01	(81)
-							_							
Solar gains in	watts, ca	alculated	for eac	h month			(83)m	n = S	um(74)m .	(82)m				
(83)m= 175.52	309.74	452.36	608.38	725.14	739	.12 704.5	9 614	.54	505.93	350.03	212.2	148.94		(83)
Total gains – i	nternal a	and solar	(84)m =	= (73)m	+ (83	B)m , watts	;			Į	•		I	
(84)m= 585.1	717.19	845.19	977.44	1069.96	1060	0.61 1011.3	928	.12	832.05	700.14	589.49	546.47		(84)
7. Mean inter	nal temp	perature	(heating	season)									
Temperature						ea from T	able 9	, Th	1 (°C)				21	(85)
Utilisation fac	ctor for g	ains for I	iving are	ea, h1,m	see	e Table 9a	1)							
Jan	Feb	Mar	Apr	May	<u> </u>	un Jul		ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.97	0.92	0.79	0.	_	0.	Ť	0.76	0.96	0.99	1		(86)
			 					- 1-1	- 0-\	<u>[</u>	<u> </u>			
Mean interna	19.94	20.24	20.61	20.86	20.	i —	20.	_	20.92	20.56	20.08	19.7]	(87)
(87)m= 19.73	19.94	20.24	20.01	20.00	20.	9/ 21	20.	99	20.92	20.56	20.06	19.7		(07)
Temperature	during h	neating p	eriods ii	rest of	dwe	lling from	Table 9	9, TI	h2 (°C)	•			•	
(88)m= 19.91	19.91	19.92	19.93	19.93	19.	95 19.95	19.	95	19.94	19.93	19.93	19.92		(88)
Utilisation fac	ctor for g	ains for r	est of d	welling,	h2,m	ı (see Tab	le 9a)							
(89)m= 1	0.99	0.97	0.89	0.73	0.5	51 0.34	0.3	39	0.68	0.94	0.99	1		(89)
Me <mark>an int</mark> erna	l temper	ature in	the rest	of dwell	ina T	2 (follow s	steps 3	to 7	in Tabl	e 9c)				
(90)m= 18.24	18.54	18.98	19.49	19.81	19.	·			19.88	19.44	18.75	18.2		(90)
` '								\forall	f	L LA = Livir	l ng area ÷ (4	4) =	0.4	(91)
														` ′
Mean interna	_	_	_	_	1		- `	_		40.00	40.05		ı	(00)
(92)m= 18.83	19.09	19.48	19.93	20.23	20.				20.29	19.88	19.27	18.79		(92)
Apply adjustr	1				_		\neg			<u> </u>	1 40 0=		l	(02)
(93)m= 18.83	19.09	19.48	19.93	20.23	20.	34 20.36	20.	36	20.29	19.88	19.27	18.79		(93)
8. Space hea			•				(T)	. 01			70)			
Set Ti to the the utilisation			•		ned a	it step 11	of Labi	le 9t	o, so tha	t II,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	ال.	un Jul	ΙΑ	ug	Sep	Oct	Nov	Dec		
Utilisation fac			<u> </u>	Iviay	1 00	<u> </u>		ug	ОСР	001	1407	Dec	l	
(94)m= 0.99	0.99	0.96	0.89	0.75	0.5	0.38	0.4	14	0.71	0.93	0.99	1		(94)
Useful gains,	l			ļ	Į					<u> </u>	<u> </u>		l	
(95)m= 581.84	706.93	813.08	872.34	799.89	577	.73 386.0	1 403	.77	590.33	654.38	582.28	544.23		(95)
Monthly aver	age exte	ernal tem	perature	e from T	ı able	 8				<u> </u>	<u>!</u>	<u> </u>	l	
(96)m= 4.3	4.9	6.5	8.9	11.7	14		16	.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for me	an intern	al temp	ı erature,	Lm ,	W =[(39)r	n x [(9:	3)m	 – (96)m	l]	<u> </u>	<u> </u>	l	
	1515.64	1381.45			592			_	642.01	970.63	1280.28	1544.01		(97)
Space heating	ıa reguire	ement fo	r each n	nonth, k	Wh/n	 nonth = 0.	 024 х I	(97)m – (95)m] x (4	1)m	<u> </u>	l	
(98)m= 725.1	543.45	422.86	205.06	68.39	0				0	235.29	502.56	743.84		
				!	!			Tota	l per year	(kWh/yea	r) = Sum(9	8) _{15.912} =	3446.56	(98)
Space heatin	a roquir	omont in	k\A/b/mi	2/voor					, , , , ,	, ,,,,,	, (-	7		
Space heatin	• .			•									38.94	(99)
9a. Energy red		nts – Indi	vidual h	eating s	yster	ns includi	ng mic	ro-C	HP)					
Space heating	•			/		tom counts								7/0043
Fraction of sp	pace hea	at trom se	econdar	y/supple	men	tary syste	m						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					93.4	(206)
Efficiency of secondary/supplementary heating s	system, %				0	(208)
Jan Feb Mar Apr May	Jun Jul	Aug Sep	Oct	Nov Dec	kWh/yea	ar
Space heating requirement (calculated above)			1 1 -		٦	
725.1 543.45 422.86 205.06 68.39	0 0	0 0	235.29 5	743.84		
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $	0 0	0 0	251.92 5	38.07 796.4	7	(211)
770.34 301.00 432.74 219.33 73.22	0 0		ear) =Sum(211)		3690.1	(211)
Space heating fuel (secondary), kWh/month				7 15, 10 12	0000.1	_(= /
= {[(98)m x (201)] } x 100 ÷ (208)						
(215)m= 0 0 0 0 0	0 0	0 0	0	0 0		_
		Total (kWh/y	ear) =Sum(215)	j) _{15,1012} =	0	(215)
Water heating						
Output from water heater (calculated above) 207.66 183.08 191.35 169.72 164.32 1	144.72 138.66	154.57 156.28	177.95 1	89.06 202.71	7	
Efficiency of water heater	l				80.3	(216)
(217)m= 87.94 87.62 86.99 85.53 83.03	80.3 80.3	80.3 80.3	85.76	87.4 88.03		(217)
Fuel for water heating, kWh/month						
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 236.14 208.94 219.97 198.44 197.91 198.44 198.	180.23 172.67	192.49 194.62	207.51 2	16.33 230.28	7	
		Total = Sum(200.20	2455.53	(219)
Annual totals			kWh	n/year	kWh/year	」 ` ′
Space heating fuel used, main system 1					3 <mark>690.1</mark>	
Water heating fuel used					2455.53	
Electricity for pumps, fans and electric keep-hot						
central heating pump:				30	7	(230c)
boiler with a fan-assisted flue				45	Ī	(230e)
Total electricity for the above, kWh/year		sum of (230a)(230g) =		75	(231)
Electricity for lighting					372.02] (232)
12a. CO2 emissions – Individual heating system	ns includina mi	cro-CHP				
	Energy kWh/year		Emission kg CO2/k		Emissions kg CO2/yea	ar
Space heating (main system 1)	(211) x		0.216	=	797.06	(261)
Space heating (secondary)	(215) x		0.519		0](263)
Water heating	(219) x				-	
-		+ (263) + (264) =	0.216		530.4	(264)
Space and water heating		(200) (204) -			1327.46	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	193.08	(268)

Total CO2, kg/year sum of (265)...(271) = 1559.46 (272)

 $TER = 17.62 \tag{273}$

eight associates

Appendix Energy Assessment Barrie House

LEAN Scenario

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.4.16 Property Address: Flat 01 Address: 1. Overall dwelling dimensions Area(m²) Av. Height(m) Volume(m³) **Basement** 64.54 (1a) x 2.7 (2a) =174.26 (3a) Ground floor (1b) x (2b) (3b) 32 28 3.27 105.56 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)96 82 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 279.82 2. Ventilation rate: main secondary other total m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c)0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 1 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.15 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4.9

4.4

5

3.8

4.3

3.8

3.7

4

4.3

4.5

4.7

(22)m=

5.1

Wind Factor (22a)n	`		4.00					1 4 00		T 4.40	1	
(22a)m= 1.27 1.2	5 1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	
Adjusted infiltration	rate (allowi	ing for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.19 0.1		0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18]	
Calculate effective If mechanical ver	•	rate for ti	ne appli	cable ca	se						0.5	(23a)
If exhaust air heat pu		endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othei	wise (23b) = (23a)			0.5	
If balanced with heat		•	, ,	,		,,	,	, , ,			73.9	
a) If balanced me	echanical ve	entilation	with hea	at recove	erv (MVI	HR) (24a	ı)m = (2	2b)m + (23b) × I	1 – (23c)		(200)
(24a)m= 0.32 0.3		0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31]	(24a)
b) If balanced me	echanical ve	entilation	without	heat rec	covery (N	иV) (24b)m = (2:	2b)m + (2	23b)		1	
(24b)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole house	extract ver	ntilation o	r positiv	e input v	ventilatio	n from c	utside				•	
if (22b)m < 0	.5 × (23b), 1	then (24c	;) = (23b); other	wise (24	c) = (22b) m + 0	.5 × (23b)	_	-	
(24c)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural venti if (22b)m = 1			•	•				0.5]				
(24d)m= 0 0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air char	ige rate - er	nter (24a)	or (24b	o) or (24	c) or (2 <mark>4</mark>	d) in box	(25)					
(25)m= 0.32 0.3	2 0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(25)
3. Heat losses and	heat loss	paramete						_			_	
	t heat loss p Gross rea (m²)	oaramete Opening m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	〈)	k-value kJ/m²·	-	A X k kJ/K
ELEMENT	Gross	Opening	gs		m²		K		<)		-	
ELEMENT G	Gross	Opening	gs	A ,r	m² x1.	W/m2	K 0.04] =	(W/I	<) 		-	kJ/K
ELEMENT of all Windows Type 1	Gross	Opening	gs	A ,r	m² x1.	W/m2 /[1/(1.2)+	(K) 0.04] = 0.04] =	(W/F	<) 		-	kJ/K (27)
Windows Type 1 Windows Type 2	Gross	Opening	gs	A ,r	x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+	(No.04] = 0.04] = 0.04] =	8.2 1.15	<) 		-	kJ/K (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3	Gross	Opening	gs	A ,r 7.16 1 2.3	x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	(No.04] = 0.04] = 0.04] =	8.2 1.15 2.63			-	kJ/K (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor	Gross	Opening	gs	A ,r 7.16 1 2.3 9.45	x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/H 8.2 1.15 2.63 10.82			-	kJ/K (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1	Pross rea (m²)	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 8.2 1.15 2.63 10.82 6.4539			-	kJ/K (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2	Pross rea (m²)	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 	(C) (C) (C) (C) (C) (C) (C) (C) (C) (C)	(W/k 8.2 1.15 2.63 10.82 6.4539 3.77			-	kJ/K (27) (27) (27) (27) (28)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3	23.54 54.89	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/N 8.2 1.15 2.63 10.82 6.4539 3.77 5.6			-	kJ/K (27) (27) (27) (27) (28) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3	23.54 24.89 23.95	0 19.91	gs 2	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/N 8.2 1.15 2.63 10.82 6.4539 3.77 5.6 4.98			-	kJ/K (27) (27) (27) (27) (28) (29) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of element	23.54 24.89 31.15 33.95 ents, m ² windows, use e	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15 208.0 alue calcula	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	8.2 1.15 2.63 10.82 6.4539 3.77 5.6 4.98		kJ/m²-	K C	kJ/K (27) (27) (27) (27) (28) (29) (29) (29) (30)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of elements	23.54 54.89 31.15 33.95 ents, m² vindows, use eleptoth sides of in	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15 208.0 alue calcula	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	(Control of the control 8.2 1.15 2.63 10.82 6.4539 3.77 5.6 4.98		kJ/m²-	K C	kJ/K (27) (27) (27) (27) (28) (29) (29) (29) (30) (31)	
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of elements of windows and roof windows and roof with include the areas on the same and the sam	23.54 23.54 54.89 31.15 33.95 ents, m² vindows, use e coth sides of in	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15 208.0 alue calcula	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.16 0.12	(K 0.04] = 0.0	8.2 1.15 2.63 10.82 6.4539 3.77 5.6 4.98	as given in	kJ/m²·	h 3.2	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of elements of the windows and roof with include the areas on the Fabric heat loss, Windows Type 1	23.54 54.89 31.15 33.95 ents, m² vindows, use electronic sides of in I/K = S (A x k)	Opening m	gs 2 andow U-va s and part	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15 33.95 208.0 alue calculatitions	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.16 0.12	(28).	(W/k 8.2 1.15 2.63 10.82 6.4539 3.77 5.6 4.98 4.07	as given in (32a)	kJ/m²·	n 3.2	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31) (33) 3.3 (34)

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

12.29

(36)

	eat loss							(33) +	(36) =			59.96	(3
entilation he	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 29.69	29.34	28.99	27.26	26.92	25.19	25.19	24.84	25.88	26.92	27.61	28.3		(38
eat transfer	coefficier	nt, W/K						(39)m	= (37) + (38)m			
9)m= 89.65	89.3	88.95	87.22	86.88	85.14	85.14	84.8	85.84	86.88	87.57	88.26		
		\							•	Sum(39) ₁ .	12 /12=	87.14	(3
eat loss par	- 	 			0.00	0.00			= (39)m ÷	·			
0.93	0.92	0.92	0.9	0.9	0.88	0.88	0.88	0.89	0.9	0.9	0.91	0.0	(4
umber of da	ays in mor	nth (Tabi	le 1a)					,	Average =	Sum(40) ₁ .	12 / 1 Z=	0.9	(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
. Water hea	ating ener	rgy requi	rement:								kWh/ye	ear:	
oumad aac	unanay l	N I									1		
ssumed occ if TFA > 13			[1 - exp	(-0.0003	49 x (TF	A -13.9)2)1 + 0.0)013 x (ΓFA -13.		71		(4
if TFA £ 13				())	,		/,]	,		-,			
nnual avera											.52		(4
edu <mark>ce the</mark> annu t more that 12	_					-	o acnieve	a water us	se target o	ľ			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage			<u> </u>	,				Sep	Oct	INOV	Dec		
4)m= 108.37	104.43	100.49	96.55	92.61	88.67	88.67	92.61	96.55	100.49	104.43	108.37		
,,,		/ 100110		0=101						m(44) ₁₁₂ =		1182.2	(4
nergy content o	of hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600				L		
5)m= 160.71	140.56	145.04	126.45	121.33	104.7	97.02	111.33	112.66	131.3	143.32	155.64		
									Γotal = Su	m(45) ₁₁₂ =	=	1550.06	(4
		ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,	to (61)			_		
nstantaneous	water heatii		07 000 (770										
S)m= 24.11	21.08	21.76	18.97	18.2	15.71	14.55	16.7	16.9	19.69	21.5	23.35		(4
S)m= 24.11 ater storage	21.08 e loss:	21.76	18.97	18.2			<u> </u>				<u> </u>		
3)m= 24.11 ater storage orage volur	21.08 e loss: me (litres)	21.76 includin	18.97 ng any so	18.2 Dlar or W	WHRS	storage	within sa				23.35		
ater storage orage volur community	21.08 e loss: me (litres) heating a	21.76) includin	18.97 g any so nk in dw	18.2 Dlar or W	/WHRS nter 110	storage litres in	within sa	ıme ves	sel		<u> </u>		
ater storage orage volur community cherwise if r	21.08 e loss: me (litres) heating a no stored	21.76) includin	18.97 g any so nk in dw	18.2 Dlar or W	/WHRS nter 110	storage litres in	within sa	ıme ves	sel		<u> </u>		
nstantaneous 6)m= 24.11 ater storage orage volur community therwise if r ater storage) If manufac	21.08 e loss: me (litres) heating a no stored e loss:	21.76 including and no ta hot water	18.97 Ig any so nk in dw er (this in	18.2 Dlar or W relling, e	/WHRS nter 110 nstantar	storage litres in neous co	within sa	ıme ves	sel	47)	<u> </u>		(4
ater storage orage volur community herwise if r ater storage	21.08 e loss: me (litres) heating a no stored e loss: cturer's de	21.76 including and no tath hot water	18.97 ng any so nk in dw er (this in	18.2 Dlar or W relling, e	/WHRS nter 110 nstantar	storage litres in neous co	within sa	ıme ves	sel	47)	0		(4
ater storage orage volur community therwise if r	21.08 e loss: me (litres) heating a no stored e loss: cturer's de	21.76 including and no tale hot water eclared loans Table	18.97 Ig any so Ik in dw Ir (this in Ir coss factor Ir 2b	18.2 plar or W relling, e ocludes in	/WHRS nter 110 nstantar	storage litres in neous co n/day):	within sa	ame vess	sel	47)	0		(4
ater storage volur community therwise if rater storage of the manuface of the	21.08 e loss: me (litres) heating a no stored e loss: cturer's de factor fro com water cturer's de	21.76 including and no tath hot water eclared to make the storage eclared to the storage ec	18.97 ng any so nk in dw er (this in oss facto 2b , kWh/ye	18.2 Dlar or Warelling, eacludes in the control of	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) ombi boil	ame vess	sel	47)	0 0		(4 (4 (4 (5
ater storage volur community therwise if rater storage of manuface emperature nergy lost from the water storage of water stor	21.08 e loss: me (litres) heating a no stored e loss: cturer's de factor fro rom water cturer's de	21.76 including and no tale hot water the clared learning attention to the color of the color o	18.97 Ig any so nk in dw r (this in oss facto 2b , kWh/ye cylinder loom Tabl	18.2 Dlar or Warelling, eacludes in the control of	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) ombi boil	ame vess	sel	47)	0 0		(4
ater storage volur community therwise if rater storage of manufacture mergy lost from the storage of water s	21.08 e loss: me (litres) heating a no stored e loss: cturer's de factor fro rom water cturer's de prage loss heating s	21.76 including and no tale hot water eclared to make the eclared control from the eclared cont	18.97 Ig any so nk in dw r (this in oss facto 2b , kWh/ye cylinder loom Tabl	18.2 Dlar or Warelling, eacludes in the control of	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) ombi boil	ame vess	sel	47)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4 (4 (4 (5 (5
ater storage volur community therwise if rater storage of manufactors are golden by the storage of the storage	21.08 e loss: me (litres) heating a no stored e loss: cturer's de factor fro com water cturer's de rage loss heating s r from Tal	21.76 including and no tale hot water eclared learning storage eclared of factor from the eclared to factor from the eclared to ble 2a	18.97 Ing any so the ser (this in the s	18.2 Dlar or Warelling, ear oss factors	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) ombi boil	ame vess	sel	47)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4) (4) (5) (5) (5)
ater storage volur community therwise if rater storage of the manuface of the	21.08 e loss: me (litres) heating a no stored e loss: cturer's de factor fro rom water cturer's de rage loss heating s r from Tal factor fro	21.76 including and no tale hot water eclared learning storage eclared of factor from the eclared of	18.97 ng any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	olar or Welling, encludes in the second of t	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) ombi boil	ers) ente	sel er 'O' in (47)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4)

Water storage loss of	alculated	for each	month			((56)m = (55) × (41)	m				
(56)m= 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedica	ted solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss (annual) fro	om Table	e 3							0		(58)
Primary circuit loss of	alculated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified by factor	from Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculate	d for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 50.96 46.03	50.96	47.61	47.19	43.73	45.18	47.19	47.61	50.96	49.32	50.96		(61)
Total heat required for	or water h	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 211.67 186.5	3 196	174.06	168.52	148.43	142.2	158.52	160.27	182.26	192.64	206.6		(62)
Solar DHW input calculate	ed 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 water he	eater											
(64)m= 211.67 186.5	3 196	174.06	168.52	148.43	142.2	158.52	160.27	182.26	192.64	206.6		
						Outp	out from wa	ater heate	r (annual) ₁	12	2127.75	(64)
Heat gains from water	er heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m] + 0.8 x	د [(4 <mark>6)</mark> m	+ (57)m	+ (59)m	1	
(65)m= 66.18 58.24	60.97	53.95	52.14	45.74	43.55	48.82	49.36	56.4	59.98	64.49		(65)
			02		40.00	40.02	49.30	30.4	39.90	04.49		(00)
in <mark>clude</mark> (57)m in ca	alculation										l leating	(00)
include (57)m in ca		of (65)m	only if c								eating	(66)
	ee Table s	of (65)m 5 and 5a	only if c								eating	(66)
5. Internal gains (s	ee Table s	of (65)m 5 and 5a	only if c								eating	(66)
5. Internal gains (s Metabolic gains (Tab	ee Table sole 5), Wat	of (65)m 5 and 5a tts	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	rom com	munity h	eating	(66)
5. Internal gains (s Metabolic gains (Tab	Mar 135.4	of (65)m 5 and 5a tts Apr 135.4	only if control is the control of th	Jun 135.4	Jul 135.4	Aug 135.4	Sep	ater is fr	om com	munity h	peating	
5. Internal gains (s Metabolic gains (Tab Jan Feb (66)m= 135.4 135.4	Mar 135.4 lated in A	of (65)m 5 and 5a tts Apr 135.4	only if control is the control of th	Jun 135.4	Jul 135.4	Aug 135.4	Sep	ater is fr	om com	munity h	eating	
5. Internal gains (s Metabolic gains (Tab Jan Fet (66)m= 135.4 135.4 Lighting gains (calculate)	Mar 135.4 lated in A	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29	only if co): May 135.4 L, equat	Jun 135.4 ion L9 or	Jul 135.4 r L9a), a	Aug 135.4 Iso see	Sep 135.4 Table 5	Oct 135.4	Nov	Dec	peating	(66)
5. Internal gains (s Metabolic gains (Tat Jan Fet (66)m= 135.4 135.4 Lighting gains (calcumus) (67)m= 22.48 19.97	Mar 135.4 lated in A 16.24	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append	only if co): May 135.4 L, equat	Jun 135.4 ion L9 or	Jul 135.4 r L9a), a	Aug 135.4 Iso see	Sep 135.4 Table 5	Oct 135.4	Nov	Dec	leating	(66)
5. Internal gains (s Metabolic gains (Tak Jan Fek (66)m= 135.4 135.4 Lighting gains (calcumos) (67)m= 22.48 19.97 Appliances gains (calcumos)	Mar 135.4 lated in A 16.24 lculated ir	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15	only if co): May 135.4 L, equat 9.19 dix L, eq 215.5	Jun 135.4 ion L9 or 7.76 uation L	Jul 135.4 r L9a), a 8.38 13 or L1 187.84	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 see Ta	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4	peating	(66) (67)
5. Internal gains (s Metabolic gains (Tab Jan Fet (66)m= 135.4 135.4 Lighting gains (calcul (67)m= 22.48 19.97 Appliances gains (calcul (68)m= 251.08 253.6	Mar 135.4 lated in A 16.24 lculated in A 247.12	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15	only if co): May 135.4 L, equat 9.19 dix L, eq 215.5	Jun 135.4 ion L9 or 7.76 uation L	Jul 135.4 r L9a), a 8.38 13 or L1 187.84	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 see Ta	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4	peating	(66) (67)
5. Internal gains (s Metabolic gains (Tat Jan Fet (66)m= 135.4 135.4 Lighting gains (calcumus) (67)m= 22.48 19.97 Appliances gains (calcumus) (68)m= 251.08 253.6 Cooking gains (calcumus)	Mar 135.4 lated in A 16.24 lculated in 9 247.12 lated in A 36.54	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54	only if construction only in construction only in construction only in c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a)	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 See Ta 191.8	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4 23.11	leating	(66) (67) (68)
5. Internal gains (s Metabolic gains (Tak Jan Fek (66)m= 135.4 135.4 Lighting gains (calcumos) (67)m= 22.48 19.97 Appliances gains (canon) (68)m= 251.08 253.6 Cooking gains (calcumos) Cooking gains (calcumos) (69)m= 36.54 36.54	Mar 135.4 lated in A 16.24 lculated in 9 247.12 lated in A 36.54	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54	only if construction only in construction only in construction only in c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a)	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 See Ta 191.8	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4 23.11	peating	(66) (67) (68)
5. Internal gains (s Metabolic gains (Tat Jan Fet (66)m= 135.4 135.4 Lighting gains (calculate) (67)m= 22.48 19.97 Appliances gains (calculate) (68)m= 251.08 253.6 Cooking gains (calculate) (69)m= 36.54 36.54 Pumps and fans gain	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 ns (Table s	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15 ppendix 36.54 5a) 3	only if only i	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42 36.54	Dec 135.4 23.11 240.01 36.54	leating	(66) (67) (68) (69)
5. Internal gains (s Metabolic gains (Tat Jan Fet (66)m= 135.4 135.4 Lighting gains (calcument (67)m= 22.48 19.97) Appliances gains (calcument (68)m= 251.08 253.6) Cooking gains (calcument (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 as (Table s 3	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54 5a) 3 tive valu	only if only i	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42	Dec 135.4 23.11 240.01 36.54	leating	(66) (67) (68) (69)
5. Internal gains (s Metabolic gains (Tak Jan Fek (66)m= 135.4 135.4 Lighting gains (calcul (67)m= 22.48 19.97 Appliances gains (calcul (68)m= 251.08 253.6 Cooking gains (calcul (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3 Losses e.g. evapora	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 as (Table s 3 cion (nega 2 -108.32	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54 5a) 3 tive valu	only if only i	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42 36.54	Dec 135.4 23.11 240.01 36.54	peating	(66) (67) (68) (69) (70)
5. Internal gains (s Metabolic gains (Tak Jan Fet Jan Fet (66)m= 135.4 135.4 Lighting gains (calcul (67)m= 22.48 19.97 Appliances gains (calcul (68)m= 251.08 253.6 Cooking gains (calcul (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3 Losses e.g. evapora (71)m= -108.32 -108.3	Mar 135.4 lated in A 16.24 lculated in A 36.54 ls (Table 5) 3 lcion (nega 2 -108.32	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54 5a) 3 tive valu	only if only i	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42 36.54	Dec 135.4 23.11 240.01 36.54	leating	(66) (67) (68) (69) (70)
5. Internal gains (s Metabolic gains (Tak Jan Fek (66)m= 135.4 135.4 Lighting gains (calcu (67)m= 22.48 19.97 Appliances gains (ca (68)m= 251.08 253.6 Cooking gains (calcu (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3 Losses e.g. evapora (71)m= -108.32 -108.3 Water heating gains	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 as (Table s 3 cion (nega 2 -108.32 (Table 5) 81.94	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15 ppendix 36.54 5a) 3 tive valu -108.32	only if construction only if c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54 3 ole 5) -108.32	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 9 see Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 3 -108.32	Nov 135.4 21.68 223.42 36.54 3	Dec 135.4 23.11 240.01 36.54 3 -108.32	leating	(66) (67) (68) (69) (70)
5. Internal gains (s Metabolic gains (Tak Jan Fek (66)m= 135.4 135.4 Lighting gains (calcul (67)m= 22.48 19.97 Appliances gains (calcul (68)m= 251.08 253.6 Cooking gains (calcul (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3 Losses e.g. evapora (71)m= -108.32 -108.3 Water heating gains (72)m= 88.94 86.67	Mar 135.4 lated in A 16.24 lculated ir A 36.54 ls (Table s 3 lcion (nega 2 -108.32 (Table 5) 81.94	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15 ppendix 36.54 5a) 3 tive valu -108.32	only if construction only if c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54 3 ole 5) -108.32	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 3 -108.32	Nov 135.4 21.68 223.42 36.54 3	Dec 135.4 23.11 240.01 36.54 3 -108.32	leating	(66) (67) (68) (69) (70)

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

Orientation: Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x} 0.77	x	2.3	x	11.28	X	0.55	x	0.7	=	6.92	(75)
Northeast _{0.9x} 0.77	X	2.3	X	22.97	X	0.55	X	0.7	=	14.09	(75)
Northeast 0.9x 0.77	X	2.3	x	41.38	X	0.55	x	0.7	=	25.39	(75)
Northeast 0.9x 0.77	x	2.3	x	67.96	x	0.55	x	0.7	=	41.7	(75)
Northeast _{0.9x} 0.77	x	2.3	x	91.35	x	0.55	x	0.7	=	56.05	(75)
Northeast 0.9x 0.77	X	2.3	x	97.38	x	0.55	x	0.7	=	59.76	(75)
Northeast _{0.9x} 0.77	X	2.3	x	91.1	X	0.55	x	0.7	=	55.9	(75)
Northeast _{0.9x} 0.77	X	2.3	x	72.63	X	0.55	X	0.7	=	44.57	(75)
Northeast _{0.9x} 0.77	X	2.3	x	50.42	X	0.55	x	0.7	=	30.94	(75)
Northeast _{0.9x} 0.77	X	2.3	X	28.07	X	0.55	X	0.7	=	17.22	(75)
Northeast _{0.9x} 0.77	X	2.3	X	14.2	X	0.55	X	0.7	=	8.71	(75)
Northeast _{0.9x} 0.77	x	2.3	x	9.21	X	0.55	x	0.7	=	5.65	(75)
Northwest 0.9x 0.77	X	7.16	X	11.28	X	0.55	X	0.7	=	21.55	(81)
Northwest 0.9x 0.77	X	1	X	11.28	X	0.55	X	0.7	=	3.01	(81)
Northwest 0.9x 0.77	x	9.45	x	11.28	X	0.55	x	0.7	=	28.45	(81)
Northwest 0.9x 0.77	X	7.16	X	22.97	Х	0.55	X	0.7	-	43.87	(81)
Northwest 0.9x 0.77	x	1	х	22.97	х	0.55	X	0.7	=	6.13	(81)
Northwest _{0.9x} 0.77	x	9.45	x	22.97	×	0.55	x	0.7	=	57.91	(81)
Northwest 0.9x 0.77	x	7.16	х	41.38	x	0.55	x	0.7	=	79.05	(81)
Northwest 0.9x 0.77	x	1	х	41.38	×	0.55	x	0.7	=	11.04	(81)
Northwest 0.9x 0.77	x	9.45	х	41.38	х	0.55	x	0.7	=	104.33	(81)
Northwest 0.9x 0.77	X	7.16	х	67.96	X	0.55	x	0.7	=	129.82	(81)
Northwest 0.9x 0.77	X	1	X	67.96	x	0.55	X	0.7	=	18.13	(81)
Northwest 0.9x 0.77	X	9.45	X	67.96	X	0.55	X	0.7	=	171.34	(81)
Northwest 0.9x 0.77	X	7.16	x	91.35	x	0.55	X	0.7	=	174.5	(81)
Northwest 0.9x 0.77	x	1	x	91.35	x	0.55	x	0.7	=	24.37	(81)
Northwest 0.9x 0.77	X	9.45	x	91.35	x	0.55	X	0.7	=	230.31	(81)
Northwest 0.9x 0.77	X	7.16	X	97.38	x	0.55	x	0.7	=	186.04	(81)
Northwest 0.9x 0.77	X	1	X	97.38	X	0.55	x	0.7	=	25.98	(81)
Northwest 0.9x 0.77	X	9.45	X	97.38	X	0.55	X	0.7	=	245.54	(81)
Northwest 0.9x 0.77	X	7.16	X	91.1	X	0.55	x	0.7	=	174.03	(81)
Northwest 0.9x 0.77	X	1	X	91.1	X	0.55	x	0.7	=	24.31	(81)
Northwest 0.9x 0.77	X	9.45	X	91.1	X	0.55	X	0.7	=	229.69	(81)
Northwest 0.9x 0.77	x	7.16	X	72.63	X	0.55	x	0.7	=	138.74	(81)
Northwest 0.9x 0.77	X	1	x	72.63	x	0.55	X	0.7	=	19.38	(81)
Northwest 0.9x 0.77	X	9.45	x	72.63	x	0.55	x	0.7	<u> </u>	183.11	(81)
Northwest 0.9x 0.77	X	7.16	x	50.42	x	0.55	x	0.7] =	96.32	(81)
Northwest 0.9x 0.77	X	1	x	50.42	x	0.55	x	0.7] =	13.45	(81)
Northwest 0.9x 0.77	X	9.45	x	50.42	x	0.55	x	0.7] =	127.13	(81)

_															
Northwest 0.9x	0.77	X	7.1	6	x	2	8.07	X		0.55	X	0.7	=	53.62	(81)
Northwest 0.9x	0.77	X	1		X	2	8.07	X		0.55	X	0.7	=	7.49	(81)
Northwest 0.9x	0.77	X	9.4	·5	x	2	8.07	X		0.55	x	0.7	=	70.77	(81)
Northwest 0.9x	0.77	X	7.1	6	x	•	14.2	X		0.55	x	0.7	=	27.12	(81)
Northwest 0.9x	0.77	X	1		x	•	14.2	X		0.55	x	0.7	=	3.79	(81)
Northwest 0.9x	0.77	X	9.4	·5	x	,	14.2	X		0.55	x	0.7		35.79	(81)
Northwest 0.9x	0.77	X	7.1	6	x	(9.21	X		0.55	x	0.7	=	17.6	(81)
Northwest _{0.9x}	0.77	X	1		x	(9.21	X		0.55	x	0.7	=	2.46	(81)
Northwest 0.9x	0.77	X	9.4	.5	x	(9.21	X		0.55	x	0.7	=	23.23	(81)
_					•										
Solar gains in	watts, cal	culated	for eacl	n month				(83)m	= St	um(74)m	(82)m				
(83)m= 59.94	122	219.81	360.99	485.24	51	17.31	483.94	385	5.8	267.84	149.1	75.41	48.95		(83)
Total gains – i	nternal an	ıd solar	(84)m =	(73)m ·	+ (8	33)m	, watts	•	•			•		•	
(84)m= 489.07	548.95	631.74	747.98	846.63	85	4.15	805.32	714.	.17	609.45	515.87	470.44	465.36		(84)
7. Mean inter	nal tempe	erature (heating	season)										
Temperature						area f	from Tah	nle 9	Th	1 (°C)				21	(85)
Utilisation fac	_	•			-			JIC 0,	• • • • •	. (0)				21	(00)
Jan	Feb	Mar		May	È	Jun	Jul			Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.96	0.84		.62	0.46	0.5	ug :4	0.85	0.99	1	1		(86)
											0.99				(00)
Me <mark>an int</mark> erna				·	_									,	
(87)m= 19.98	20.1	20.33	20.66	20.9	2	0.99	21	21	1	20.92	20.6	20.24	19.97		(87)
Temperature	during he	eating pe	eriods ir	rest of	dw	elling	from Ta	able 9	, Tr	12 (°C)					
(88)m= 20.15	20.15	20.15	20.17	20.17	2	0.19	20.19	20.	19	20.18	20.17	20.16	20.16		(88)
Utilisation fac	tor for gai	ins for r	est of d	welling.	h2.	m (se	e Table	9a)							
(89)m= 1	1	0.99	0.95	0.79	_).55	0.38	0.4	5	0.79	0.98	1	1]	(89)
Maan intarna	l tomporo	turo in t	ho root	of dwalli	na.	T2 /f	allow oto	L	+o 7	in Tabl	o 0o)	!		ı	
Mean interna (90)m= 18.77	18.94	19.28	19.76	20.07	Ť	1 ∠ (10 0.18	20.18	20.	$\overline{}$	20.12	e 9c) 19.68	19.16	18.76	1	(90)
(90)111- 18.77	10.94	19.20	19.70	20.07		0.16	20.16	20.	19			ng area ÷ (4			` ′
											LA - LIVII	ig area · (-	") =	0.22	(91)
Mean interna	I tempera	ture (for	r the wh	ole dwe	lling	g) = fl	_A × T1	+ (1	– fL	A) × T2		_			
(92)m= 19.03	19.2	19.51	19.96	20.26	2	0.36	20.36	20.3	36	20.29	19.89	19.4	19.02		(92)
Apply adjustr	nent to the	e mean	internal	temper	atu	re fro	m Table	4e, v	whe	re appro	priate			,	
(93)m= 18.88	19.05	19.36	19.81	20.11	2	0.21	20.21	20.2	21	20.14	19.74	19.25	18.87		(93)
8. Space hea	ting requi	rement													
Set Ti to the					ed	at ste	ep 11 of	Tabl	e 9b	, so that	t Ti,m=((76)m an	d re-cal	culate	
the utilisation	1 1				_	_						T	T _	1	
Jan	Feb	Mar	Apr	May	<u>_</u>	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Utilisation fac					_					1				1	(04)
(94)m= 1	1 1	0.99	0.94	0.79).55	0.38	0.4	.5	0.78	0.97	1	1		(94)
Useful gains,	- i	`	<u> </u>		1-	74.07	007.0		00	477.55	500.54	100.00	404.77	1	(OE)
(95)m= 488.23	LL	623.77	703.45	668.46		71.67	307.2	322.	.23	477.55	502.54	468.66	464.77		(95)
Monthly aver		- i			_		10.0	10	, 1	444	10.0	7.4	4.0	1	(06)
(96)m= 4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.		14.1	10.6	7.1	4.2	J	(96)
Heat loss rate									' T	<u> </u>		1062 77	1205.04	1	(97)
(97)m= 1307.25	1263.27	1143.91	951.34	730.29	L 4/	77.24	307.66	323.	.45	518.74	793.62	1063.77	1295.04	J	(31)

Space heating requirement for	or each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 609.35 481.41 386.98	178.48	46	0	0	0	0	216.56	428.48	617.72		_
					Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	2964.98	(98)
Space heating requirement in	n kWh/m²	²/year								30.62	(99)
9a. Energy requirements – Ind	lividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heating:									Г		7,004)
Fraction of space heat from s			mentary	system	(202) = 1	(201) -				0	(201)
Fraction of space heat from r	•	` '			(202) = 1	,	(203)] =			1	(202)
Fraction of total heating from	•				(204) - (2	02) ^ [1 =	(203)] =		<u> </u>	1	(204)
Efficiency of main space hear Efficiency of secondary/suppl			a eveton	0/-					[90.4	(208)
			· ·	i	<u> </u>	Con	Oct	Nov		-	」 ` ′
Jan Feb Mar Space heating requirement (Apr calculate	May d above	Jun)	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
609.35 481.41 386.98	178.48	46	0	0	0	0	216.56	428.48	617.72		
$(211)m = \{[(98)m \times (204)]\} \times (204)$	100 ÷ (20)6)	!	<u>I</u>		!	!	!	!		(211)
674.06 532.53 428.08	197.43	50.89	0	0	0	0	239.56	473.98	683.32		_
					Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	3279.85	(211)
Space heating fuel (secondar	- 1	month									
$= \{[(98)m \times (201)]\} \times 100 \div (201)$ (215)m= 0 0 0	08)	0	0	0	0	0	0	0	0		
			,			ıl (kWh/yea				0	(215)
Water heating									L		J
Output from water heater (calc					T				· 1		
211.67 186.58 196	174.06	168.52	148.43	142.2	158.52	160.27	182.26	192.64	206.6	22.2	7(246)
Efficiency of water heater (217)m= 87.56 87.33 86.73	85.11	82.27	80.3	80.3	80.3	80.3	85.49	87.01	87.64	80.3	(216)
Fuel for water heating, kWh/m		02.21		00.0		00.0	00.40	07.01	07.04		(=,
(219) m = (64) m x $100 \div (217)$	<u>)m</u>			1	•						
(219)m= 241.74 213.65 225.98	204.5	204.84	184.84	177.09	197.41	199.59	213.2	221.41	235.74		٦
Ammunal dadala					Tota	ıl = Sum(2		Mb /		2519.99	(219)
Annual totals Space heating fuel used, main	system	1					K	Wh/yeaı	· [kWh/year 3279.85	7
Water heating fuel used	,									2519.99	╡
Electricity for pumps, fans and	electric	keen-ho	t						Ĺ	2010100	╛
mechanical ventilation - balar		•		anut fror	n outside	2			230.43		(230a)
	iocu, cxl	ιασι σι μ	JOSIUVE II	iput IIOI	ii outsidt	-					
central heating pump:						-f (000-)	(000=)		30		(230c)
Total electricity for the above,	kWh/yea	r			sum	of (230a).	(230g) =			260.43	(231)
Electricity for lighting										397.05	(232)
12a. CO2 emissions – Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHF						

Energy

kWh/year

Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	708.45	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	544.32	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1252.76	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	135.16	(267)
Electricity for lighting	(232) x	0.519	=	206.07	(268)
Total CO2, kg/year	sum	of (265)(271) =		1594	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =		16.46	(273)
El rating (section 14)				85	(274)

		User Details:				
Assessor Name: Software Name:	Stroma FSAP 2012	Stroma N Software		Versio	n: 1.0.4.16	
		Property Address: Fla				
Address :						
Overall dwelling dimens	sions:					
.		Area(m²)	Av. Height(m	1)	Volume(m³)	
Basement		52.41 (1a)		(2a) =	141.51	(3a)
Ground floor		32.02 (1b)	x 3.27	(2b) =	104.71	(3b)
Total floor area TFA = (1a)-	+(1b)+(1c)+(1d)+(1e)+(1n) 84.43 (4)				_
Dwelling volume)+(3b)+(3c)+(3d)+(3e)+	(3n) =	246.22	(5)
2. Ventilation rate:					240.22	
2. Ventilation rate.	main seconda		total		m³ per hour	•
Number of chimneys	heating heating + 0		= 0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	= 0	x 20 =	0	(6b)
Number of intermittent fans			0	x 10 =	0	」 (7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fires	s		0	x 40 =	0	(7c)
Infiltration due to chimneys	flues and fans = (6a)+(6b)+ n carried out or is intended, proce		0 0 (16)	A ir ch	anges per hou	ur](8)
Number of storeys in the		ed to (17), otherwise contin	1011 (9) 10 (10)	1	0	(9)
Additional infiltration			[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25	for steel or timber frame of	or 0.35 for masonry co	enstruction	İ	0	(11)
if both types of wall are pres deducting areas of openings	ent, use the value corresponding	to the greater wall area (aft	er	•		_
	or, enter 0.2 (unsealed) or	0.1 (sealed), else ente	er O	[0	(12)
If no draught lobby, enter	,	, ,,		ļ	0	(13)
•	and doors draught stripped			[0	(14)
Window infiltration	д си ррс	0.25 - [0.2 x (14	4) ÷ 100] =	L [0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	l I	0	(16)
	50, expressed in cubic met	res per hour per squar	e metre of envelor	i oe area - [3	(17)
If based on air permeability	•		·	[0.15	(18)
Air permeability value applies it	a pressurisation test has been d	one or a degree air permea	bility is being used	L		
Number of sides sheltered					0	(19)
Shelter factor		(20) = 1 - [0.07]	5 x (19)] =	İ	1	(20)
Infiltration rate incorporating	g shelter factor	(21) = (18) x (2	0) =	j	0.15	(21)
Infiltration rate modified for	monthly wind speed					
Jan Feb M	ar Apr May Jun	Jul Aug S	Sep Oct No	v Dec		
Monthly average wind spee	ed from Table 7					

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

Wind Factor (22a)m - (22)m + 4	
Wind Factor (22a)m = (22)m ÷ 4 (22a)m= 1.27	
Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.19 0.19 0.18 0.16 0.16 0.14 0.14 0.14 0.15 0.16 0.17 0.18 Calculate effective air change rate for the applicable case	
	23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 73.95	23c)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]	
(24a)m= 0.32 0.31 0.3 0.29 0.27 0.27 0.28 0.29 0.3 0.31 (2	24a)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)	
(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)
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 =	24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	
(25)m= 0.32 0.32 0.31 0.3 0.29 0.27 0.27 0.28 0.29 0.3 0.31 (2	25)
	25)
3. Heat losses and heat loss parameter: ELEMENT Gross Openings Net Area U-value A X U k-value A X k	25)
3. Heat losses and heat loss parameter: ELEMENT Gross Openings Met Area U-value A X U k-value A X k kJ/m²·K kJ/m²·K kJ/m²·K	
3. Heat losses and heat loss parameter: ELEMENT Gross Openings m^2 Net Area U-value A X U (W/K) k-value kJ/m²·K M/M^2 ·K $M/M^$	25) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross Openings m² Net Area $A, m²$ W/m2K $A \times U$ (W/K) $A \times V$ Windows Type 1	27) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross Openings m² Net Area A , m² W/m2K (W/K) k-value kJ/m²-K (W/K) Windows Type 1 Windows Type 2 2.3 $x^{1/[1/(1.2) + 0.04]} = 9.74$ (2 Windows Type 3 $x^{1/[1/(1.2) + 0.04]} = 10.82$ (2	27) 27) 27)
3. Heat losses and heat loss parameter: 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 Windows Type 1 8.51 $x^{1/[1/(1.2) + 0.04]} = 9.74$ (2 Windows Type 2 2.3 $x^{1/[1/(1.2) + 0.04]} = 2.63$ (2 Windows Type 3 9.45 $x^{1/[1/(1.2) + 0.04]} = 10.82$ (2 Windows Type 4 9.56 $x^{1/[1/(1.2) + 0.04]} = 10.95$ (2	27) 27) 27) 27)
3. Heat losses and heat loss parameter: 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 Windows Type 1 8.51 $x1/[1/(1.2) + 0.04] = 9.74$ 9.74 (2 Windows Type 2 2.3 $x1/[1/(1.2) + 0.04] = 2.63$ (2 Windows Type 3 9.45 $x1/[1/(1.2) + 0.04] = 10.82$ (2 Windows Type 4 9.56 $x1/[1/(1.2) + 0.04] = 10.95$ (2 Windows Type 5 4.65 $x1/[1/(1.2) + 0.04] = 5.32$ (2	27) 27) 27) 27) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross	27) 27) 27) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	27) 27) 27) 27) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	27) 27) 27) 27) 27) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	227) 227) 227) 227) 227) 228)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A ,m² W/m2K (W/K) kJ/m²-K kJ/K Windows Type 1	227) 227) 227) 227) 227) 227) 228) 229)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Floor Walls Type 1 Walls Type 2 Walls Type 3 Walls Type 3 Walls Type 3 Walls Type 3 Walls Type 3 Walls Type 3 Walls Type 4 Walls Type 4 Walls Type 5 Walls Type 5 Walls Type 6 Walls Type 7 Wal	227) 227) 227) 227) 227) 227) 228) 229)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A , m² W/m2K (W/K) kJ/m²-K Windows Type 1 Windows Type 2 2.3 x1/[1/(1.2) + 0.04] = 9.74 Windows Type 3 Windows Type 4 9.56 x1/[1/(1.2) + 0.04] = 10.82 Windows Type 5 Floor 52.412 x 0.1 = 5.2412 Walls Type1 27.27 0 27.27 x 0.16 = 4.36 Walls Type2 76.5 34.47 42.03 x 0.16 = 6.73 Walls Type3 12.09 0 12.09 x 0.16 = 1.93 Roof 20.39 0 20.39 x 0.12 = 2.45	227) 227) 227) 227) 227) 228) 229) 229)
3. Fleat losses and heat loss parameter: ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Floor Walls Type 1 Walls Type 2 Walls Type 2 Walls Type 3 Walls Type 3 Walls Type 3 Walls Type 4 Walls Type 4 Walls Type 5 A. St. A. M. A. W. Windows A. A. M. A. W. Windows A. M. A. M. A. M. A. M. M. M. M. M. M. M. M. M. M. M. M. M.	227) 227) 227) 227) 227) 228) 229) 229)
3. Heat losses and heat loss parameter: ELEMENT Gross area (n²) Openings m² Net Area A ,m² W/m²2K (W/K) kJ/m²-K kJ/K Windows Type 1 Windows Type 2 2.3 x1/[1/(1.2)+0.04] = 9.74 Windows Type 3 Windows Type 4 9.56 x1/[1/(1.2)+0.04] = 10.82 Windows Type 5 Floor 52.412 x 0.1 = 5.2412 Walls Type 1 27.27 0 27.27 x 0.16 = 4.36 Walls Type 2 76.5 34.47 42.03 x 0.16 = 6.73 Walls Type 3 12.09 0 12.09 x 0.16 = 1.93 Roof 20.39 0 20.39 x 0.12 = 2.45 Total area of elements, m² 188.66 * 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)	227) 227) 227) 227) 227) 227) 228) 229) 229) 229) 330)

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.

	•	,	•		using Ap	•	<						12.8	(36)
	of therma abric he		are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			72.98	(37)
			alculated	d monthly	y				. ,		25)m x (5)		72.90	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	26.12	25.82	25.51	23.99	23.68	22.16	22.16	21.86	22.77	23.68	24.29	24.9		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	99.1	98.8	98.49	96.97	96.66	95.14	95.14	94.84	95.75	96.66	97.27	97.88		_
Heat Ic	oss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) _{1.} (4)	.12 /12=	96.89	(39)
(40)m=	1.17	1.17	1.17	1.15	1.14	1.13	1.13	1.12	1.13	1.14	1.15	1.16		
Numbe	er of day	s in mor	nth (Tah	le 1a)					,	Average =	Sum(40) _{1.}	.12 /12=	1.15	(40)
rambe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			<u> </u>	<u> </u>			<u> </u>							
4. Wa	ater heat	ting ener	rgy requ	irement:								kWh/ye	ear:	
۸۵۵۰۰۳	and annu	inanai. I	N I										1	(40)
if TF				[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		54		(42)
			ater usag	ge in litre	es per da	ıy Vd,av	erage =	(25 x N)	+ 36		94	.56		(43)
					5% if the d		-	o achieve	a water us	e target o				
not more										2 /			1	
Hot wate	Jan er usage ii	Feb	Mar day for ea	Apr	May Vd,m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	104.02	100.24	96.45	92.67	88.89	85.11		(.0)						
(++)11	104.02	100.24	00.70				1 85 11	88 89	92 67	96.45	100 24	104 02		
			!		00.00	00.1	85.11	88.89	92.67	96.45	100.24 n(44) ₁₁₂ =	104.02	1134.76	1 (44)
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.					Γotal = Su	m(44) ₁₁₂ =		1134.76	(44)
Energy (45)m=	content of	hot water 134.91	used - cal	culated mo						Γotal = Su	m(44) ₁₁₂ =		1134.76	
(45)m=	154.26	134.91	139.22	121.38	onthly = 4.	190 x Vd,r	93.13	0Tm / 3600 106.86	108.14	Fotal = Sui th (see Ta	m(44) ₁₁₂ =	c, 1d)	1134.76 1487.84	(44)
(45)m=	154.26	134.91	139.22	121.38	onthly = 4.	190 x Vd,r	93.13	0Tm / 3600 106.86	108.14	Fotal = Sui th (see Ta	m(44) ₁₁₂ = ables 1b, 1 137.57	c, 1d)		
(45)m= If instant (46)m= Water	taneous w 23.14 storage	134.91 vater heatin 20.24 loss:	139.22 ng at point 20.88	121.38 f of use (no	onthly = 4. 116.46 hot water 17.47	190 x Vd,r. 100.5 storage),	93.13 enter 0 in	07m / 3600 106.86 boxes (46) 16.03	108.14 106.14 108.22	Total = Sui th (see Ta 126.03 Total = Sui 18.9	m(44) ₁₁₂ = sbles 1b, 1. 137.57 m(45) ₁₁₂ =	c, 1d)		(45)
(45)m= If instant (46)m= Water Storag	taneous w 23.14 storage e volum	134.91 vater heatin 20.24 loss: e (litres)	139.22 ng at point 20.88 includir	121.38 f of use (no 18.21 ng any so	onthly = 4. 116.46 hot water 17.47 Dlar or W	190 x Vd,ri 100.5 storage), 15.07	93.13 enter 0 in 13.97 storage	07m / 3600 106.86 boxes (46) 16.03 within sa	108.14 106.14 108.22	Total = Sui th (see Ta 126.03 Total = Sui 18.9	m(44) ₁₁₂ = bles 1b, 112 = 20.64	c, 1d)		(45)
(45)m= If instant (46)m= Water Storag If comm	taneous w 23.14 storage e volum munity h	134.91 vater heatin 20.24 loss: e (litres) eating a	139.22 ng at point 20.88 includir and no ta	121.38 f of use (not) 18.21 ng any so	onthly = 4. 116.46 hot water 17.47 clar or W yelling, e	190 x Vd,r. 100.5 storage), 15.07 /WHRS	93.13 enter 0 in 13.97 storage	106.86 boxes (46) 16.03 within sa	108.14 108.61) 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 112 = 20.64	22.41		(45) (46)
(45)m= If instant (46)m= Water Storag If commotherw	taneous w 23.14 storage e volum munity h	134.91 20.24 loss: e (litres) eating a o stored	139.22 ng at point 20.88 includir and no ta	121.38 f of use (not) 18.21 ng any so	onthly = 4. 116.46 hot water 17.47 Dlar or W	190 x Vd,r. 100.5 storage), 15.07 /WHRS	93.13 enter 0 in 13.97 storage	106.86 boxes (46) 16.03 within sa	108.14 108.61) 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 112 = 20.64	22.41		(45) (46)
(45)m= If instant (46)m= Water Storag If commotherw Water	taneous w 23.14 storage e volum munity h vise if no	134.91 20.24 loss: e (litres) eating a stored loss:	139.22 ng at point 20.88 includir and no ta hot wate	121.38 fof use (not) 18.21 ng any so ank in dw er (this in	onthly = 4. 116.46 hot water 17.47 clar or W yelling, e	190 x Vd,r 100.5 storage), 15.07 /WHRS nter 110	93.13 enter 0 in 13.97 storage litres in neous co	106.86 boxes (46) 16.03 within sa	108.14 108.61) 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46)
(45)m= If instant (46)m= Water Storag If comr Otherw Water a) If m	taneous w 23.14 storage e volum munity h vise if no storage	134.91 20.24 loss: e (litres) eating a stored loss:	139.22 ng at point 20.88 includir and no ta hot wate	121.38 for use (not) 18.21 ng any so ank in dw er (this in	onthly = 4. 116.46 hot water 17.47 olar or W velling, e	190 x Vd,r 100.5 storage), 15.07 /WHRS nter 110	93.13 enter 0 in 13.97 storage litres in neous co	106.86 boxes (46) 16.03 within sa	108.14 108.61) 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47)
(45)m= If instant (46)m= Water Storag If comr Otherw Water a) If m Tempe Energy	taneous w 23.14 storage e volum munity h vise if no storage nanufact erature fa	134.91 20.24 loss: e (litres) eating a costored loss: urer's de actor fro	139.22 ng at point 20.88 includir and no ta hot wate eclared I m Table	121.38 for use (not) 18.21 Ing any so ank in dwer (this in oss factors) 2b g, kWh/ye	onthly = 4. 116.46 hot water 17.47 clar or Water velling, encludes in the control of the co	190 x Vd,r 100.5 storage), 15.07 WHRS nter 110 nstantar	93.13 enter 0 in 13.97 storage litres in neous co	106.86 boxes (46) 16.03 within sa	108.14 108.14 10.22 16.22 16.22 16.22 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47) (48)
(45)m= If instant (46)m= Water Storag If commotherw Water a) If m Tempe Energy b) If m	taneous w 23.14 storage e volum munity h vise if no storage nanufact erature fa	134.91 20.24 loss: e (litres) eating a o stored loss: urer's de actor fro m water urer's de	139.22 ng at point 20.88 includir and no ta hot wate eclared I m Table storage	121.38 for use (not) 18.21 Ing any so ank in dwer (this in oss factors) 2b c, kWh/ye cylinder (1)	onthly = 4. 116.46 hot water 17.47 plar or W velling, e ncludes in or is known ear	190 x Vd,r. 100.5 storage), 15.07 /WHRS nter 110 nstantar wn (kWh	93.13 enter 0 in 13.97 storage litres in neous con/day):	106.86 boxes (46) 16.03 within sa (47)	108.14 108.14 10.22 16.22 16.22 16.22 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47) (48) (49) (50)
(45)m= If instant (46)m= Water Storag If commotherw Water a) If m Tempe Energy b) If m Hot wa	taneous w 23.14 storage e volum munity h vise if no storage nanufact erature fa y lost fro nanufact ater storage	134.91 20.24 loss: lee (litres) leating a lostored loss: lurer's de actor fro m water urer's de age loss	139.22 ng at point 20.88 includir and no ta hot wate eclared I m Table eclared of	121.38 f of use (not) 18.21 Ing any so ank in dweer (this in oss factors) 2b c, kWh/ye cylinder left om Table	onthly = 4. 116.46 hot water 17.47 clar or Water velling, encludes in the control of the co	190 x Vd,r. 100.5 storage), 15.07 /WHRS nter 110 nstantar wn (kWh	93.13 enter 0 in 13.97 storage litres in neous con/day):	106.86 boxes (46) 16.03 within sa (47)	108.14 108.14 10.22 16.22 16.22 16.22 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47) (48) (49)
(45)m= If instant (46)m= Water Storag If comr Otherw Water a) If m Tempe Energy b) If m Hot wa If comr	taneous w 23.14 storage e volum munity h vise if no storage nanufact erature fa / lost fro nanufact ater stora munity h	134.91 20.24 loss: e (litres) eating a o stored loss: urer's de actor fro m water urer's de	139.22 ng at point 20.88 includir and no ta hot wate eclared I m Table storage eclared of	121.38 for use (not) 18.21 Ing any so ank in dweer (this in oss factors) 2b c, kWh/ye cylinder left om Table	onthly = 4. 116.46 hot water 17.47 plar or W velling, e ncludes in or is known ear	190 x Vd,r. 100.5 storage), 15.07 /WHRS nter 110 nstantar wn (kWh	93.13 enter 0 in 13.97 storage litres in neous con/day):	106.86 boxes (46) 16.03 within sa (47)	108.14 108.14 10.22 16.22 16.22 16.22 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47) (48) (49) (50)
(45)m= If instant (46)m= Water Storag If commotherw Water a) If m Tempe Energy b) If m Hot wa If commotherw Volume	taneous w 23.14 storage e volum munity h vise if no storage nanufact erature fa / lost fro nanufact ater stora munity h e factor	134.91 20.24 loss: e (litres) eating a control stored loss: urer's defactor from water urer's defage loss leating s	139.22 ng at point 20.88 includir and no ta hot wate eclared I m Table storage eclared of factor fr see secti	121.38 for use (not) 18.21 Ing any so ank in dweer (this in oss factors 2b expected, kWh/ye cylinder I from Table on 4.3	onthly = 4. 116.46 hot water 17.47 plar or W velling, e ncludes in or is known ear	190 x Vd,r. 100.5 storage), 15.07 /WHRS nter 110 nstantar wn (kWh	93.13 enter 0 in 13.97 storage litres in neous con/day):	106.86 boxes (46, 16.03 within sa (47)	108.14 108.14 10.22 16.22 16.22 16.22 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bbles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47) (48) (49) (50) (51)

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	= 0		(5	54)
Enter (50) or (54) in (55)		0		(5	55)
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	(5	56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m wh	here (H11) is fron	n Appendi	×Н	
(57)m= 0 0 0 0 0 0 0	0 0	0 0	0	(5	57)
Primary circuit loss (annual) from Table 3		0		(5	58)
Primary circuit loss calculated for each month (59)m = (58) \div	365 × (41)m				
(modified by factor from Table H5 if there is solar water hea	ating and a cylinder the	ermostat)			
(59)m= 0 0 0 0 0 0 0	0 0	0 0	0	(5	59)
Combi loss calculated for each month (61)m = (60) \div 365 × (4	l1)m				
(61)m= 50.96 46.03 49.15 45.7 45.3 41.97 43.37	45.3 45.7 49	9.15 49.32	50.96	(6	61)
Total heat required for water heating calculated for each mon	th (62)m = $0.85 \times (45)$ i	m + (46)m + (57)m +	(59)m + (61)m	
(62)m= 205.22 180.94 188.37 167.08 161.76 142.47 136.5	5 152.16 153.84 175	5.18 186.88	200.35	(6	62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	tity) (enter '0' if no solar con	ntribution to water	heating)		
(add additional lines if FGHRS and/or WWHRS applies, see A	Appendix G)				
(63)m= 0 0 0 0 0 0	0 0	0 0	0	(6	63)
Output from water heater					
(64)m= 205.22 180.94 188.37 167.08 161.76 142.47 136.5	5 152.16 153.84 175	5.18 186.88	200.35		
	Output from water h	heater (annual) ₁	12	2050.74	64)
Heat gains from water heating, kWh/month 0.25 [0.85 × (45]	m + (61)m] + 0.8 x [(4)	6)m + (57)m -	+ (<mark>5</mark> 9)m]	
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ (65) m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81		6)m + (57)m - 4.19 58.07	+ (59)m 62.41		65)
	46.86 47.38 54	1.19 58.07	62.41	(6	65)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81	46.86 47.38 54	1.19 58.07	62.41	(6	65)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):	46.86 47.38 54	1.19 58.07	62.41	(6	65)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the	46.86 47.38 54 e dwelling or hot water	1.19 58.07	62.41	(6	65)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	e dwelling or hot water Aug Sep C	1.19 58.07 r is from comm	62.41 nunity he	eating	65) 66)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 127.08 127.08 127.08 127.08 127.08 127.08	Aug Sep C 8 127.08 127.08 127	r is from comn	62.41 nunity he	eating	
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep C 8 127.08 127.08 127	r is from comn	62.41 nunity he	eating (6	
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16	1.19 58.07 r is from comm Oct Nov 7.08 127.08 5.82 19.64	Dec 127.08	eating (6	66)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 127.0	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16	7 is from common	Dec 127.08	eating (6	66)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187	7 is from common	Dec 127.08	eating (6	66) 67)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5	7 is from common	Dec 127.08	eating (6	66) 67)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 127.0	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5	7.23 203.29	Dec 127.08	eating (6	66) 67)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 (67)m= 20.37 18.09 14.71 11.14 8.33 7.03 7.59 Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 228.45 230.82 224.85 212.13 196.08 180.99 170.9 Cooking gains (calculated in Appendix L, equation L15 or	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5 1 35.71 35.71 35	7.23 203.29	Dec 127.08	eating (6	66) 67)
include (57)m in calculation of (65)m only if cylinder is in the state of (57)m in calculation of (65)m only if cylinder is in the state of (57)m in calculation of (65)m only if cylinder is in the state of (57)m in calculation of (65)m only if cylinder is in the state of (57)m in calculation of (65)m only if cylinder is in the state of (57)m only if cylinder is in the state of (57)m only if cylinder is in the state of (65)m only if cylinder is in the state of (66)m. Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m 127.08 1	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5 35.71 35.71 35	1.19 58.07 r is from common co	Dec 127.08 20.93 35.71	eating (6	66) 67) 68)
include (57)m in calculation of (65)m only if cylinder is in the include (57)m in calculation of (65)m only if cylinder is in the first include (57)m in calculation of (65)m only if cylinder is in the first include (57)m in calculation of (65)m only if cylinder is in the first include (57)m in calculate 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 1	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1.13a), also see Table 5 1.168.54 174.51 187 5a), also see Table 5 3.35.71 35.71 35	1.19 58.07 r is from common co	Dec 127.08 20.93 35.71	eating	66) 67) 68)
include (57)m in calculation of (65)m only if cylinder is in the final state of (57)m in calculation of (65)m only if cylinder is in the final state of (57)m in calculation of (65)m only if cylinder is in the final state of (57)m in calculation of (65)m only if cylinder is in the final state of (57)m in calculation of (65)m only if cylinder is in the final state of (57)m only if cylinder is in the final state of (65)m only if cylinder is in the final state of (65)m only if cylinder is in the final state of (65)m only if cylinder is in the final state of (66)m. Here are the final state of (65)m only if cylinder is in the final state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m Jul (66)m only if cylinder is in the final state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m Jul (66)m only if cylinder is in the final state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m. Jul (66)m Jul (66)m only if cylinder is in the final state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m. Jul (66)m Jul (66)m. Jul (66)m Jul (65)m. Appendix L, equation L9 or L9a), (67)m. Jul (66	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1.13a), also see Table 5 1.168.54 174.51 187 5a), also see Table 5 3.35.71 35.71 35	1.19 58.07 r is from common co	Dec 127.08 20.93 35.71 3	eating	66) 67) 68) 69)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5 3 35.71 35.71 35	1.19 58.07 r is from common co	Dec 127.08 20.93 35.71 3	eating	66) 67) 68) 69)
include (57)m in calculation of (65)m only if cylinder is in the final gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 1	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5 35.71 35.71 35	1.19 58.07 r is from common state of the sta	Dec 127.08 20.93 35.71 3 -101.66 83.89	eating	66) 67) 68) 69) 70)
include (57)m in calculation of (65)m only if cylinder is in the final gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 1	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5 35.71 35.71 35 3 3 6 -101.66 -101.66 -10 6 62.98 65.81 72 7)m + (68)m + (69)m + (70)m	1.19 58.07 r is from common state of the sta	Dec 127.08 20.93 35.71 3 -101.66 83.89	eating	66) 67) 68) 69) 70)

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

Orientation: Access F Table 6d	actor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	X	9.56	x	11.28	x	0.55	x	0.7	=	28.78	(75)
Northeast _{0.9x} 0.77	X	4.65	x	11.28	x	0.55	x	0.7	=	14	(75)
Northeast 0.9x 0.77	X	9.56	x	22.97	x	0.55	x	0.7	=	58.58	(75)
Northeast 0.9x 0.77	X	4.65	x	22.97	x	0.55	x	0.7] =	28.49	(75)
Northeast _{0.9x} 0.77	X	9.56	x	41.38	x	0.55	x	0.7	=	105.54	(75)
Northeast 0.9x 0.77	X	4.65	x	41.38	x	0.55	x	0.7	=	51.34	(75)
Northeast _{0.9x} 0.77	X	9.56	x	67.96	x	0.55	x	0.7	=	173.33	(75)
Northeast _{0.9x} 0.77	X	4.65	x	67.96	x	0.55	x	0.7	=	84.31	(75)
Northeast _{0.9x} 0.77	X	9.56	x	91.35	x	0.55	x	0.7	=	232.99	(75)
Northeast _{0.9x} 0.77	X	4.65	x	91.35	x	0.55	x	0.7	=	113.33	(75)
Northeast 0.9x 0.77	X	9.56	x	97.38	x	0.55	x	0.7	=	248.39	(75)
Northeast 0.9x 0.77	X	4.65	x	97.38	x	0.55	x	0.7	=	120.82	(75)
Northeast 0.9x 0.77	X	9.56	x	91.1	x	0.55	x	0.7	=	232.37	(75)
Northeast 0.9x 0.77	X	4.65	x	91.1	x	0.55	x	0.7	=	113.02	(75)
Northeast 0.9x 0.77	X	9.56	x	72.63	x	0.55	x	0.7	=	185.25	(75)
Northeast 0.9x 0.77	X	4.65	X	72.63	X	0.55	X	0.7		90.1	(75)
Northeast 0.9x 0.77	x	9.56	х	50.42	x	0.55	x	0.7		128.61	(75)
Northeast 0.9x 0.77	x	4.65	x	50.42] x	0.55	x	0.7	=	62.55	(75)
Northeast 0.9x 0.77	X	9.56	х	28.07	x	0.55	x	0.7	=	71.59	(75)
Northeast 0.9x 0.77	x	4.65	x	28.07	_x	0.55	x	0.7	=	34.82	(75)
Northeast 0.9x 0.77	x	9.56	х	14.2	х	0.55	x	0.7	=	36.21	(75)
Northeast 0.9x 0.77	X	4.65	x	14.2	x	0.55	x	0.7	=	17.61	(75)
Northeast 0.9x 0.77	X	9.56	x	9.21	x	0.55	X	0.7	=	23.5	(75)
Northeast 0.9x 0.77	X	4.65	X	9.21	x	0.55	X	0.7	=	11.43	(75)
Southwest _{0.9x} 0.77	X	2.3	X	36.79		0.55	X	0.7	=	22.58	(79)
Southwest _{0.9x} 0.77	X	2.3	x	62.67]	0.55	X	0.7	=	38.46	(79)
Southwest _{0.9x} 0.77	X	2.3	x	85.75]	0.55	X	0.7	=	52.62	(79)
Southwest _{0.9x} 0.77	X	2.3	x	106.25]	0.55	X	0.7	=	65.2	(79)
Southwest _{0.9x} 0.77	X	2.3	X	119.01]	0.55	X	0.7	=	73.03	(79)
Southwest _{0.9x} 0.77	X	2.3	x	118.15]	0.55	X	0.7	=	72.5	(79)
Southwest _{0.9x} 0.77	X	2.3	X	113.91]	0.55	x	0.7	=	69.9	(79)
Southwest _{0.9x} 0.77	X	2.3	X	104.39]	0.55	X	0.7	=	64.06	(79)
Southwest _{0.9x} 0.77	X	2.3	x	92.85]	0.55	x	0.7	=	56.98	(79)
Southwest _{0.9x} 0.77	X	2.3	x	69.27]	0.55	X	0.7	=	42.51	(79)
Southwest _{0.9x} 0.77	X	2.3	x	44.07]	0.55	X	0.7	=	27.04	(79)
Southwest _{0.9x} 0.77	X	2.3	X	31.49]	0.55	X	0.7	=	19.32	(79)
Northwest 0.9x 0.77	X	8.51	x	11.28	x	0.55	X	0.7	=	25.62	(81)
Northwest 0.9x 0.77	X	9.45	x	11.28	x	0.55	x	0.7] =	28.45	(81)
Northwest 0.9x 0.77	Х	8.51	X	22.97	×	0.55	X	0.7] =	52.15	(81)

Namibura et a a F		_		_			1		_			Γ	–
Northwest 0.9x	0.77	×	9.45	×		2.97	X	0.55	X	0.7	_ =	57.91	(81)
Northwest 0.9x	0.77	×	8.51	×	4	1.38	X	0.55	X	0.7	=	93.95	(81)
Northwest 0.9x	0.77	×	9.45	×	4	1.38	X	0.55	X	0.7	=	104.33	(81)
Northwest 0.9x	0.77	X	8.51	X	6	7.96	X	0.55	X	0.7	=	154.29	(81)
Northwest 0.9x	0.77	X	9.45	X	6	7.96	X	0.55	X	0.7	=	171.34	(81)
Northwest 0.9x	0.77	X	8.51	X	9	1.35	X	0.55	X	0.7	=	207.4	(81)
Northwest 0.9x	0.77	X	9.45	X	9	1.35	x	0.55	X	0.7	=	230.31	(81)
Northwest 0.9x	0.77	X	8.51	X	9	7.38	X	0.55	X	0.7	=	221.11	(81)
Northwest 0.9x	0.77	X	9.45	X	9	7.38	X	0.55	X	0.7	=	245.54	(81)
Northwest 0.9x	0.77	x	8.51	x	(91.1	x	0.55	X	0.7	=	206.85	(81)
Northwest _{0.9x}	0.77	×	9.45	×	9	91.1	x	0.55	x	0.7	=	229.69	(81)
Northwest _{0.9x}	0.77	×	8.51	×	7	2.63	x	0.55	X	0.7	=	164.9	(81)
Northwest _{0.9x}	0.77	×	9.45	x	7	2.63	x	0.55	×	0.7		183.11	(81)
Northwest _{0.9x}	0.77	x	8.51	×	5	0.42	x	0.55	x	0.7	-	114.48	(81)
Northwest _{0.9x}	0.77	x	9.45	×	5	0.42	x	0.55	x	0.7	<u> </u>	127.13	(81)
Northwest _{0.9x}	0.77	×	8.51	×	2	8.07	x	0.55	x	0.7		63.73	(81)
Northwest 0.9x	0.77	×	9.45	×	2	8.07	x	0.55	x	0.7	-	70.77	(81)
Northwest 0.9x	0.77	×	8.51	X	<u> </u>	14.2	Х	0.55	X	0.7	=	32.23	(81)
Northwest 0.9x	0.77	= x	9.45	= x		14.2	х	0.55	X	0.7	= -	35.79	(81)
Northwest _{0.9x}	0.77	×	8.51	x	9	9.21	×	0.55	X	0.7	╡ =	20.92	(81)
Northwest _{0.9x}	0.77	×	9.45	x	9	9.21	x	0.55	x	0.7	=	23.23	(81)
_							_				_		
Solar gains in	watts, calcu	ılated	for each mo	onth			(83)m	ı = Sum(74)m .	(8 <mark>2</mark>)m				
(83)m= 119.42	235.59 40	7.78	648.47 857	.06	908.37	851.83	687	.42 489.75	283.4	1 148.9	98.41		(83)
Total gains – ii	nternal and	solar	(84)m = (73))m +	(83)m	, watts	-				-		
(84)m= 518.43	632.5	90.2	1007.79 119	2.86 1	221.49	1150.65	992	.94 807.44	624.4	3 516.6	485.73		(84)
7. Mean inter	nal tempera	ature (heating sea	son)									
Temperature	during heat	ting pe	eriods in the	living	area t	from Tab	ole 9	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	s for li	iving area, h	1,m (s	see Ta	ble 9a)							
Jan	Feb I	Mar	Apr N	lay	Jun	Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99 0).98	0.89 0.	7	0.49	0.36	0.4		0.96	1	1		(86)
Mean interna	l temperatu	re in I	iving area T	1 (follo	ow ste	ns 3 to 7	7 in T	able 9c)	•	•	•	•	
(87)m= 19.74		0.27	20.69 20	<u> </u>	20.99	21	2		20.55	20.07	19.71		(87)
Tomporatura	during boot	tina n	oriodo in roc	t of d	vallina	from To	hla (<u> </u>	<u> </u>	<u> </u>	l	
Temperature (88)m= 19.94		9.95	19.96 19		19.98	19.98	19.		19.96	19.96	19.95		(88)
` '			I	!_				10.07	10.00	7 13.30	10.00		(00)
Utilisation fac					<u> </u>		T .			1	Γ.	1	(00)
(89)m= 1	0.99 0).97	0.86 0.	54	0.42	0.28	0.3	0.66	0.95	0.99	1		(89)
Mean interna	l temperatu	re in t		velling	72 (f	ollow ste	eps 3	to 7 in Tabl	le 9c)		1	1	
(90)m= 18.27	18.55	9.04	19.62 19	.9	19.97	19.98	19.		19.45		18.23		(90)
								1	fLA = Li	ving area ÷ (4) =	0.25	(91)
Mean interna	l temneratu	re (foi	r the whole	hwellir	na) = fl	Δ x T1	+ (1	_ fl Δ) x T2					

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

(92)m= 18.63													
(32)111- 10.03	18.89	19.34	19.89	20.16	20.23	20.23	20.23	20.17	19.73	19.08	18.6		(92)
Apply adjustr	nent to t	he mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate	<u>!</u>			
93)m= 18.48	18.74	19.19	19.74	20.01	20.08	20.08	20.08	20.02	19.58	18.93	18.45		(93)
8. Space hea	ting requ	uirement											
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	:										
94)m= 1	0.99	0.96	0.85	0.64	0.42	0.29	0.35	0.66	0.94	0.99	1		(94
Useful gains,	hmGm	, W = (94	1)m x (84	1)m									
95)m= 516.06	624.99	758.4	857.9	763.78	517.18	330.92	348.25	535.5	585.83	511.45	484.09		(95
Monthly average	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						-``		<u> </u>				ı	
97)m= 1405.51	1367.78	ļ!	1051.2	803.03	521.05	331.33	349.32	567.26	867.65	1151.1	1395		(97)
Space heatin	ř	1						<u> </u>	<u> </u>			ı	
98)m= 661.75	499.15	366	139.17	29.2	0	0	0	0	209.67	460.55	677.72		_
							Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3043.22	(98
Space heatin	g require	ement in	kWh/m²	/year								36.04	(99
a. Energy red	nuiremer	nts – Indi	vidual h	eating sv	/stems i	ncluding	micro-C	CHP)					
Space heatir													
Fraction of sp	_	t from se	econdary	//supple	<mark>men</mark> tary	system						0	(20
Fraction of sp	ace hea	t from m	ain syst	em(s)			(202) = 1	- (201) =				1	(20:
Fraction of to													
Efficiency of I		9					(204) = (2)	02) × [1 –	(203)] =			1	(20
	main sna	ce heati					(204) = (2	02) × [1 –	(203)] =				╡`
			ng syste	em 1	a evetom		(204) = (2	02) × [1 –	(203)] =			90.4	(20
Efficiency of	seconda	ry/supple	ng syste	em 1 y heating		າ, %					_	90.4	(20
Efficiency of s	seconda Feb	ry/supple Mar	ng syste ementary Apr	em 1 y heating May	Jun		(204) = (2 Aug	02) × [1 -	(203)] = Oct	Nov	Dec	90.4	(20
Efficiency of s Jan Space heatin	seconda Feb g require	ry/supple Mar ement (c	ng systementary Apr alculated	em 1 y heating May d above)	Jun	n, %	Aug	Sep	Oct			90.4	(20
Efficiency of s Jan Space heatin 661.75	Feb g require 499.15	ry/supple Mar ement (c 366	ng systementary Apr alculated	em 1 y heating May d above) 29.2	Jun	າ, %				Nov 460.55	Dec 677.72	90.4	(20) (20) ear
Efficiency of S Jan Space heatin 661.75 211)m = {[(98)	Feb g require 499.15	ry/supple Mar ement (c 366 4)] } x 1	Apr alculated 139.17 00 ÷ (20	em 1 y heating May d above; 29.2	Jun) 0	n, % Jul 0	Aug 0	Sep 0	Oct 209.67	460.55	677.72	90.4	(20) (20) ear
Efficiency of s Jan Space heatin 661.75	Feb g require 499.15	ry/supple Mar ement (c 366	ng systementary Apr alculated	em 1 y heating May d above) 29.2	Jun	n, %	Aug 0	Sep 0	Oct 209.67	460.55 509.46	677.72 749.68	90.4 0 kWh/ye	(20) (20) ear
Efficiency of S Jan Space heatin 661.75 211)m = {[(98)	Feb g require 499.15	ry/supple Mar ement (c 366 4)] } x 1	Apr alculated 139.17 00 ÷ (20	em 1 y heating May d above; 29.2	Jun) 0	n, % Jul 0	Aug 0	Sep 0	Oct 209.67	460.55 509.46	677.72 749.68	90.4	(20) ear
Efficiency of s Jan Space heatin 661.75 211)m = {[(98) 732.03 Space heatin	Feb g require 499.15 s)m x (20 552.16 g fuel (s	mar Mar ement (c. 366 4)] } x 1 404.87	Apr alculated 139.17 00 ÷ (20 153.95	em 1 y heating May d above; 29.2 6) 32.3	Jun) 0	n, % Jul 0	Aug 0	Sep 0	Oct 209.67	460.55 509.46	677.72 749.68	90.4 0 kWh/ye	(20) (20) ear
Jan Space heatin 661.75 211)m = {[(98 732.03 Space heatin [(98)m x (20	seconda Feb g require 499.15 m x (20 552.16 g fuel (s	mar Mar	Apr alculated 139.17 00 ÷ (20 153.95	em 1 y heating May d above; 29.2 6) 32.3 month	Jun 0 0	o 0	Aug 0 Tota	Sep 0 0 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2	460.55 509.46 211) _{15,1012}	749.68	90.4 0 kWh/ye	(20) ear
Space heatin Space heatin 661.75 211)m = {[(98) 732.03 Space heatin {[(98)m x (20)	Feb g require 499.15 s)m x (20 552.16 g fuel (s	mar Mar ement (c. 366 4)] } x 1 404.87	Apr alculated 139.17 00 ÷ (20 153.95	em 1 y heating May d above; 29.2 6) 32.3	Jun) 0	n, % Jul 0	Aug 0 Tota	Sep 0 0 I (kWh/yea	Oct 209.67 231.93 ar) =Sum(2	460.55 509.46 211) _{15.1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21)
Jan Space heatin 661.75 211)m = {[(98 732.03 Space heatin ([(98)m x (20	seconda Feb g require 499.15 m x (20 552.16 g fuel (s	mar Mar	Apr alculated 139.17 00 ÷ (20 153.95	em 1 y heating May d above; 29.2 6) 32.3 month	Jun 0 0	o 0	Aug 0 Tota	Sep 0 0 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2	460.55 509.46 211) _{15.1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21)
Efficiency of s Jan Space heatin 661.75 211)m = {[(98) 732.03 Space heatin {[(98)m x (20) 215)m= 0 Vater heating	seconda Feb g require 499.15 s)m x (20 552.16 g fuel (s 01)] } x 1	mar ement (c 366 4)] } x 1 404.87 econdary 00 ÷ (20	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/68)	em 1 y heating May d above) 29.2 6) 32.3 month	Jun 0 0	o 0	Aug 0 Tota	Sep 0 0 I (kWh/yea	Oct 209.67 231.93 ar) =Sum(2	460.55 509.46 211) _{15.1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21)
Jan Space heatin 661.75 211)m = {[(98 732.03 732.03 Space heatin ([(98)m x (20 215)m = 0 Output from w	seconda Feb g require 499.15 552.16 g fuel (s 01)] } x 1 0 ater hea	mar Mar ement (c 366 4)] } x 1 404.87 econdary 00 ÷ (20 0	Apr alculated al	em 1 y heating May d above) 29.2 6) 32.3 month 0	Jun) 0 0 0	o 0	O Tota	Sep 0 1 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2 0 ar) =Sum(2	460.55 509.46 211) _{15,1012} 0 215) _{15,1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21)
Efficiency of s Jan Space heatin 661.75 211)m = {[(98) 732.03 Space heatin [(98)m x (20) 215)m = 0 Vater heating Output from w 205.22	seconda Feb g require 499.15 f)m x (20 552.16 g fuel (s 01)] } x 1 0 ater hea 180.94	ry/supplement (c 366 4)] } x 1 404.87 econdary 00 ÷ (20 0 condary 188.37	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/68)	em 1 y heating May d above) 29.2 6) 32.3 month	Jun 0 0	o 0	Aug 0 Tota	Sep 0 0 I (kWh/yea	Oct 209.67 231.93 ar) =Sum(2	460.55 509.46 211) _{15.1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21) (21)
Jan Space heatin 661.75 211)m = {[(98 732.03 732.03 Space heatin {[(98)m x (20 215)m = 0 Output from w 205.22 Efficiency of w	seconda Feb g require 499.15 m x (20 552.16 g fuel (s 01)] } x 1 0 ater hea 180.94 vater hea	mar Mar	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/ 8) 0	em 1 y heating May d above; 29.2 6) 32.3 month 0	Jun 0 0 0 142.47	0 0 136.5	O Tota 152.16	Sep 0 0 1 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2 0 ar) =Sum(2	460.55 509.46 211) _{15,1012} 0 215) _{15,1012}	749.68 - 0 - 200.35	90.4 0 kWh/ye	(20) (20) ear (21)
Efficiency of s Jan Space heatin 661.75 211)m = {[(98) 732.03 Space heatin = {[(98)m x (20) 215)m = 0 Water heating Output from w 205.22 Efficiency of w 217)m = 87.79	seconda Feb g require 499.15 552.16 g fuel (s 01)] } x 1 0 ater hea 180.94 rater hea 87.47	ry/supplement (c 366 4)] } x 1 404.87 econdary 00 ÷ (20 0 188.37 ter 86.69	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/8 0	em 1 y heating May d above) 29.2 6) 32.3 month 0	Jun) 0 0 0	o 0	O Tota	Sep 0 1 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2 0 ar) =Sum(2	460.55 509.46 211) _{15,1012} 0 215) _{15,1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21)
Jan Space heatin 661.75 211)m = {[(98 732.03	seconda Feb g require 499.15 552.16 g fuel (s 01)] } x 1 0 ater hea 180.94 rater hea 87.47 heating,	ry/supplement (c. 366 4)] } x 1 404.87 econdary 00 ÷ (20 0	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/8 0 ulated al 167.08 84.6 onth	em 1 y heating May d above; 29.2 6) 32.3 month 0	Jun 0 0 0 142.47	0 0 136.5	O Tota 152.16	Sep 0 0 1 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2 0 ar) =Sum(2	460.55 509.46 211) _{15,1012} 0 215) _{15,1012}	749.68 - 0 - 200.35	90.4 0 kWh/ye	(20) (20) (20) (21) (21)
Jan Space heatin 661.75 211)m = {[(98 732.03 732.03 Space heatin {[(98)m x (20 215)m 0	seconda Feb g require 499.15 552.16 g fuel (s 01)] } x 1 0 ater hea 180.94 rater hea 87.47 heating,	ry/supplement (c. 366 4)] } x 1 404.87 econdary 00 ÷ (20 0	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/8 0 ulated al 167.08 84.6 onth	em 1 y heating May d above; 29.2 6) 32.3 month 0	Jun 0 0 0 142.47	0 0 136.5	O Tota 152.16	Sep 0 0 1 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2 0 ar) =Sum(2	460.55 509.46 211) _{15,1012} 0 215) _{15,1012}	749.68 - 0 - 200.35	90.4 0 kWh/ye	(204 (206 (208 ear (211 (211) (216 (217)

Annual totals		kWh/yea	ır	kWh/year	
Space heating fuel used, main system 1		-		3366.39	
Water heating fuel used				2428.98	
Electricity for pumps, fans and electric keep-hot					
mechanical ventilation - balanced, extract or pos	itive input from outside		202.76		(230a)
central heating pump:			30		(230c)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		232.76	(231)
Electricity for lighting				359.68	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy	Emission fac	ctor	Emissions	
	kWh/year	kg CO2/kWh		kg CO2/yea	ar
Space heating (main system 1)	kWh/year (211) x	kg CO2/kWh	=	kg CO2/yea	ar (261)
Space heating (main system 1) Space heating (secondary)	•		=	,	_
, , ,	(211) x	0.216		727.14	(261)
Space heating (secondary)	(211) x (215) x	0.216	=	727.14	(261)
Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216	=	727.14 0 524.66	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	=	727.14 0 524.66 1251.8	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	= =	727.14 0 524.66 1251.8 120.8	(261) (263) (264) (265) (267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216 0.519 0.519	= =	727.14 0 524.66 1251.8 120.8	(261) (263) (264) (265) (267) (268)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.4.16 Property Address: Flat 03 Address: 1. Overall dwelling dimensions Area(m²) Av. Height(m) Volume(m³) **Basement** 63.22 (1a) x 2.7 (2a) =170.69 (3a) Ground floor (1b) x (2b) (3b) 39.79 3.27 130.12 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)103.01 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 300.81 2. Ventilation rate: main secondary other total m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c)0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 1 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.15 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4.9

4.4

5

3.8

4.3

3.8

3.7

4

4.3

4.5

4.7

(22)m=

5.1

Wind Fa	actor (2	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted	d infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
	0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculat		<i>tive air</i> Il ventila	_	rate for t	he appli	cable ca	se	-	-	-		-	-	(23a)
				endix N. (2	(3b) = (23a	a) × Fmv (e	eguation (N	N5)) . othe	rwise (23b) = (23a)			0.8	 -
			overy: effic							, (,			73.9	
			•	-	_				a)m = (2:	2h)m + (23b) × [1 – (23c)		(200)
(24a)m=	0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(24a)
b) If b	alance	d mech	anical ve	ntilation	without	heat red	covery (N	л ЛV) (24t	o)m = (22	2b)m + (23b)	<u> </u>	J	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If w	/hole h	ouse ex	tract ver	tilation o	or positiv	e input	ventilatio	n from o	outside	l .			ı	
if	(22b)m	า < 0.5 ×	(23b), t	hen (24	c) = (23b); other	wise (24	c) = (22l	b) m + 0.	5 × (23b)		_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
			on or wh											
	<u>` </u>		<u> </u>	`		<u> </u>			2b)m² x					(244)
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
	_	_	rate - er				<u> </u>			0.00	0.0	T 0 04	1	(25)
(25)m=	0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31	J	(25)
3. Heat	t losses	s and he	eat loss r	paramete										
			_		51.					_	_			_
ELEIVII	ENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value kJ/m²-		A X k kJ/K
Window	-	area	SS	Openin	gs		m²		2K		K)			
	s Type	area	SS	Openin	gs	A ,r	m² x1.	W/m2	2K · 0.04] =	(W/	K)			kJ/K
Window	s Type	area 1	SS	Openin	gs	A ,r	m² x1.	W/m2 /[1/(1.2)+	2K · 0.04] = · 0.04] =	9.74	K)			kJ/K (27)
Window Window	s Type s Type s Type	area 1 2 3	SS	Openin	gs	A ,r 8.51	m² x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+	2K · 0.04] = · 0.04] = · 0.04] =	9.74 2.63	K)			kJ/K (27) (27)
Window Window Window	s Type s Type s Type s Type	area 1 2 3 4	SS	Openin	gs	A ,r 8.51 2.3 9.45	x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82	K)			kJ/K (27) (27) (27)
Window Window Window Window	s Type s Type s Type s Type s Type s Type	area 1 2 3 4 5 5	SS	Openin	gs	A ,r 8.51 2.3 9.45 6.41	x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82 7.34	K)			kJ/K (27) (27) (27) (27)
Window Window Window Window	s Type s Type s Type s Type s Type s Type s Type	area 1 2 3 4 5 6	SS	Openin	gs	A ,r 8.51 2.3 9.45 6.41 2.3	x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82 7.34 2.63 2.63	K)			kJ/K (27) (27) (27) (27) (27) (27)
Window Window Window Window Window	s Type s Type s Type s Type s Type s Type s Type	area 1 2 3 4 5 6	SS	Openin	gs	A ,r 8.51 2.3 9.45 6.41 2.3	x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82 7.34 2.63	K)			kJ/K (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window	s Type s Type s Type s Type s Type s Type s Type s Type s Type	area 1 2 3 4 5 6 7	ss (m²)	Openin m	gs	A ,r 8.51 2.3 9.45 6.41 2.3 2.3 4.65 63.22	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322	K)			kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Floor Walls Ty	s Type s Type s Type s Type s Type s Type s Type s Type ype1	area 1 2 3 4 5 6 7	ss (m²)	Openin m	gs 1 ²	A ,r 8.51 2.3 9.45 6.41 2.3 2.3 4.65 63.22 29.04	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322 4.65	K)			kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Window Window Floor Walls Ty Walls Ty	s Type s Type s Type s Type s Type s Type s Type ype1 ype2	area 1 2 3 4 5 6 7	ss (m²)	0 35.92	gs 1 ²	A ,r 8.51 2.3 9.45 6.41 2.3 2.3 4.65 63.22 29.04 44.9	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] =	9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322 4.65 7.19	K)			kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Window Window Floor Walls Ty Walls Ty	s Type s Type s Type s Type s Type s Type s Type ype1 ype2	area 1 2 3 4 5 6 7 29.0 80.8	(m²)	0 35.92	gs 1 ²	A ,r 8.51 2.3 9.45 6.41 2.3 4.65 63.22 29.04 44.9°	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W// 9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322 4.65 7.19 2.15	K)			kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (29) (29)
Window Window Window Window Window Window Window Window Floor Walls Ty Walls Ty Roof	s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3	area 1 2 3 4 5 6 7 29.0 80.8 13.4 24.9	3 3 11	0 35.92	gs 1 ²	A ,r 8.51 2.3 9.45 6.41 2.3 2.3 4.65 63.22 29.04 44.91 13.42 24.91	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = =	9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322 4.65 7.19	K)			kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (30)
Window Window Window Window Window Window Floor Walls Ty Walls Ty Roof Total are	s Type s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3 ea of e	area 1 2 3 4 5 6 7 29.0 80.8 13.4 24.9 lements	65 (m²) 14 (m²) 13 (m²) 14 (m²)	0 35.9:	gs 1 ²	A ,r 8.51 2.3 9.45 6.41 2.3 4.65 63.22 29.02 44.9° 13.42 24.9°	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W// 9.74 2.63 10.82 7.34 2.63 2.63 5.32 4.65 7.19 2.15 2.99		kJ/m²·	K C	kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (29) (29)
Window Window Window Window Window Window Window Window Floor Walls Ty Walls Ty Roof Total are * for window	s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3 ea of e	area 1 2 3 4 5 6 7 29.0 80.8 13.4 24.9 lements	65 (m²) 14 (m²) 13 (m²) 14 (m²)	Openin m 0 35.92 0 offective wi	gs 1 ² 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A ,r 8.51 2.3 9.45 6.41 2.3 4.65 63.22 29.02 44.9° 13.42 24.9° 211.4	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W// 9.74 2.63 10.82 7.34 2.63 2.63 5.32 4.65 7.19 2.15 2.99		kJ/m²·	K C	kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (30)
Window Window Window Window Window Window Floor Walls Ty Walls Ty Roof Total are * for winde ** include Fabric h	s Type s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3 ea of e ows and the area leat los	area 1 2 3 4 5 6 7 29.0 80.8 13.4 24.9 lements roof winders on both s, W/K	14 13 12 11 11 12 11 12 11 12 11 12 11 12 11 12 13 14 14 15 16 17 17 18 18 18 18 18 18 18 18 18 18 18 18 18	Openin m 0 35.92 0 offective with ternal wall	gs 1 ² 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A ,r 8.51 2.3 9.45 6.41 2.3 4.65 63.22 29.02 44.9° 13.42 24.9° 211.4	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	2K 0.04] = 0.04]	(W// 9.74 2.63 10.82 7.34 2.63 2.63 5.32 4.65 7.19 2.15 2.99		kJ/m²·	K C	kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (29) (30) (31)
Window Window Window Window Window Window Window Window Floor Walls Ty Walls Ty Roof Total are * for windo ** include	s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3 ea of e ows and the area eat los pacity (area 1 2 3 4 5 6 7 29.0 80.8 13.4 24.9 Ilements roof winders on both s, W/K: Cm = S((m²) (m²) (m²) (m²) (m²) (m²) (m²) (m²) (m²) (m²)	Openin m 35.92 0 0 offective winternal walk U)	gs g² 2 indow U-va	A ,r 8.51 2.3 9.45 6.41 2.3 4.65 63.22 29.04 44.91 13.42 24.91 211.4 alue calculatitions	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	2K 0.04] = 0.	9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322 4.65 7.19 2.15 2.99		kJ/m²·	K	(27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (30) (31)

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

an be used inste	au or a uci	anca carce	ilation.										
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<						13.7	(36
details of therma		are not kn	own (36) =	= 0.15 x (3	1)			(22)	(20) -				—
otal fabric he		مام داماه	الطائم مصا					(33) +	,	OF\ \((F)		78.12	(3
entilation hea					lun	1	Aug		`	25)m x (5)		1	
Jan 38)m= 31.91	Feb 31.54	Mar 31.17	Apr 29.31	May 28.94	Jun 27.08	Jul 27.08	Aug 26.7	Sep 27.82	Oct 28.94	Nov 29.68	Dec 30.43		(3
			29.01	20.94	27.00	27.00	20.7			<u> </u>	30.43		(0
Heat transfer of 110.04			107.10	407.00	405.0	105.0	104.00	. ,	= (37) + (37)		100.55	1	
39)m= 110.04	109.67	109.29	107.43	107.06	105.2	105.2	104.83	105.94	107.06	107.81 Sum(39) ₁	108.55	107.34	(3
leat loss para	meter (H	HLP), W/	m²K						= (39)m ÷	` '	12 / 12-	107.54	(
1.07	1.06	1.06	1.04	1.04	1.02	1.02	1.02	1.03	1.04	1.05	1.05		
								,	Average =	Sum(40) ₁	12 /12=	1.04	(4
lumber of day												1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(4
11)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
											138/1/		
4. Water heat	ting ener	gy requi	rement:								kWh/y	ear:	
ssumed occu	inancy	d .										1	(1
		V								1 2	77		(4
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	013 x (ΓFA -13.		.77		(4
if TFA £ 13.9	9, N = 1 9, N = 1	+ 1.76 x			·			`	ΓFA -13.		77		(4
if <mark>TFA £</mark> 13.9 Inn <mark>ual av</mark> erag	9, N = 1 9, N = 1 ge hot wa	+ 1.76 x	je in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		9)	0.89		
if TFA £ 13.9 Annual averag Reduce the annua	9, N = 1 9, N = 1 ge hot wa al average	+ 1.76 x ater usag	ge in litre	es per da 5% if the d	ay Vd,av	erage =	(25 x N)	+ 36		9)			
if TFA £ 13.9 Annual average deduce the annual of more that 125	9, N = 1 9, N = 1 ge hot wa al average	+ 1.76 x ater usag	ge in litre usage by a day (all w	es per da 5% if the d vater use, h	ay Vd,av	erage =	(25 x N) to achieve	+ 36 a water us		9)	0.89		`
if TFA £ 13.9 Annual average annual at the	9, N = 1 9, N = 1 ge hot wa al average i litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, h	ay Vd,av lwelling is hot and co	erage = designed (d)	(25 x N) to achieve	+ 36	se target o	9)			
if TFA £ 13.9 Annual average deduce the annual of more that 125 Jan lot water usage in	9, N = 1 9, N = 1 ge hot wa al average i litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, h	ay Vd,av lwelling is hot and co	erage = designed (d)	(25 x N) to achieve	+ 36 a water us	se target o	9)	0.89		`
if TFA £ 13.9 Annual average deduce the annual of more that 125 Jan Jan Jot water usage in 14)m= 109.87	9, N = 1 9, N = 1 ge hot was all average if litres per per per per per per per per per per	ter usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, l May Vd,m = fat 93.89	ay Vd,av welling is not and co Jun ctor from 1	erage = designed (d) Jul Table 1c x 89.9	(25 x N) to achieve Aug (43) 93.89	+ 36 a water us Sep 97.89	Oct 101.88 Fotal = Su	9) 99 Nov 105.88 m(44) ₁₁₂ =	Dec 109.87	1198.63	(4
if TFA £ 13.9 Annual average deduce the annual of more that 125 Jan Jan Jan 109.87	9, N = 1 9, N = 1 ge hot was all average if litres per per per per per per per per per per	ter usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, l May Vd,m = fat 93.89	ay Vd,av welling is not and co Jun ctor from 1	erage = designed (d) Jul Table 1c x 89.9	(25 x N) to achieve Aug (43) 93.89	+ 36 a water us Sep 97.89	Oct 101.88 Fotal = Su	9) 99 Nov 105.88 m(44) ₁₁₂ =	Dec 109.87	1198.63	(4
if TFA £ 13.9 Annual average annual of more that 125 Jan Jan 14)m= 109.87	9, N = 1 9, N = 1 ge hot was all average if litres per per per per per per per per per per	ter usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, l May Vd,m = fat 93.89	ay Vd,av welling is not and co Jun ctor from 1	erage = designed (d) Jul Table 1c x 89.9	(25 x N) to achieve Aug (43) 93.89	+ 36 a water us Sep 97.89	Oct 101.88 Fotal = Su	9) 99 Nov 105.88 m(44) ₁₁₂ =	Dec 109.87	1198.63	(4
if TFA £ 13.9 Annual average annual average annual average in the annual average in the annual average in the average in the average in the average av	9, N = 1 9, N = 1 ge hot waal average litres per p Feb n litres per 105.88	+ 1.76 x ter usag hot water person per Mar day for ea 101.88 used - calc 147.06	ge in litre usage by a day (all w Apr ach month 97.89 culated mo	es per da 5% if the da 5% if th	y Vd,av lwelling is not and co Jun ctor from 7 89.9 190 x Vd,r	erage = designed ald) Jul Table 1c x 89.9 m x nm x E 98.37	(25 x N) to achieve Aug (43) 93.89 97m / 3600 112.88	+ 36 a water us Sep 97.89 0 kWh/mor	Oct 101.88 Fotal = Su th (see Ta 133.12	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1	Dec 109.87 = c, 1d) 157.8	1198.63	(4
if TFA £ 13.9 Annual average annual of more that 125 Jan Hot water usage in 149m= 109.87 Energy content of 145)m= 162.94	9, N = 1 9, N = 1 ge hot waal average litres per p 105.88 f hot water 142.51	ter usaghot water person per Mar day for ea 101.88 147.06	pe in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21	es per da 5% if the d vater use, h May Vd,m = fax 93.89 onthly = 4.	y Vd,av lwelling is not and co Jun ctor from 7 89.9 190 x Vd,r 106.15	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 97m / 3600 112.88 boxes (46)	+ 36 a water us Sep 97.89 9 kWh/mor 114.23	Oct 101.88 Fotal = Sulth (see Tail 133.12) Fotal = Sulth (see Tail 133.12)	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ =	Dec 109.87 = c, 1d) 157.8		(4
if TFA £ 13.9 Annual average annual average annual average annual average in the annual average in the annual average in the annual average in the average in the average average average average average average average annual average average average average annual average avera	9, N = 1 9, N = 1 ge hot waal average I litres per p 105.88 142.51 vater heatin 21.38	+ 1.76 x ter usag hot water person per Mar day for ea 101.88 used - calc 147.06	ge in litre usage by a day (all w Apr ach month 97.89 culated mo	es per da 5% if the da 5% if th	y Vd,av lwelling is not and co Jun ctor from 7 89.9 190 x Vd,r	erage = designed ald) Jul Table 1c x 89.9 m x nm x E 98.37	(25 x N) to achieve Aug (43) 93.89 97m / 3600 112.88	+ 36 a water us Sep 97.89 0 kWh/mor	Oct 101.88 Fotal = Su th (see Ta 133.12	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31	Dec 109.87 = c, 1d) 157.8		(4
if TFA £ 13.9 Annual average annual average annual average annual average in the annual average in the annual average in the a	9, N = 1 9, N = 1 ge hot was all average is litres per per per per per per per per per per	ter usage hot water person per Mar day for ear 101.88 147.06 147.06	ge in litre usage by a day (all w Apr ach month 97.89 128.21 of use (no	es per da 5% if the da 5% if th	y Vd,av welling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage),	erage = designed ald) Jul Table 1c x 89.9 m x nm x E 98.37 enter 0 in 14.76	(25 x N) to achieve Aug (43) 93.89 07m / 3600 112.88 boxes (46) 16.93	+ 36 a water us Sep 97.89 0 kWh/mor 114.23 0 to (61) 17.13	Oct 101.88 Total = Su 133.12 Total = Su 19.97	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67		(4
if TFA £ 13.9 Annual average annual average annual average annual average in annual average in a section and a section average in a se	9, N = 1 9, N = 1 ge hot waal average is litres per p 105.88 105.88 142.51 21.38 1058: ne (litres)	ter usage hot water person per day for each 101.88 used - calce 147.06 ag at point 22.06	ge in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21 of use (no	es per da 5% if the de 5% if the 5% if the de 5% if the de 5% if the de 5% if the de 5% if the d	ay Vd,av lwelling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage), 15.92	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 77m / 3600 112.88 boxes (46) 16.93 within sa	+ 36 a water us Sep 97.89 0 kWh/mor 114.23 0 to (61) 17.13	Oct 101.88 Total = Su 133.12 Total = Su 19.97	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8		(4
if TFA £ 13.9 Annual average annual average annual average annual average in annual average in a second annual average in a second annual average in a second annual average in a second annual average in a second annual average average volume is community in annual average annual average average volume is a second annual average average volume is annual average annual average annual average annual average annual average annual average annual average annual average annual average annual average annual average annual average annual average in a second annua	9, N = 1 9, N = 1 19e hot was all average is litres per per per per per per per per per per	ter usage hot water person per Mar day for ear 101.88 147.06 147.06 includin nd no ta	ge in litre usage by a day (all w Apr 97.89 culated mo 128.21 of use (no 19.23 ng any so nk in dw	es per da 5% if the d vater use, f May Vd,m = fat 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e	y Vd,av welling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7Tm / 3600 112.88 boxes (46) 16.93 within sa (47)	+ 36 a water us Sep 97.89 9 kWh/mor 114.23 1 to (61) 17.13 ame vesi	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67		(4)
if TFA £ 13.9 Annual average annual of more that 125 Jan Hot water usage in 149m= 109.87 Energy content of 159m= 162.94 It instantaneous water storage of 160m= 24.44 Vater storage volume for community in 160 of 160	9, N = 1 9, N = 1 19e hot was all average is litres per per per per per per per per per per	ter usage hot water person per Mar day for ear 101.88 147.06 147.06 includin nd no ta	ge in litre usage by a day (all w Apr 97.89 culated mo 128.21 of use (no 19.23 ng any so nk in dw	es per da 5% if the d vater use, f May Vd,m = fat 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e	y Vd,av welling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7Tm / 3600 112.88 boxes (46) 16.93 within sa (47)	+ 36 a water us Sep 97.89 9 kWh/mor 114.23 1 to (61) 17.13 ame vesi	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67		(4
if TFA £ 13.9 Annual average annual average annual average annual average in the second annual average in the second average annual average in the second average aver	9, N = 1 9, N = 1 19, N = 1 19e hot water all average is litres per per per per per per per per per per	ter usage hot water person per day for ear 101.88 147.06 147.06 including and no talk to the water the talk to	ge in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ag any so nk in dw er (this in	es per da 5% if the d vater use, h May Vd,m = fac 93.89 onthly = 4. 123.02 o hot water 18.45 olar or W velling, e	ay Vd,av lwelling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7Tm / 3600 112.88 boxes (46) 16.93 within sa (47)	+ 36 a water us Sep 97.89 9 kWh/mor 114.23 1 to (61) 17.13 ame vesi	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67		(4)
if TFA £ 13.9 Annual average annual of more that 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Jan Jan Jan Jan Jan Jan Ja	9, N = 1 9, N = 1 19, N = 1 19e hot was all average is litres per per per per per per per per per per	tter usage hot water person per Mar day for ear 101.88 147.06 147.06 including at point 22.06 including the twater the calculation and the twater the calculation and the calculation	Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ng any so nk in dw er (this in	es per da 5% if the d vater use, h May Vd,m = fac 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e	ay Vd,av lwelling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7Tm / 3600 112.88 boxes (46) 16.93 within sa (47)	+ 36 a water us Sep 97.89 9 kWh/mor 114.23 1 to (61) 17.13 ame vesi	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 c, 1d) 157.8 23.67		(4)
Annual average annual average annual average annual average in the average in the average in the average in the average in the average average. At a storage average in the average in the average average average in th	9, N = 1 9, N = 1 19, N = 1 19e hot was all average is litres per per per per per per per per per per	tter usage hot water person per Mar day for ear 101.88 147.06 147.06 includin and no tale hot water eclared lem Table storage	Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ng any so nk in dw er (this in oss facto 2b , kWh/ye	es per da 5% if the d vater use, h May Vd,m = fax 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e ocludes in or is knowear	ay Vd,av lwelling is not and co Jun 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110 nstantar	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7Tm / 3600 112.88 boxes (46) 16.93 within sa (47)	+ 36 a water us Sep 97.89 97.89 114.23 10 to (61) 17.13 ame vess ers) enter	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 c, 1d) 157.8 23.67		(4)
Annual average annual average annual average annual average annual average in the following annual average in the following annual average ave	9, N = 1 9, N = 1 19, N = 1 19e hot was all average is litres per per per per per per per per per per	tter usage hot water person per day for eat 101.88 101.88 147.06 147.06 includin and no tall hot water eclared least storage eclared of the storage eclared	ge in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ag any so nk in dw er (this in oss facto 2b , kWh/ye cylinder l	es per da 5% if the d vater use, I May Vd,m = fax 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e includes in or is known ear oss factor	ay Vd,av lwelling is not and co Jun 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110 nstantar wn (kWh	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7m / 3600 112.88 boxes (46) 16.93 within sa (47) pmbi boil	+ 36 a water us Sep 97.89 97.89 114.23 10 to (61) 17.13 ame vess ers) enter	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67 0 0 0 0 0		(4) (4) (4) (4) (5)
if TFA £ 13.9 Annual average annual average annual average in the annual average in the average in the average in the average average average in the average	9, N = 1 9, N = 1 105, Salar	tter usaghot water person per day for ea 101.88 101.88 147.06 including at point 22.06 including at point water person per day for ea 101.88	ge in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ag any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl	es per da 5% if the d vater use, I May Vd,m = fax 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e includes in or is known ear oss factor	ay Vd,av lwelling is not and co Jun 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110 nstantar wn (kWh	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7m / 3600 112.88 boxes (46) 16.93 within sa (47) pmbi boil	+ 36 a water us Sep 97.89 97.89 114.23 10 to (61) 17.13 ame vess ers) enter	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67		(4) (4) (4) (4) (5)
if TFA £ 13.9 Annual average annual average in the annual average in the annual average in the average in the average in the average in the average content of the average average content of the average in the average	9, N = 1 9, N = 1 19, N = 1 19 hot was all average is litres per per per per per per per per per per	tter usage hot water person per Mar day for ear 101.88 147.06 147.06 including at point 22.06 including at point water eclared lear to the storage eclared of factor free sections.	ge in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ag any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl	es per da 5% if the d vater use, I May Vd,m = fax 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e includes in or is known ear oss factor	ay Vd,av lwelling is not and co Jun 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110 nstantar wn (kWh	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7m / 3600 112.88 boxes (46) 16.93 within sa (47) pmbi boil	+ 36 a water us Sep 97.89 97.89 114.23 10 to (61) 17.13 ame vess ers) enter	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67 0 0 0 0 0		(4 (4 (4 (4 (4 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5

Energy lost from water storage, kWh/year Enter (50) or (54) in (55)	(47) x (51) x (52) x (53) =	0	(54) (55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		(00)
(56)m= 0 0 0 0 0 0 0	0 0 0	0 0	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] +	(50), else (57)m = (56)m where	(H11) is from Append	H xilt
(57)m= 0 0 0 0 0 0 0	0 0 0	0 0	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 3	` ,		
(modified by factor from Table H5 if there is solar water hea	, , , , , , , , , , , , , , , , , , ,] (50)
(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 × (4	'i	, ,	1
(61)m= 50.96 46.03 50.96 48.27 47.85 44.33 45.81	47.85 48.27 50.96	49.32 50.96	(61)
Total heat required for water heating calculated for each mont	- 	ì i i i i i i i i i i i i i i i i i i i	ı`´´
(62)m= 213.9 188.54 198.01 176.48 170.86 150.49 144.18		194.63 208.76	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quant		tion to water heating	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)		(63)
		0 0	(03)
Output from water heater (64)m= 213.9 188.54 198.01 176.48 170.86 150.49 144.18	3 160.73 162.5 184.08	194.63 208.76	1
(64)m= 213.9 188.54 198.01 176.48 170.86 150.49 144.18	3 160.73 162.5 184.08 Output from water heate		2153.15 (64)
Heat going from water heating IVMh/month 9.35 (10.95 x (45)			
Heat gains from water heating, kWh/month 0.25 [0.85 × (45)] (65)m= 66.92 58.89 61.64 54.7 52.86 46.38 44.16		60.64 65.21	(65)
include (57)m in calculation of (65)m only if cylinder is in the			J ' '
	dwelling of flot water is i	TOTTI COMMITTALINEY I	leating
5. Internal gains (see Table 5 and 5a):			
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul			
	I Aug I San I Oct	Nov Dec	 1
	Aug Sep Oct	Nov Dec	(66)
(66)m= 138.29 138.29 138.29 138.29 138.29 138.29 138.29	138.29 138.29 138.29	Nov Dec 138.29 138.29	(66)
(66)m= 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5	138.29 138.29	J
(66)m= 138.29	also see Table 5 11.28 15.14 19.23	 	(66)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92	(67)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29	J
(66)m= 138.29 13	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58	(67) (68)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92	(67)
(66)m= 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 Lighting gains (calculated in Appendix L, equation L9 or L9a), (67)m= 23.28 20.68 16.81 12.73 9.52 8.03 8.68 Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 261.11 263.82 256.99 242.45 224.1 206.86 195.34 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 36.83 36.83 36.83 36.83 36.83 36.83 36.83 36.83 36.83	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83	(67) (68) (69)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83	(67) (68)
(66)m= 138.29 13	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3	[(67) (68) (69) (70)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3	(67) (68) (69)
(66)m= 138.29 138.3 138.3	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3	[(67) (68) (69) (70)
(66)m= 138.29 138.69 138.68 138.68 139.3	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3 -110.63 -110.63 84.23 87.64	(67) (68) (69) (70) (71)
(66)m= 138.29 138.68 86.8 86.8 86.8 86.8 138.68 138.68 86.8 138.68 195.34 106.86 195.34 195.34 195.34 195.34 1	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3 -110.63 -110.63 84.23 87.64	(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	6.41	x	11.28	x	0.55	x	0.7	=	19.3	(75)
Northeast 0.9x 0.77	X	4.65	x	11.28	х	0.55	x	0.7	=	14	(75)
Northeast 0.9x 0.77	X	6.41	x	22.97	х	0.55	x	0.7	=	39.28	(75)
Northeast 0.9x 0.77	X	4.65	x	22.97	x	0.55	x	0.7] =	28.49	(75)
Northeast 0.9x 0.77	X	6.41	x	41.38	х	0.55	x	0.7	=	70.77	(75)
Northeast 0.9x 0.77	X	4.65	x	41.38	х	0.55	x	0.7	=	51.34	(75)
Northeast 0.9x 0.77	X	6.41	x	67.96	х	0.55	x	0.7	=	116.22	(75)
Northeast 0.9x 0.77	X	4.65	x	67.96	x	0.55	x	0.7	=	84.31	(75)
Northeast 0.9x 0.77	X	6.41	x	91.35	x	0.55	x	0.7	=	156.22	(75)
Northeast 0.9x 0.77	X	4.65	x	91.35	x	0.55	x	0.7	=	113.33	(75)
Northeast _{0.9x} 0.77	X	6.41	x	97.38	x	0.55	x	0.7	=	166.55	(75)
Northeast _{0.9x} 0.77	X	4.65	x	97.38	x	0.55	x	0.7	=	120.82	(75)
Northeast _{0.9x} 0.77	X	6.41	x	91.1	x	0.55	x	0.7	=	155.8	(75)
Northeast _{0.9x} 0.77	X	4.65	x	91.1	x	0.55	x	0.7	=	113.02	(75)
Northeast _{0.9x} 0.77	X	6.41	x	72.63	x	0.55	x	0.7	=	124.21	(75)
Northeast 0.9x 0.77	X	4.65	X	72.63	X	0.55	X	0.7		90.1	(75)
Northeast 0.9x 0.77	X	6.41	х	50.42	x	0.55	x	0.7		86.23	(75)
Northeast 0.9x 0.77	X	4.65	x	50.42	×	0.55	x	0.7	=	62.55	(75)
Northeast 0.9x 0.77	X	6.41	х	28.07	x	0.55	x	0.7	=	48	(75)
Northeast 0.9x 0.77	X	4.65	x	28.07	×	0.55	x	0.7	=	34.82	(75)
Northeast 0.9x 0.77	X	6.41	х	14.2	х	0.55	x	0.7	=	24.28	(75)
Northeast 0.9x 0.77	X	4.65	x	14.2	x	0.55	x	0.7	=	17.61	(75)
Northeast 0.9x 0.77	x	6.41	x	9.21	X	0.55	X	0.7	=	15.76	(75)
Northeast _{0.9x} 0.77	X	4.65	X	9.21	X	0.55	X	0.7	=	11.43	(75)
Southeast 0.9x 0.77	X	8.51	X	36.79	X	0.55	X	0.7	=	83.54	(77)
Southeast 0.9x 0.77	X	9.45	x	36.79	X	0.55	X	0.7	=	92.77	(77)
Southeast 0.9x 0.77	X	2.3	x	36.79	X	0.55	X	0.7	=	22.58	(77)
Southeast 0.9x 0.77	X	8.51	X	62.67	X	0.55	X	0.7	=	142.3	(77)
Southeast 0.9x 0.77	X	9.45	x	62.67	x	0.55	X	0.7	=	158.02	(77)
Southeast 0.9x 0.77	X	2.3	x	62.67	X	0.55	X	0.7	=	38.46	(77)
Southeast 0.9x 0.77	X	8.51	x	85.75	X	0.55	X	0.7	=	194.7	(77)
Southeast 0.9x 0.77	X	9.45	x	85.75	x	0.55	X	0.7	=	216.21	(77)
Southeast 0.9x 0.77	X	2.3	X	85.75	X	0.55	X	0.7	=	52.62	(77)
Southeast 0.9x 0.77	X	8.51	X	106.25	X	0.55	X	0.7	=	241.25	(77)
Southeast 0.9x 0.77	X	9.45	x	106.25	x	0.55	x	0.7	=	267.89	(77)
Southeast 0.9x 0.77	X	2.3	x	106.25	x	0.55	x	0.7	=	65.2	(77)
Southeast 0.9x 0.77	X	8.51	x	119.01	x	0.55	x	0.7	=	270.21	(77)
Southeast 0.9x 0.77	X	9.45	x	119.01	x	0.55	x	0.7	=	300.06	(77)
Southeast 0.9x 0.77	X	2.3	X	119.01	X	0.55	X	0.7	=	73.03	(77)

Southeast 0.9x	0.77	1	0.54	۱ .,	440.45	1 ,	0.55	l "	0.7	1 =	000.00	7(77)
Southeast 0.9x	0.77] X	8.51	X	118.15] X] .,	0.55	X	0.7] 1	268.26	(77)
Southeast 0.9x	0.77	X	9.45	X I	118.15] X]	0.55	X	0.7] = 1 _	297.89	(77)
Southeast 0.9x	0.77] X	2.3	l X	118.15] X] .,	0.55	X	0.7] = 1 _	72.5	(77)
Southeast 0.9x	0.77) X	8.51	X	113.91] X	0.55	X	0.7] = 1	258.63	(77)
<u> </u>	0.77	X	9.45	X	113.91	X	0.55	X	0.7] = 1	287.2	(77)
Southeast 0.9x	0.77	X	2.3	X	113.91	X	0.55	X	0.7] = 1	69.9	(77)
Southeast 0.9x	0.77	X	8.51	X	104.39	X	0.55	X	0.7] = 1	237.02	(77)
Southeast 0.9x	0.77	X	9.45	X	104.39	X	0.55	X	0.7] = 1	263.2	(77)
Southeast 0.9x	0.77	X	2.3	X	104.39	X	0.55	X	0.7] = 1	64.06	(77)
Southeast 0.9x	0.77	X	8.51	X	92.85	X	0.55	X	0.7] = 1	210.82	(77)
Southeast 0.9x	0.77	X	9.45	X	92.85	X	0.55	X	0.7] =	234.11	(77)
Southeast 0.9x	0.77	X	2.3	X	92.85	X	0.55	X	0.7] =	56.98	(77)
Southeast 0.9x	0.77	X	8.51	X	69.27	X	0.55	X	0.7] =	157.27	(77)
Southeast 0.9x	0.77	X	9.45	Х	69.27	X	0.55	X	0.7	=	174.64	(77)
Southeast 0.9x	0.77	X	2.3	X	69.27	X	0.55	X	0.7	=	42.51	(77)
Southeast 0.9x	0.77	X	8.51	X	44.07	X	0.55	X	0.7] =	100.06	(77)
Southeast 0.9x	0.77	X	9.45	X	44.07	X	0.55	X	0.7	=	111.12	(77)
Southeast 0.9x	0.77	X	2.3	Х	44.07	Х	0.55	X	0.7	=	27.04	(77)
Southeast 0.9x	0.77	X	8.51	Х	31.49	X	0.55	X	0.7	=	71.49	(77)
Southeast _{0.9x}	0.77	X	9.45	х	31.49	×	0.55	X	0.7	=	79.39	(77)
Southeast _{0.9x}	0.77	X	2.3	X	31.49	X	0.55	X	0.7	=	19.32	(77)
Southwest _{0.9x}	0.77	X	2.3	Х	36.79		0.55	X	0.7	=	22.58	(79)
Southwest _{0.9x}	0.77	X	2.3	Х	62.67		0.55	X	0.7	=	38.46	(79)
Southwest _{0.9x}	0.77	X	2.3	X	85.75]	0.55	X	0.7	=	52.62	(79)
Southwest _{0.9x}	0.77	X	2.3	X	106.25]	0.55	X	0.7	=	65.2	(79)
Southwest _{0.9x}	0.77	X	2.3	X	119.01]	0.55	X	0.7	=	73.03	(79)
Southwest _{0.9x}	0.77	X	2.3	X	118.15]	0.55	X	0.7	=	72.5	(79)
Southwest _{0.9x}	0.77	X	2.3	X	113.91	_	0.55	X	0.7	=	69.9	(79)
Southwest _{0.9x}	0.77	X	2.3	X	104.39	_	0.55	X	0.7	=	64.06	(79)
Southwest _{0.9x}	0.77	X	2.3	X	92.85	ļ	0.55	X	0.7	=	56.98	(79)
Southwest _{0.9x}	0.77	X	2.3	X	69.27		0.55	X	0.7	=	42.51	(79)
Southwest _{0.9x}	0.77	X	2.3	X	44.07	_	0.55	X	0.7	=	27.04	(79)
Southwest _{0.9x}	0.77	X	2.3	X	31.49	_	0.55	X	0.7	=	19.32	(79)
Northwest _{0.9x}	0.77	X	2.3	X	11.28	X	0.55	X	0.7	=	6.92	(81)
Northwest _{0.9x}	0.77	X	2.3	X	22.97	X	0.55	X	0.7	=	14.09	(81)
Northwest _{0.9x}	0.77	X	2.3	x	41.38	X	0.55	X	0.7	=	25.39	(81)
Northwest _{0.9x}	0.77	X	2.3	x	67.96	X	0.55	X	0.7] =	41.7	(81)
Northwest 0.9x	0.77	x	2.3	x	91.35	X	0.55	x	0.7	=	56.05	(81)
Northwest _{0.9x}	0.77	X	2.3	x	97.38	X	0.55	X	0.7	=	59.76	(81)
Northwest _{0.9x}	0.77	X	2.3	x	91.1	X	0.55	X	0.7	=	55.9	(81)
Northwest _{0.9x}	0.77	X	2.3	X	72.63	X	0.55	X	0.7	=	44.57	(81)

Northwe	est _{0.9x}	0.77	X	2.3	3	x	50.42	x		0.55	x	0.7	=	30.94	(81)
Northwe	est _{0.9x}	0.77	X	2.3	3	x	28.07	x		0.55	x	0.7	=	17.22	(81)
Northwe	est _{0.9x}	0.77	X	2.3	3	x	14.2	x		0.55	x	0.7	=	8.71	(81)
Northwe	est _{0.9x}	0.77	X	2.3	3	x	9.21	x		0.55	_ x _	0.7		5.65	(81)
	_					_		-							
Solar g	ains in	watts, ca	alculated	for eacl	h month			(83)m =	= Su	ım(74)m	(82)m				
(83)m=	261.68	459.1	663.65	881.77	1041.94	1	3.29 1010.36	887.2	22	738.61	516.98	315.87	222.37		(83)
Total g	ains – ir	nternal a	nd solai	(84)m =	(73)m	+ (83	3)m , watts	•					•		
(84)m=	703.5	898.72	1087.78	1280.41	1414.1	1405	5.08 1341.22	1225.	.14	1090.21	894.3	722.37	651.01		(84)
7. Me	an inter	nal temp	erature	(heating	season)									
		•		`		<i>'</i>	ea from Tal	ole 9,	Th1	I (°C)				21	(85)
•		_	• .			_	e Table 9a)			` ,					
	Jan	Feb	Mar	Apr	May	Ò	ın Jul	Au	ıa T	Sep	Oct	Nov	Dec]	
(86)m=	1	0.99	0.95	0.85	0.67	0.4	-	0.39	-	0.64	0.92	0.99	1		(86)
L	intorno	tompor	oturo in	livina or	. T1 /f	سا	otopo 2 to -	l 7 in Ta	مامد	. 00)				I	
(87)m=	19.95	20.19	20.49	20.8	20.95	20.	steps 3 to 7	21	$\overline{}$	20.97	20.73	20.27	19.91	1	(87)
` ′ [l					_		20.73	20.21	19.91		(01)
· r				1		r -	lling from Ta			`				1	(0.0)
(88)m=	20.03	20.03	20.03	20.05	20.05	20.	07 20.07	20.0	7	20.06	20.05	20.04	20.04		(88)
Util <mark>isa</mark>	itio <mark>n fac</mark>	tor for g	ains for	rest of d	welling,	h2,m	(see Table	9a)							
(89)m=	1	0.98	0.94	0.82	0.61	0.4	1 0.27	0.31	1	0.57	0.89	0.99	1		(89)
Mean	interna	temper	ature in	the rest	of dwelli	ing T	2 (follow ste	eps 3 t	to 7	in Table	e 9 <mark>c)</mark>				
(90)m=	18.63	18.98	19.41	19.84	20.01	20.	06 20.07	20.0	7	20.04	19.76	19.12	18.58		(90)
			7					•		f	LA = Livin	g area ÷ (4	4) =	0.26	(91)
Mean	interna	temper	ature (fo	r the wh	ole dwe	llina)	= fLA × T1	+ (1 -	_ fl /	Δ) x T2					
(92)m=	18.97	19.29	19.69	20.09	20.25	20		20.3	\neg	20.28	20.01	19.41	18.92]	(92)
` ′ [nent to the	ne mear	internal	temper	ature	from Table	4e. w	vhe		priate			J	
(93)m=	18.82	19.14	19.54	19.94	20.1	20.		20.1	$\overline{}$	20.13	19.86	19.26	18.77]	(93)
8. Spa	ace hea	ting requ	uirement												
Set Ti	to the r	nean int	ernal tei	mperatui	e obtair	ned a	t step 11 of	Table	9b	, so that	t Ti,m=(76)m an	d re-cald	culate	
the uti	ilisation	factor fo	or gains	using Ta	ble 9a									1	
	Jan	Feb	Mar	Apr	May	Jı	ın Jul	Au	ıg	Sep	Oct	Nov	Dec		
г		tor for g	1	î .			-	1	_	ı		Г	1	1	(0.1)
(94)m=	0.99	0.98	0.93	0.81	0.62	0.4	11 0.28	0.32	2	0.57	0.89	0.98	1		(94)
г				4)m x (84			00 070 70	T	<u>. T</u>	204.40	704.40	700.00	L 0.17 0.4	1	(05)
(95)m=	698.51	878.22		1037.72		581		393.	3	624.43	791.49	709.29	647.81		(95)
г		_		perature				164	,	111	10.6	7.1	1 4 2	1	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	14		16.4		14.1	10.6	7.1	4.2		(96)
r	1597.53			1185.61	899.71	Lm , 583	W =[(39)m .99 373.96	X [(93 393.7	_	638.85	991.19	1311.1	1582	l	(97)
` ' L						<u> </u>	nonth = 0.02		_				1302	J	(01)
(98)m=	668.87	459.03	305.9	106.48	21.85	VVII/II		24 X [(<u>31)</u>	0 0	148.58	433.3	695.03]	
(00)111-	000.01	.55.55		1 .30.40		Щ			Otal			r) = Sum(9	<u> </u>	2839.05	(98)
0				1380 / 3	24			'	otal	poi yeai (ixvviii yedi	, – Guiii(9	√J15,912 ¯		=
Space	neating	y require	ement in	kWh/m²	year									27.56	(99)

9a. Energy requirements – Ind	lividual hea	ating systems	including	a micro-C	HP)					
Space heating:	iiviaaai iioo		morading	, moro o	,					_
Fraction of space heat from s	•		ry system						0	(201)
Fraction of space heat from r	nain syster	m(s)		(202) = 1 -					1	(202)
Fraction of total heating from	main syste	em 1		(204) = (20)2) × [1 –	(203)] =			1	(204)
Efficiency of main space hear	ting systen	n 1							90.4	(206)
Efficiency of secondary/supp	lementary	heating syste	m, %					•	0	(208)
Jan Feb Mar	Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space heating requirement (compared to the following formula f	1 1	above) 21.85 0	0	0	0	148.58	433.3	695.03	1	
			1 0	0	- 0	140.50	433.3	095.03		(044)
$(211)m = \{[(98)m \times (204)] \} \times (204) $ $739.9 507.78 338.39$		24.17 0	0	0	0	164.36	479.31	768.84	1	(211)
700.0 007.70 000.00	117.70	24.17				ar) =Sum(2			3140.54	(211)
Space heating fuel (secondar	rv). kWh/m	onth						-		` ′
$= \{[(98)\text{m x } (201)] \} \text{ x } 100 \div (201)$									_	
(215)m= 0 0 0	0	0 0	0	0	0	0	0	0		
				Total	(kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating										
Output from water heater (calc		ove) 170.86 150.49	144.18	160.73	162.5	184.08	194.63	208.76		
Efficiency of water heater									80.3	(216)
(217)m= 87.73 87.21 86.14	83.82	81.33 80.3	80.3	80.3	80.3	84.52	87.01	87.85		(217)
Fuel for water heating, kWh/m										
(219) m = (64) m x $100 \div (217)$ (219)m = 243.83 216.19 229.87		210.09 187.41	179.55	200.16	202.37	217.8	223.69	237.64	1	
(219)111- 243.03 210.19 223.07	210.54	210.09 107.41	179.55			19a) _{1 12} =	223.09	237.04	2559.11	(219)
Annual totals					•		Wh/yeaı	r	kWh/yea	`
Space heating fuel used, main	system 1						•		3140.54	
Water heating fuel used									2559.11	
Electricity for pumps, fans and	electric ke	eep-hot								
mechanical ventilation - balar	nced, extra	act or positive	input from	m outside)			247.72]	(230a)
central heating pump:	,	·	'					30]]	(230c)
Total electricity for the above,	k\/\/h/vear			sum	of (230a).	(230g) =			277.72	(231)
•	Kvvii/yeai			54	o. (2 000).	(2009)				=
Electricity for lighting									411.09	(232)
12a. CO2 emissions – Individ	lual heating	g systems ind	cluding m	icro-CHP						
			nergy Wh/year			Emiss kg CO	ion fac 2/kWh	tor	Emission kg CO2/ye	
Space heating (main system 1)	(2	11) x			0.2	16	=	678.36	(261)
Space heating (secondary)		(2	15) x			0.5	19	=	0	(263)
Water heating		(2	19) x			0.2	16	=	552.77	(264)
Space and water heating		(2	61) + (262)	+ (263) + (2	264) =		-		1231.12	(265)
opass and nator nothing		(, ()	(- / (-	,				1231.12	(203)

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	144.14	(267)
Electricity for lighting	(232) x	0.519	213.36	(268)
Total CO2, kg/year		sum of (265)(271) =	1588.62	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	15.42	(273)
El rating (section 14)			86	(274)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.4.16 Property Address: Flat 04 Address: 1. Overall dwelling dimensions Area(m²) Av. Height(m) Volume(m³) **Basement** 59.89 (1a) x 2.7 (2a) =161.7 (3a) Ground floor (1b) x (2b) (3b) 46.65 3.27 152.55 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)106.54 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 314.25 2. Ventilation rate: main secondary other total m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c)0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 1 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.15 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4.9

4.4

5

3.8

4.3

3.8

3.7

4

4.3

4.5

4.7

(22)m=

5.1

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infiltr	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m		-		-	
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18]	
Calculate effe		•	rate for t	he appli	cable ca	se	!		!	!		, 	1,00
If mechanic			andiv N. (2	2h) = (22c) v Emu (a	auation (NEN otho	nuina (22h	s) = (22a)			0.5	(23a)
If balanced with)) = (23a)			0.5	(23b)
a) If balance		•	•	_		,		•	2b)m + (23b) × [1 – (23c)	73.9 ÷ 1001	(23c)
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31]	(24a)
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (ľ	MV) (24t)m = (2	2b)m + (2	23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h				•	•					-	-	_	
if (22b)r	n < 0.5 ×	(23b), t	hen (24)	c) = (23b); other	vise (24	c) = (22h	o) m + 0	.5 × (23b)		1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural if (22b)r	ventilation n = 1, the				•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(25)
3. Heat losse	es and he	eat loss r	paramete	er:									
3. Heat losse ELEMENT	Gros	SS	oaramete Openin m	gs	Net Ar		U-valı W/m2		A X U	()	k-value		A X k kJ/K
	Gros area	SS	Openin	gs	Net Ar A ,r 8.51	m²	U-vali W/m2 /[1/(1.2)+	2K	A X U (W/I	()	k-value kJ/m²·		A X k kJ/K
ELEMENT	Gros area e 1	SS	Openin	gs	A ,r	m² x1	W/m2	2K 0.04] =	(W/I	<) 			kJ/K
ELEMENT Windows Type	Gros area e 1	SS	Openin	gs	A ,r	m² x1 x1	W/m2 /[1/(1.2)+	0.04] = 0.04] =	9.74	<) 			kJ/K (27)
ELEMENT Windows Type Windows Type	Gros área e 1 e 2 e 3	SS	Openin	gs	A ,r 8.51 2.3	m ² x1 x1 x1	W/m2 /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] =	9.74 2.63	<) 			kJ/K (27) (27)
Windows Type Windows Type Windows Type	Gros área e 1 e 2 e 3	SS	Openin	gs	A ,r 8.51 2.3 8.51	x1 x1 x1 x1 x1	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] =	9.74 2.63 9.74	<) 			kJ/K (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	Gros área e 1 e 2 e 3	ss (m²)	Openin	gs	A ,r 8.51 2.3 8.51 5.35	x1 x1 x1 x1 x1	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 9.74 6.13	<) 			kJ/K (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Floor	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs ²	A ,r 8.51 2.3 8.51 5.35 59.89	x1 x1 x1 x2 x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 9.74 6.13 5.989	<)			kJ/K (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Floor Walls Type1	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs ²	A ,r 8.51 2.3 8.51 5.35 59.89	x1 x1 x1 x2 x x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 	0.04] = 0.04] = 0.04] = 0.04] = = = =	9.74 2.63 9.74 6.13 5.989 1.86	<)			kJ/K (27) (27) (27) (27) (28)
Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2	Gros area e 1 e 2 e 3 e 4	22 16 15	Openin m	gs ²	A ,r 8.51 2.3 8.51 5.35 59.89 11.62	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16	0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	9.74 2.63 9.74 6.13 5.989 1.86	<)			kJ/K (27) (27) (27) (27) (28) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3	22 26 35 88	0 24.6 0	gs ²	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 10.29	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = =	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98	<)			kJ/K (27) (27) (27) (27) (28) (29) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3 15.9	55 (m²) 66 85 88	0 24.6 0	gs ²	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 10.29 62.35	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.16	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98 1.92	<)			kJ/K (27) (27) (27) (27) (28) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Total area of e	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3 15.9 16.4 elelements	55 (m²) 22 26 25 28 28 28 29 29 29 29 29 29 29 29 29 29 29 29 29	Openin m 0 24.6 0 0 0 effective wi	gs ² 7	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 62.35 15.98 16.48 201.2	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.16 0.12	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98 1.92 1.98		kJ/m²·	K	(27) (27) (27) (27) (28) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Total area of e	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3 15.9 16.4 elements	22	Openin m 0 24.6 0 0 ceffective winternal wall	gs ² 7	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 62.35 15.98 16.48 201.2	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.16 0.12	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98 1.92 1.98		kJ/m²·	K	(27) (27) (27) (27) (28) (29) (29) (29) (30) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Total area of e * for windows and ** include the area	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3 15.9 16.4 elements d roof windows, W/K =	52 66 68 88 98 98 98 98 98 98 98 98 9	Openin m 0 24.6 0 0 ceffective winternal wall	gs ² 7	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 62.35 15.98 16.48 201.2	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04]	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98 1.92 1.98	as given in	kJ/m²·	K	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Total area of e * for windows and ** include the are Fabric heat los	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3 15.9 16.4 elements d roof winder as on both ss, W/K = Cm = S(55 (m²) 66 (m²) 76 (m²) 77 (m²) 78 (m²) 78 (m²) 78 (m²) 78 (m²) 78 (m²) 79 (m²)	Openin m 24.6 0 0 effective winternal walk U)	gs 2 7 Indow U-vals and part	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 62.35 15.98 16.48 201.2 alue calculatitions	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] = = 0.04] =	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98 1.92 1.98	as given in (2) + (32a)	kJ/m²·	h 3.2	(27) (27) (27) (27) (28) (29) (29) (29) (30) (30) (31)

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.

	al bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix k	<						7.67	(36)
		0 0	are not kn	own (36) =	0.15 x (3	1)								_
Total fa	abric he	at loss							(33) +	(36) =			59.28	(37)
Ventila	ation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)	· · · · · · · · · · · · · · · · · · ·		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	33.34	32.95	32.56	30.62	30.23	28.28	28.28	27.9	29.06	30.23	31.01	31.78		(38)
Heat tr	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	92.62	92.23	91.84	89.9	89.51	87.56	87.56	87.17	88.34	89.51	90.28	91.06		
Heat lo	oss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) _{1.} (4)	12 /12=	89.8	(39)
(40)m=	0.87	0.87	0.86	0.84	0.84	0.82	0.82	0.82	0.83	0.84	0.85	0.85		
								!	,	Average =	Sum(40) _{1.}	12 /12=	0.84	(40)
Numbe	er of day	s in mor	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ener	gy requi	irement:								kWh/ye	ear:	
Λ			. I											
		ipancy, l		[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0)013 x (ΓFA -13.		79		(42)
	A £ 13.9		6 /	L. Oxip	(0.000	(7	/_/]						
								(25 x N)).52		(43)
				usage by a day (all w			-	to achieve	a water us	se target o	1			
			_					Aug	Con	Oct	Nov	Dec		
Hot water	Jan er usage ii	Feb	Mar	Apr	May	Jun	Jul	I AHO				i Deci		
		n litres ber	day for ea	ch month	Vd.m = fa	ctor from T	able 1c x		Sep	Oct	NOV			
(44)m=				ach month				(43)						
(44)m=	110.57	106.55	day for ea	98.51	<i>Vd,m = fa</i> 94.49	otor from 7	90.47		98.51	102.53	106.55	110.57	1206 23	7(44)
	110.57	106.55	102.53	98.51	94.49	90.47	90.47	(43)	98.51	102.53 Fotal = Su	106.55 m(44) ₁₁₂ =	110.57	1206.23	(44)
	110.57	106.55	102.53	98.51	94.49	90.47	90.47	94.49	98.51	102.53 Fotal = Su	106.55 m(44) ₁₁₂ =	110.57	1206.23	(44)
Energy	110.57	106.55	102.53 used - cal	98.51	94.49 onthly = 4.	90.47 190 x Vd,n	90.47 m x nm x D	94.49 OTm / 3600	98.51 9 kWh/mon	102.53 Total = Su tth (see Ta 133.96	106.55 m(44) ₁₁₂ = ables 1b, 1	110.57 : c, 1d)	1206.23	(44)
Energy (45)m=	110.57 content of	106.55 hot water 143.41	102.53 used - cal	98.51 culated mo	94.49 onthly = 4.	90.47 190 x Vd,n	90.47 n x nm x E 98.99	94.49 OTm / 3600	98.51 98.51 98.Wh/mort	102.53 Total = Su tth (see Ta 133.96	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23	110.57 : c, 1d)		
Energy (45)m= If instan (46)m=	110.57 content of 163.97 taneous w	106.55 hot water 143.41 vater heatin 21.51	102.53 used - cal	98.51 culated mo	94.49 onthly = 4.	90.47 190 x Vd,n	90.47 n x nm x E 98.99	94.49 97m / 3600 113.59	98.51 98.51 98.Wh/mort	102.53 Total = Su tth (see Ta 133.96	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23	110.57 : c, 1d)		
Energy (45)m= If instant (46)m= Water	content of 163.97 taneous w 24.6 storage	106.55 hot water 143.41 vater heatin 21.51 loss:	102.53 used - cal 147.99 ng at point 22.2	98.51 culated model 129.02 of use (not 19.35)	94.49 onthly = 4. 123.8 o hot water 18.57	90.47 190 x Vd,n 106.83 - storage), 16.02	90.47 n x nm x D 98.99 enter 0 in 14.85	(43) 94.49 07m / 3600 113.59 boxes (46) 17.04	98.51 9 kWh/mon 114.95 9 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ =	110.57 : c, 1d) 158.8		(45)
Energy (45)m= If instant (46)m= Water Storage	content of 163.97 taneous w 24.6 storage	106.55 hot water 143.41 vater heatin 21.51 loss: e (litres)	102.53 used - cal 147.99 ng at point 22.2 includir	98.51 culated model 129.02 for use (not 19.35) ng any so	94.49 onthly = 4. 123.8 hot water 18.57 olar or W	90.47 190 x Vd,n 106.83 storage), 16.02	90.47 n x nm x E 98.99 enter 0 in 14.85 storage	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa	98.51 9 kWh/mon 114.95 9 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ =	110.57 : c, 1d) 158.8		(45)
Energy (45)m= If instant (46)m= Water Storag If comm	110.57 content of 163.97 taneous w 24.6 storage ye volum munity h	hot water 143.41 21.51 loss: e (litres)	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta	98.51 culated model 129.02 for use (not 19.35) and any south in dw.	94.49 onthly = 4. 123.8 hot water 18.57 olar or Welling, e	90.47 190 x Vd,n 106.83 storage), 16.02 /WHRS	90.47 98.99 enter 0 in 14.85 storage	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47)	98.51 9 kWh/mon 114.95 1 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8		(45)
Energy (45)m= If instan (46)m= Water Storag If comi	taneous w 24.6 storage ye volum munity h	hot water 143.41 21.51 loss: e (litres) eating a o stored	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta	98.51 culated model 129.02 for use (not 19.35) and any south in dw.	94.49 onthly = 4. 123.8 hot water 18.57 olar or Welling, e	90.47 190 x Vd,n 106.83 storage), 16.02 /WHRS	90.47 98.99 enter 0 in 14.85 storage	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa	98.51 9 kWh/mon 114.95 1 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8		(45)
Energy (45)m= If instant (46)m= Water Storag If comit Otherv Water	taneous w 24.6 storage working if no storage	hot water 143.41 21.51 loss: e (litres) eating as stored loss:	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate	98.51 culated model 129.02 for use (not 19.35) ag any sounk in dwer (this in	94.49 onthly = 4. 123.8 o hot water 18.57 olar or W relling, e cludes i	90.47 190 x Vd,n 106.83 storage), 16.02 /WHRS = nter 110 nstantan	90.47 98.99 enter 0 in 14.85 storage litres in neous co	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47)	98.51 9 kWh/mon 114.95 1 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82		(45) (46) (47)
Energy (45)m= If instan (46)m= Water Storag If cominothery Water a) If m	taneous w 24.6 storage we volum munity h vise if no storage nanufact	hot water 143.41 21.51 loss: lee (litres) leeating as o stored loss: lurer's de	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate	98.51 culated model 129.02 for use (not 19.35) and any south in dwarf (this in the coss factors)	94.49 onthly = 4. 123.8 o hot water 18.57 olar or W relling, e cludes i	90.47 190 x Vd,n 106.83 storage), 16.02 /WHRS = nter 110 nstantan	90.47 98.99 enter 0 in 14.85 storage litres in neous co	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47)	98.51 9 kWh/mon 114.95 1 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82		(45) (46) (47) (48)
Energy (45)m= If instant (46)m= Water Storag If commodities Otherw Water a) If m Tempe	taneous w 24.6 storage ye volum munity h vise if no storage nanufact erature fi	hot water 143.41 21.51 loss: e (litres) eating a o stored loss: urer's de	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate eclared I m Table	98.51 culated model 129.02 for use (not 19.35) and any south in dwarf (this in the cost factor 2b	94.49 onthly = 4. 123.8 hot water 18.57 olar or Water relling, excludes in the column of the c	90.47 190 x Vd,n 106.83 storage), 16.02 /WHRS = nter 110 nstantan	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47) ombi boile	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82		(45) (46) (47) (48) (49)
Energy (45)m= If instan (46)m= Water Storag If cominothery Water a) If m Temper Energy	taneous w 24.6 storage ye volum munity h vise if no storage nanufact erature fi	hot water 143.41 21.51 loss: e (litres) eating a control of stored loss: urer's defactor from water	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot water eclared I m Table	98.51 culated model 129.02 for use (not 19.35) and any south in dweer (this in oss factors 2b k, kWh/ye	94.49 onthly = 4. 123.8 hot water 18.57 olar or W relling, e cludes i or is knowear	90.47 190 x Vd,n 106.83 s storage), 16.02 /WHRS : nter 110 nstantan	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47)	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82		(45) (46) (47) (48)
Energy (45)m= If instan (46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m	taneous w 24.6 storage we volum munity h vise if no storage nanufact erature fi	hot water 143.41 21.51 loss: e (litres) eating a control of stored loss: urer's defactor from water urer's defactor from urer's defactor f	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate eclared I m Table storage	98.51 culated model 129.02 for use (not 19.35) and any south in dwarf (this in the cost factor 2b	94.49 onthly = 4. 123.8 hot water 18.57 olar or W relling, e cludes i or is knower ear oss factor	90.47 190 x Vd,n 106.83 16.02 /WHRS : nter 110 nstantan wn (kWh	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47) ombi boile	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82		(45) (46) (47) (48) (49)
Energy (45)m= If instan (46)m= Water Storag If cominothery Water a) If m Temper Energy b) If m Hot water	taneous w 24.6 storage ye volum munity h vise if no storage nanufact erature fi y lost fro nanufact ater stora munity h	hot water 143.41 21.51 loss: e (litres) eating a control of the stored loss: urer's defactor from water urer's defage loss leating s	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate eclared I m Table storage eclared of	98.51 culated model 129.02 for use (not 19.35) ag any sounk in dwer (this in oss factor 2b) cylinder I com Table	94.49 onthly = 4. 123.8 hot water 18.57 olar or W relling, e cludes i or is knower ear oss factor	90.47 190 x Vd,n 106.83 16.02 /WHRS : nter 110 nstantan wn (kWh	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47) ombi boile	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82 0		(45) (46) (47) (48) (49) (50)
Energy (45)m= If instant (46)m= Water Storag If comin Otherv Water a) If m Tempe Energy b) If m Hot wa If comin Volume	taneous w 24.6 storage we volume munity h vise if no storage nanufact erature fi y lost fro nanufact ater stora munity h e factor	hot water 143.41 21.51 loss: e (litres) eating a control stored loss: urer's defactor from water urer's defage loss eating s from Tai	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate eclared I m Table storage eclared of factor fr ee section	98.51 culated model 129.02 for use (not 19.35) and any so the ser (this in 19.35) coss factor 2b cylinder I from Table on 4.3	94.49 onthly = 4. 123.8 hot water 18.57 olar or W relling, e cludes i or is knower ear oss factor	90.47 190 x Vd,n 106.83 16.02 /WHRS : nter 110 nstantan wn (kWh	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47) ombi boile	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82 0		(45) (46) (47) (48) (49) (50)
Energy (45)m= If instant (46)m= Water Storag If comit Otherv Water a) If m Tempe Energy b) If m Hot wa If comit Volume	taneous w 24.6 storage we volume munity h vise if no storage nanufact erature fi y lost fro nanufact ater stora munity h e factor	hot water 143.41 21.51 loss: e (litres) eating a control of the stored loss: urer's defactor from water urer's defage loss leating s	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate eclared I m Table storage eclared of factor fr ee section	98.51 culated model 129.02 for use (not 19.35) and any so the ser (this in 19.35) coss factor 2b cylinder I from Table on 4.3	94.49 onthly = 4. 123.8 hot water 18.57 olar or W relling, e cludes i or is knower ear oss factor	90.47 190 x Vd,n 106.83 16.02 /WHRS : nter 110 nstantan wn (kWh	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47) ombi boile	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82 0		(45) (46) (47) (48) (49) (50) (51)

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		
(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 Append	lix H
(57)m= 0 0 0 0 0 0	0 0 0	0 0	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷	365 × (41)m		
(modified by factor from Table H5 if there is solar water hea	ating and a cylinder therm	ostat)	
(59)m= 0 0 0 0 0 0	0 0 0	0 0	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (4	l1)m		
(61)m= 50.96 46.03 50.96 48.58 48.15 44.61 46.1	48.15 48.58 50.96	49.32 50.96	(61)
Total heat required for water heating calculated for each mon	th (62)m = 0.85 × (45)m +	(46)m + (57)m +	(59)m + (61)m
(62)m= 214.93 189.44 198.95 177.6 171.95 151.44 145.0	9 161.74 163.53 184.92	195.55 209.76	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quar	tity) (enter '0' if no solar contribu	ition to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see A	Appendix G)		_
(63)m= 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater			
(64)m= 214.93 189.44 198.95 177.6 171.95 151.44 145.0	9 161.74 163.53 184.92	195.55 209.76	
	Output from water heate	er (annual) ₁₁₂	2164.91 (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	1]
(65)m= 67.26 59.19 61.95 55.04 53.2 46.67 44.44	49.81 50.37 57.28	CO OF CE 54	1 (65)
	49.61 30.57 37.28	60.95 65.54	(65)
include (57)m in calculation of (65)m only if cylinder is in the			J '
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):			J '
5. Internal gains (see Table 5 and 5a):			J '
			J '
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	e dwelling or hot water is to Aug Sep Oct	from community h	J '
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.62 139.62 139.62 139.62 139.62 139.62	Aug Sep Oct 139.62 139.62	rom community h	neating
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oct 139.62 139.62	rom community h	neating
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62	Nov Dec 139.62	neating (66)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.62 139.62 139.62 139.62 139.62 139.62 Lighting gains (calculated in Appendix L, equation L9 or L9a). (67)m= 23.76 21.1 17.16 12.99 9.71 8.2 8.86	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5	Nov Dec 139.62	neating (66)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4	Nov Dec 139.62 139.62	(66)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.62 139.62 139.62 139.62 139.62 139.62 Lighting gains (calculated in Appendix L, equation L9 or L9a) (67)m= 23.76 21.1 17.16 12.99 9.71 8.2 8.86 Appliances gains (calculated in Appendix L, equation L13 or I	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5	Nov Dec 139.62 139.62	(66)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.62 139.62 139.62 139.62 139.62 139.62 Lighting gains (calculated in Appendix L, equation L9 or L9a), (67)m= 23.76 21.1 17.16 12.99 9.71 8.2 8.86 Appliances gains (calculated in Appendix L, equation L13 or I (68)m= 266.49 269.25 262.28 247.45 228.72 211.12 199.3 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 36.96 36.96 36.96 36.96 36.96 36.96 36.96	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73	(66) (67) (68)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.62 139.62 139.62 139.62 139.62 139.62 Lighting gains (calculated in Appendix L, equation L9 or L9a). (67)m= 23.76 21.1 17.16 12.99 9.71 8.2 8.86 Appliances gains (calculated in Appendix L, equation L13 or I (68)m= 266.49 269.25 262.28 247.45 228.72 211.12 199.3 Cooking gains (calculated in Appendix L, equation L15 or L15)	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73	(66) (67) (68)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5 5 36.96 36.96 36.96	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96	(66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 6a), also see Table 5 6 36.96 36.96 36.96 3 3 3 3	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96	(66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 6a), also see Table 5 6 36.96 36.96 36.96 3 3 3 3	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96 3	[] (66) (67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 6a), also see Table 5 7 36.96 36.96 36.96 3 3 3 3	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96 3	[] (66) (67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 6a), also see Table 5 7 36.96 36.96 36.96 3 3 3 3	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96 3 3 3 3 -111.7 -111.7	(66) (67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 6a), also see Table 5 3 36.96 36.96 36.96 3 3 3 3 7 -111.7 -111.7 -111.7	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96 3 3 3 3 -111.7 -111.7	(66) (67) (68) (69) (70)

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

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	X	8.51	x	36.79	x	0.55	x	0.7	=	83.54	(77)
Southeast 0.9x	0.77	X	8.51	x	36.79	x	0.55	x	0.7	=	83.54	(77)
Southeast 0.9x	0.77	X	5.35	x	36.79	x	0.55	x	0.7	=	52.52	(77)
Southeast 0.9x	0.77	X	8.51	x	62.67	x	0.55	x	0.7] =	142.3	(77)
Southeast 0.9x	0.77	X	8.51	x	62.67	x	0.55	x	0.7	=	142.3	(77)
Southeast 0.9x	0.77	X	5.35	x	62.67	x	0.55	x	0.7	=	89.46	(77)
Southeast 0.9x	0.77	X	8.51	x	85.75	x	0.55	x	0.7	=	194.7	(77)
Southeast 0.9x	0.77	X	8.51	x	85.75	x	0.55	x	0.7	=	194.7	(77)
Southeast 0.9x	0.77	X	5.35	x	85.75	x	0.55	x	0.7	=	122.4	(77)
Southeast 0.9x	0.77	X	8.51	x	106.25	x	0.55	x	0.7	=	241.25	(77)
Southeast 0.9x	0.77	X	8.51	x	106.25	x	0.55	x	0.7	=	241.25	(77)
Southeast 0.9x	0.77	X	5.35	x	106.25	x	0.55	x	0.7	=	151.66	(77)
Southeast 0.9x	0.77	X	8.51	x	119.01	x	0.55	x	0.7	=	270.21	(77)
Southeast 0.9x	0.77	X	8.51	x	119.01	X	0.55	x	0.7	=	270.21	(77)
Southeast 0.9x	0.77	X	5.35	x	119.01	X	0.55	x	0.7	=	169.88	(77)
Southeast 0.9x	0.77	X	8.51	X	118.15	X	0.55	X	0.7] =	268.26	(77)
Southeast 0.9x	0.77	X	8.51	х	118.15	x	0.55	x	0.7		268.26	(77)
Southeast 0.9x	0.77	X	5.35	x	118.15	×	0.55	x	0.7	=	168.65	(77)
Southeast 0.9x	0.77	X	8.51	х	113.91	x	0.55	x	0.7	=	258.63	(77)
Southeast 0.9x	0. <mark>77</mark>	X	8.51	х	113.91	_x	0.55	x	0.7	=	258.63	(77)
Southeast 0.9x	0.77	X	5.35	х	113.91	х	0.55	x	0.7	=	162.59	(77)
Southeast 0.9x	0.77	X	8.51	х	104.39	X	0.55	x	0.7	=	237.02	(77)
Southeast 0.9x	0.77	X	8.51	X	104.39	X	0.55	X	0.7	=	237.02	(77)
Southeast 0.9x	0.77	X	5.35	X	104.39	X	0.55	X	0.7	=	149.01	(77)
Southeast 0.9x	0.77	X	8.51	X	92.85	X	0.55	X	0.7	=	210.82	(77)
Southeast 0.9x	0.77	X	8.51	x	92.85	x	0.55	x	0.7	=	210.82	(77)
Southeast 0.9x	0.77	X	5.35	x	92.85	x	0.55	X	0.7	=	132.54	(77)
Southeast 0.9x	0.77	X	8.51	x	69.27	x	0.55	X	0.7	=	157.27	(77)
Southeast 0.9x	0.77	X	8.51	X	69.27	X	0.55	X	0.7	=	157.27	(77)
Southeast 0.9x	0.77	X	5.35	x	69.27	x	0.55	X	0.7	=	98.87	(77)
Southeast 0.9x	0.77	X	8.51	x	44.07	x	0.55	X	0.7	=	100.06	(77)
Southeast 0.9x	0.77	X	8.51	x	44.07	x	0.55	x	0.7	=	100.06	(77)
Southeast 0.9x	0.77	X	5.35	x	44.07	x	0.55	X	0.7	=	62.91	(77)
Southeast 0.9x	0.77	X	8.51	x	31.49	x	0.55	X	0.7	=	71.49	(77)
Southeast 0.9x	0.77	X	8.51	x	31.49	X	0.55	X	0.7	=	71.49	(77)
Southeast 0.9x	0.77	X	5.35	x	31.49	x	0.55	X	0.7	=	44.95	(77)
Southwest _{0.9x}	0.77	X	2.3	x	36.79]	0.55	X	0.7	=	22.58	(79)
Southwest _{0.9x}		X	2.3	x	62.67]	0.55	x	0.7	=	38.46	(79)
Southwest _{0.9x}	0.77	X	2.3	X	85.75		0.55	X	0.7	=	52.62	(79)

_					_									_		<u>_</u>
Southwest _{0.9x}	0.77	X	2.3	3	x L	10	06.25			0.55	X	0.7		• <u>L</u>	65.2	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x	1	19.01			0.55	X	0.7	:	-	73.03	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x [1	18.15			0.55	x	0.7			72.5	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x [1	13.91			0.55	x	0.7			69.9	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x [10	04.39			0.55	x	0.7			64.06	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x [9	2.85			0.55	x	0.7	:		56.98	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x [6	9.27			0.55	x [0.7			42.51	(79)
Southwest _{0.9x}	0.77	x	2.3	3	x [4	4.07			0.55	x [0.7		-	27.04	(79)
Southwest _{0.9x}	0.77	x	2.3	3	x [3	1.49			0.55	x	0.7		-	19.32	(79)
				_									_			
Solar gains in v	watts, cald	culated	for each	n month				(83)m	= Su	ım(74)m .	(82)m					
(83)m= 242.18	412.52	564.43	699.36	783.34	77	7.67	749.76	687.	11	611.16	455.92	290.08	207.2	6		(83)
Total gains – ir	nternal an	d solar	(84)m =	: (73)m -	+ (8	3)m	, watts									
(84)m= 690.72	858.84	995.02	1104.13	1161.16	11	29.7	1085.6	1030	.05	968.02	838.83	702.65	642.3	8		(84)
7. Mean intern	nal tempe	rature (heating	season)											
Temperature	during he	ating pe	eriods ir	the livir	ng a	area f	from Tab	ole 9,	Th1	l (°C)					21	(85)
Utilisation fac	tor for gai	ns for li	ving are	a, h1,m	(se	е Та	ble 9a)			, ,				_		
Jan	Feb	Mar	Apr	May	Ė	Jun	Jul	Αι	ıg	Sep	Oct	Nov	De			
(86)m= 1	0.99	0.96	0.86	0.69	0	.49	0.35	0.3		0.62	0.91	0.99	1			(86)
Me <mark>an int</mark> ernal	temperat	ure in li	iving are	ea T1 (fc	ارمال	v ste	ns 3 to 7	in T	ahle	9c)						
(87)m= 20.2		20.65	20.87	20.97		21	21	21		20.99	20.84	20.48	20.17	,		(87)
` '					4	11:	form To		71							
Temperature (88)m= 20.19	20.2	20.2	20.22	20.22		211111g 0.23	20.23	20.2	_	20.23	20.22	20.21	20.21	\neg		(88)
										20.20	20.22	20.21	20.2			(55)
Utilisation fac			1			<u> </u>		–		0.55				_		(00)
(89)m= 1	0.98	0.94	0.83	0.64	0	.44	0.29	0.3	2	0.55	0.88	0.99	1			(89)
Mean internal	temperat	ure in t		of dwelli	ng	T2 (f	ollow ste	ps 3	to 7	in Tabl	e 9c)	•		_		
(90)m= 19.13	19.43	19.76	20.08	20.19	20	0.23	20.23	20.2	24	20.22	20.05	19.54	19.09)		(90)
										f	LA = Livir	ng area ÷ (4	4) =		0.25	(91)
Mean internal	temperat	ure (for	the wh	ole dwe	ling	g) = fl	_A × T1	+ (1 -	– fL	A) × T2						
(92)m= 19.39	19.67	19.98	20.27	20.39	20	0.42	20.42	20.4	13	20.41	20.25	19.77	19.36	5		(92)
Apply adjustm	nent to the	mean	internal	temper	atur	re fro	m Table	4e, v	whe	re appro	priate			_		
(93)m= 19.24	19.52	19.83	20.12	20.24	20	0.27	20.27	20.2	28	20.26	20.1	19.62	19.21			(93)
8. Space heat	ting requir	rement														
Set Ti to the r					ed	at ste	ep 11 of	Table	e 9b	, so tha	t Ti,m=(76)m an	d re-ca	alcula	ate	
the utilisation	1					1	l. d	۸.	1	0	0-4	Navi		П		
Jan Utilisation fac	Feb tor for gain	Mar	Apr	May		Jun	Jul	Αι	ıg [Sep	Oct	Nov	De			
(94)m= 0.99	0.98	0.94	0.82	0.64	0	.44	0.3	0.3	3	0.56	0.87	0.98	1	7		(94)
Useful gains,							0.0	0.0		0.00	0.01	0.00	<u> </u>			(- /
(95)m= 686.43		931.58	910.2	746.31	49	5.57	321.72	337.	85	538.93	731.87	690	639.6	9		(95)
Monthly avera	age exterr	nal temi	ı perature	from Ta	able	 e 8						<u> </u>	<u> </u>			
(96)m= 4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.4	4	14.1	10.6	7.1	4.2			(96)
Heat loss rate	for mean	interna	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93	 3)m-	 - (96)m]	-	I	_		
	1348.36 1			764.23		6.76	321.79	337.	' T	544.38	849.94	1130.77	1366.8	88		(97)
	<u>!</u>									!		!				

Space heating requirement fo				1				i			
98)m= 519.08 341.37 217.97	71.09	13.34	0	0	0 Tota	0 I per year	87.84	317.35	541.03	2109.08	(98)
Space heating requirement in	k\/\/h/m²	²/vear			Tota	ii pei yeai	(KVVIII y Cai) – odin(o	O)15,912 —	19.8](99)
			votomo i	poludina	mioro C	יחטי			L	19.0	
ea. Energy requirements – Indi Space heating:	viduai II	eaung s	ysterns i	riciualing	THICIU-C	,пг)					
Fraction of space heat from se	econdar	y/supple	mentary	system						0	(201)
Fraction of space heat from m	ain syst	em(s)			(202) = 1 -	- (201) =			Ī	1	(202)
Fraction of total heating from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heat	ng syste	em 1								90.4	(206
Efficiency of secondary/supple	ementar	y heating	g systen	n, %						0	(208
Jan Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement (c	alculate 71.09	d above)	0	0	0	0	87.84	317.35	541.03		
$\frac{319.08 \left 341.37 \right 217.97}{211)m} = \{ [(98)m \times (204)] \} \times 1$		<u> </u>	U		U	U	07.04	317.33	341.03		(211
574.21 377.62 241.12	78.64	14.75	0	0	0	0	97.17	351.05	598.49		(211
				<u> </u>	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2333.06	(211
Space heating fuel (secondar	y), kWh/	month							_		_
= {[(98)m x (201)] } x 100 ÷ (20											
215)m= 0 0 0	0	0	0	0	0 Tota	0 I (kWh/yea	0 ar) =Sum(3	0	0	0	(215
Water heating						(,	715,1012	L	0	ار2،0
Output from water heater (calc	ulated a	bove)									
214.93 189.44 198.95	177.6	171.95	151.44	145.09	161.74	163.53	184.92	195.55	209.76		,
Efficiency of water heater	00.05	00.05	00.0	T 00 0	00.0	00.0	00.0	00.00	07.00	80.3	(216
217)m= 87.19 86.52 85.28 Fuel for water heating, kWh/mo	82.95	80.95	80.3	80.3	80.3	80.3	83.3	86.26	87.33		(217
219)m = (64)m x 100 ÷ (217)								_			
219)m= 246.51 218.96 233.28	214.11	212.41	188.6	180.69	201.43	203.65	222.01	226.69	240.19		_
					Tota	I = Sum(2				2588.52	(219
Annual totals Space heating fuel used, main	system	1					K	Wh/year	Г	2333.06	7
Vater heating fuel used	,								L [2588.52	<u> </u>
Electricity for pumps, fans and	electric	keep-ho	t						L		J
mechanical ventilation - balan		•		nput fror	n outside	9			258.78		(230
central heating pump:	•	r		•					30		(230
otal electricity for the above, k	:Wh/yea	ır			sum	of (230a).	(230g) =		 	288.78	(231
· · · · · · · · · · · · · · · · · · ·	-								Ļ		╡
Electricity for lighting										419.57	(232

Energy

kWh/year

Stroma FSAP 2012 Version: 1.0.4.16 (SAP 9.92) - http://www.stroma.com

Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	503.94	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	559.12	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1063.06	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	149.88	(267)
Electricity for lighting	(232) x	0.519	=	217.76	(268)
Total CO2, kg/year	sum o	of (265)(271) =		1430.69	(272)
Dwelling CO2 Emission Rate	(272)	÷ (4) =		13.43	(273)
El rating (section 14)				87	(274)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	112		Strom Softwa				Versio	on: 1.0.4.16	
		Р	roperty .	Address	: Flat 05	5				
Address :										
1. Overall dwelling dimer	nsions:									
Basement				a(m²) ′1.92	(1a) x		2.5	(2a) =	Volume(m 179.81	3) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n	1) 7	1.92	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	179.81	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	у 	other 0	7 = F	total 0	x -	40 =	m³ per hou	Jr ── _(6a)
Number of open flues	0 +	0	┪╻	0		0	x	20 =	0	(6b)
Number of intermittent fan					J	0	x	10 =	0	(7a)
Number of passive vents					L			10 =		(7b)
·					L	0		40 =	0	
Number of flueless gas fire	25				L	0	^		nanges per h	(7c)
Infiltration due to chimney	s flues and fans = 1	(6a)+(6b)+(7	(a)+(7b)+(7c) =	Г	0	_	÷ (5) =		(8)
If a pressurisation test has be					continue fi	0 from (9) to		+ (5) -	0	(6)
Number of storeys in the									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening		esponding to	the great	er wall are	a (after					
If suspended wooden flo		aled) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	` '	-			0	(15)
Infiltration rate						12) + (13)			0	(16)
Air permeability value, o			•	•	•	netre of e	envelope	area	3	(17)
If based on air permeabilit Air permeability value applies	-					rio boina u	ucod		0.15	(18)
Number of sides sheltered		as been don	e or a deg	gree air pe	тпеаышу	is being u	13 C U		0	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified fo	r monthly wind spee	ed						,		
Jan Feb M	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	1.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4	•							•	
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
	1 1.00	1 3.33			<u> </u>	1	<u></u>		I	

0.19	0.19	0.18	0.16	0.16	0.14	0.14	(21a) x	0.15	0.16	0.17	0.18		
Calculate effec		l ' '	l ' '			l -	0.14	0.10	0.10	0.17	0.10		
If mechanica	l ventila	ition:										0.5	
If exhaust air he	at pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				73.9	5
a) If balance	d mecha	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		
b) If balance	d mecha	anical ve	ntilation	without	heat rec	overy (N	MV) (24b)m = (22	2b)m + (23b)		•	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		
c) If whole ho if (22b)m				•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		
d) If natural v									0.5]	•	•		
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)		•		•	
25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		
3. Heat losses	and he	at loss i	naramet	or.									
LEMENT	Gros area	SS	Openin	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·l		A X I
/indows Type					17.75		/[1/(1.2)+		20.32				
/indows Type	2				4.65	x1	/[1/(1.2)+	0.04] =	5.32	Ħ			
/indows Type					4.65		/[1/(1.2)+	\ \ \ \ \ \	5.32	Ħ			
/alls Type1	68.6	i6	27.0	<u>-</u>	41.61		0.16		6.66	Η ,			
/alls Type2	17.7	_	0		17.76	=	0.16	-	2.84	=		륏 늗	
otal area of el						_	0.10		2.04				
ior windows and i			effective wi	ndow H-v	86.42		r formula 1	/[(1/Ll-valu	ıe)+0 041 a	as aiven in	naragrant	132	
include the area						atou uomg	, ioiiniaia i	7[(17 0 va la	0,10.04, 0	so giveii iii	paragrapi	0.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				40.4	.7
eat capacity (Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	11280	.49
nermal mass	parame	ter (TMF	o = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250)
or design assessi				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
in be used instea ormal bridge				ioina Ar	nondiy l	,							
nermal bridge details of therma	`	,		•	•	`						12.4	1
otal fabric hea		are not kn	OWII (00) -	- 0.70 X (O	'')			(33) +	(36) =			52.8	18
entilation hea	t loss ca	alculated	l monthl	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 19.08	18.85	18.63	17.52	17.3	16.18	16.18	15.96	16.63	17.3	17.74	18.19		
eat transfer c	pefficier	nt. W/K			!		!	(39)m	= (37) + (37)	38)m		1	
				70.40	CO 07	00.07	T co o4	·			74.07	l	
9)m= 71.96	71.74	71.51	70.4	70.18	69.07	69.07	68.84	69.51	70.18	70.62	71.07		

Heat Ic	ss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1	1	0.99	0.98	0.98	0.96	0.96	0.96	0.97	0.98	0.98	0.99		
N I Is			- 41- / T - 1-1	l- 4-V					,	Average =	Sum(40) ₁ .	12 /12=	0.98	(40)
Numbe			nth (Tab		N 4 =	1	11	A	0	0-4	N.			
(44)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ıng enei	gy requi	rement:								kWh/yea	ar:	
if TF	ed occu A > 13.9 A £ 13.9	9, N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		29		(42)
Reduce	the annua	l average		usage by	5% if the d	welling is	designed t	(25 x N) to achieve		se target o		5.63		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	ı litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	97.5	93.95	90.41	86.86	83.31	79.77	79.77	83.31	86.86	90.41	93.95	97.5		
C		h at water			and by A	100 1/1		T / 0000			m(44) ₁₁₂ =		1063.6	(44)
											ables 1b, 1			
(45)m=	144.58	126.45	130.49	113.76	109.16	94.2	87.29	100.16	101.36	118.12	128.94	140.02	1204 54	(45)
lf inst <mark>an</mark> i	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar = Su	m(45) ₁₁₂ =		1394.54	(45)
(46)m=	2 1.69	18.97	19.57	17.06	16.37	14.13	13.09	15.02	15.2	17.72	19.34	21		(46)
Water	storage	loss:												
		,						within sa	ame ves	sel		0		(47)
	•	•	nd no ta		•			` '	\1-	· · · (0) : (47)			
	storage		not wate	er (uns ir	iciudes ii	nstantar	ieous co	mbi boil	ers) erite	er U III (47)			
	_		eclared le	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 o	-										
			factor fr ee section		e z (kvvi	n/litre/da	ly)					0		(51)
	e factor	•		JII 4.0								0		(52)
Tempe	erature fa	actor fro	m Table	2b							-	0		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or (54) in (5	55)									0		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendix	Н	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	inual) fro	m Table	3							0		(58)
	-	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor f	om Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
	0	0	0	0	0	0	0	0	0	0	0	0		(59)

					<i>(</i>) -								
Combi loss ca				<u> </u>		· ` `		T 40.04	1007	T 40.00	1,0,00	1	(61)
(61)m= 49.68	43.24	46.07	42.84	42.46	39.34	40.65	42.46		46.07	46.33	49.68]	(61)
							`		` 	ì 	`	(59)m + (61)m	(00)
(62)m= 194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.62		164.19	175.27	189.71		(62)
Solar DHW input									r contribut	tion to wate	er heating)		
(add additiona						·			Ι ,	1 0		1	(62)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w			450.0	454.00	400.50	107.04	1 40 00		1 404 40	1,75,07	100 74	1	
(64)m= 194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.62		164.19	175.27	189.71	1926.19	(64)
lla at mains for		la a a C. a a	1.3.4/1- /		- / [0 0-	(45)		utput from wa](04)
Heat gains fro						 		-	 			']]	(65)
(65)m= 60.49	52.86	54.91	48.54	46.91	41.15	39.19	43.92		50.79	54.46	58.98]	(03)
include (57)			. ,		ylinder i	s in the o	dwellin	g or hot w	ater is t	rom com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):									
Metabolic gair						l		1 -		1	_	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	<u> </u>	Oct	Nov	Dec		(00)
(66)m= 114.6	114.6	114.6	114.6	114.6	114.6	114.6	114.6	_	114.6	114.6	114.6		(66)
Lighting gains	_		_							_		1	
(67)m= 17.99	15.97	12.99	9.84	7.35	6.21	6.71	8.72	11.7	14.86	17.34	18.49		(67)
App <mark>liance</mark> s ga		ulat <mark>ed ir</mark>	Append		uation L		3a), al	so see Ta	_			,	
(68)m= 201.75	203.84	198.56	187.33	173.16	159.83	150.93	148.84	154.11	165.34	179.52	192.84		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also	see Table	5		•		
(69)m= 34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46		(69)
Pumps and fa	ns gains	(Table 5	a)					_					
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)					_			
(71)m= -91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68		(71)
Water heating	gains (T	able 5)						_				_	
(72)m= 81.31	78.66	73.8	67.41	63.05	57.16	52.67	59.03	61.68	68.27	75.63	79.27		(72)
Total internal	gains =				(66)m + (67)m	n + (68)n	n + (69)m + ((70)m + (7	71)m + (72))m -	_	
(73)m= 361.42	358.85	345.73	324.96	303.94	283.58	270.68	276.96	287.87	308.85	332.87	350.98		(73)
6. Solar gains	s:												
Solar gains are		•				•	itions to	convert to th	ne applical		tion.		
Orientation: A	Access F Fable 6d	actor	Area m²		Flu	ix ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
_							, –	Table ob	_ '				-
Northeast _{0.9x}	0.77	X	4.6	35	X	1.28	x	0.55		0.7	=	14	(75)
Northeast _{0.9x}	0.77	X	4.6	35	X 2	22.97	×	0.55	× _	0.7	=	28.49	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	X 2	11.38	×	0.55	x	0.7	=	51.34	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	× (67.96	x _	0.55	x	0.7	=	84.31	(75)
Northeast _{0.9x}	0.77	X	4.6	65	x (91.35	X	0.55	x	0.7	=	113.33	(75)

Northeast 0.9x 0.77	٦.,	1.05	1	07.00	1 .,	0.55	– "г			100.00	7(75)
Northwest] X]	4.65] X]	97.38] X]	0.55		0.7	_ = -	120.82	(75)
Neglected	X	4.65] X]	91.1] X]	0.55	×	0.7	_ =	113.02	(75)
Northood	」 × ¬	4.65	J X	72.63	J X	0.55	×	0.7	=	90.1	(75)
Northeast 0.9x 0.77	_ X	4.65	J X I	50.42] X]	0.55	_	0.7	=	62.55	(75)
Northeast 0.9x 0.77	X	4.65	X	28.07	X	0.55	_ ×	0.7	_ =	34.82	(75)
Northeast 0.9x 0.77	X	4.65	X	14.2	X	0.55	×	0.7	=	17.61	(75)
Northeast 0.9x 0.77	X	4.65	X	9.21	X	0.55	x [0.7	=	11.43	(75)
Southeast 0.9x 0.77	X	17.75	X	36.79	X	0.55	X	0.7	=	174.25	(77)
Southeast 0.9x 0.77	X	17.75	X	62.67	X	0.55	X	0.7	=	296.81	(77)
Southeast 0.9x 0.77	X	17.75	X	85.75	X	0.55	X	0.7	=	406.11	(77)
Southeast 0.9x 0.77	X	17.75	X	106.25	X	0.55	X	0.7	=	503.19	(77)
Southeast 0.9x 0.77	X	17.75	X	119.01	X	0.55	X	0.7	=	563.61	(77)
Southeast 0.9x 0.77	x	17.75	X	118.15	X	0.55	x [0.7	=	559.53	(77)
Southeast 0.9x 0.77	x	17.75	x	113.91	X	0.55	x	0.7	=	539.45	(77)
Southeast 0.9x 0.77	x	17.75	x	104.39	X	0.55	×	0.7	=	494.37	(77)
Southeast 0.9x 0.77	x	17.75	x	92.85	x	0.55	x [0.7	=	439.73	(77)
Southeast 0.9x 0.77	x	17.75	x	69.27	X	0.55	_ x [0.7	=	328.04	(77)
Southeast 0.9x 0.77	x	17.75	X	44.07	Х	0.55	х	0.7	=	208.71	(77)
Southeast 0.9x 0.77	X	17.75	x	31.49	X	0.55	x	0.7		149.12	(77)
Southwest _{0.9x} 0.77	X	4.65	X	36.79	i /	0.55	x	0.7		45.65	(79)
Southwest _{0.9x} 0.77	x	4.65	X	62.67	i /	0.55	x	0.7	-	77.76	(79)
Southwest _{0.9x} 0.77	i x	4.65	X	85.75	i	0.55	- x	0.7	= =	106.39	(79)
Southwest _{0.9x} 0.77	i x	4.65	X	106.25	i	0.55		0.7	= =	131.82	(79)
Southwest _{0.9x} 0.77] x	4.65	X	119.01]]	0.55	×	0.7	_	147.65	(79)
Southwest _{0.9x} 0.77] x	4.65] x	118.15]]	0.55	x	0.7	= -	146.58	(79)
Southwest _{0.9x} 0.77] x	4.65] x	113.91]]	0.55		0.7	= -	141.32	(79)
Southwest _{0.9x} 0.77] ^] x	4.65] ^] x	104.39]]	0.55	^ L x [0.7	= =	129.51	(79)
Southwest _{0.9x} 0.77] ^] x	4.65]	92.85]]	0.55	^ L x [0.7	= =	115.2	(79)
0	」^] ×		1]]		^ L x [= -		(79)
01	╡	4.65] X] ,	69.27] 1	0.55	≓ ¦	0.7	- -	85.94	= ' '
0 11 1] X]	4.65] X]	44.07] 1	0.55	×	0.7	_	54.68	= (79)
Southwest _{0.9x} 0.77	X	4.65	X	31.49	J	0.55	X	0.7	=	39.07	(79)
Oalan maina in wetter and av		fa., a a a la a	4 1_		(00)	0(74)	(00)				
Solar gains in watts, calculus (83)m= 233.89 403.06 563	3.83	719.31 824.5		26.93 793.79	713	.99 617.48	(82)m 448.79	281	199.62		(83)
Total gains – internal and		!			1 , , ,	.00 011.10	110.70	1 20.	100.02		()
		1044.27 1128.5	`	110.51 1064.48	990	.95 905.35	757.64	613.87	550.6		(84)
` '					1 000	100 000.00		1 0 10101	000.0		
7. Mean internal tempera				for Tal	- I - O	Th4 (90)					7(05)
Temperature during heat	•		_		ole 9	, In1 (°C)				21	(85)
Utilisation factor for gains			Ť				0 = 1	N1	Des		
 	/lar	Apr Ma	_	Jun Jul	 	ug Sep	Oct	Nov	Dec		(96)
(86)m= 0.99 0.97 0	.9	0.75 0.57		0.4 0.29	0.3	32 0.52	0.84	0.97	0.99		(86)
Mean internal temperatur			`	i	1			1		1	
(87)m= 20.18 20.44 20	.71	20.91 20.98	3	21 21	2	1 20.99	20.87	20.48	20.13		(87)

i emperatilire di irii				ali 112	C	1-1- A T	LO (00)					
·	g heating p	1	i		1	20.12		20.4	20.4	20.00		(88)
(88)m= 20.08 20.		20.1	20.1	20.12	20.12		20.11	20.1	20.1	20.09		(00)
Utilisation factor fo	-	1		- ` ` 		- 		0.70	0.00			(00)
(89)m= 0.99 0.9	6 0.88	0.71	0.52	0.34	0.23	0.26	0.46	0.79	0.96	0.99		(89)
Mean internal tem		1	1	` ` `	1		i					
(90)m= 19.01 19.	19.74	20.01	20.09	20.12	20.12	20.12	20.11	19.97	19.46	18.94		(90)
							f	LA = Livin	g area ÷ (4	1) =	0.42	(91)
Mean internal tem	perature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m= 19.5 19.	32 20.15	20.39	20.46	20.48	20.49	20.49	20.48	20.35	19.88	19.44		(92)
Apply adjustment	o the mea	n interna	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 19.35 19.	37 20	20.24	20.31	20.33	20.34	20.34	20.33	20.2	19.73	19.29		(93)
8. Space heating	equiremen	t										
Set Ti to the mean the utilisation fact		•		ned at ste	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan F	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for	r gains, hn	n:										
(94)m= 0.98 0.9	5 0.87	0.72	0.53	0.36	0.24	0.27	0.47	8.0	0.96	0.99		(94)
Useful gains, hm(m , W = (9	4)m x (8	4)m									
(95)m= 585.88 724	39 794.74	749.92	596.57	395.41	257.94	270.92	429.63	604.09	589.28	544.47		(95)
Monthly average	xternal ten	perature	from T	able 8								
(96)m= 4.3 4.	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			_		-			_				
(97)m= 1082.64 1059		798.15	604.46	396.04	257.99	271.02		673.49	892.27	1072.32		(97)
Space heating red	i									-		
(98)m= 369.59 225	15 126.77	34.72	5.87	0	0	0	0	51.64	218.16	392.72		
						Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1424.61	(98)
Space heating red	uirement ir	า kWh/m²	²/year									
9a. Energy require	anda lad										19.81	(99)
	nents – Ind	lividual h	eating s	ystems i	ncluding	micro-C	CHP)				19.81	(99)
Space heating:				,	<u> </u>		CHP)			l		
Fraction of space	heat from s	secondar	y/supple	,	system		Ź				0	(201)
	heat from s	secondar	y/supple	,	system		Ź					
Fraction of space	neat from s	secondar nain syst	y/supple em(s)	,	system	(202) = 1	Ź	(203)] =			0	(201)
Fraction of space Fraction of space	heat from s heat from r eating from	secondar main syst main sys	y/supple em(s) stem 1	,	system	(202) = 1	- (201) =	(203)] =			0	(201)
Fraction of space Fraction of space Fraction of total h	neat from s heat from r eating from space hea	secondar main syst main sys ting syste	y/supple em(s) stem 1 em 1	ementary	system	(202) = 1	- (201) =	(203)] =			0 1 1	(201) (202) (204)
Fraction of space Fraction of space Fraction of total had be a second space Efficiency of main	neat from s heat from r eating from space hea	secondar main syst main sys ting syste	y/supple em(s) stem 1 em 1	ementary	system	(202) = 1	- (201) =	(203)] =	Nov	Dec	0 1 1 90.4	(201) (202) (204) (206) (208)
Fraction of space Fraction of space Fraction of total had be a second space Efficiency of main	heat from sheat from reating from space hear ndary/suppleb Mar	secondar main syst main sys ting syste lementar Apr	y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov	Dec	0 1 1 90.4	(201) (202) (204) (206) (208)
Fraction of space Fraction of space Fraction of total had be be be be be be be be be be be be be	neat from sheat from reating from space heardary/suppleb Maruirement (secondar main syst main sys ting syste lementar Apr	y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov 218.16	Dec 392.72	0 1 1 90.4	(201) (202) (204) (206) (208)
Fraction of space Fraction of space Fraction of total h Efficiency of main Efficiency of seco Jan Fo	neat from sheat from reating from space heardary/suppleb Maruirement (and 15 126.77	main systemain systementar Apr calculate 34.72	y/supple em(s) stem 1 em 1 y heating May d above	g system Jun	system 1, % Jul	(202) = 1 · (204) = (2	- (201) = 02) × [1 - (Oct			0 1 1 90.4	(201) (202) (204) (206) (208)
Fraction of space Fraction of space Fraction of total h Efficiency of main Efficiency of seco Jan Form Space heating rec 369.59 225	heat from sheat from reating from space heardary/suppleb Maruirement (continuity) 126.77	main systemain systementar Apr calculate 34.72	y/supple em(s) stem 1 em 1 y heating May d above	g system Jun	system 1, % Jul	(202) = 1 · (204) = (2	- (201) = 02) × [1 - (Oct			0 1 1 90.4	(201) (202) (204) (206) (208) ear
Fraction of space Fraction of space Fraction of total had be a special fraction of tot	heat from sheat from reating from space heardary/suppleb Maruirement (content from the following from the fo	main systemain systemain systementar Apr Calculate 34.72	y/supple em(s) stem 1 em 1 y heatin May d above 5.87	g system Jun 0	system 1, % Jul 0	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - (Oct 51.64 57.12	218.16	392.72	0 1 1 90.4	(201) (202) (204) (206) (208) ear
Fraction of space Fraction of space Fraction of total had be a special fraction of tot	heat from sheat from reating from space hear hadary/suppleb Maruirement (doi:15 126.77) (204)] } x	main systemain systemain systementar Apr Calculate 34.72 100 ÷ (20 38.41	y/supple em(s) stem 1 em 1 y heating May d above 5.87 06) 6.49	g system Jun 0	system 1, % Jul 0	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - 1	Oct 51.64 57.12	218.16	392.72	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Fraction of space Fraction of space Fraction of total h Efficiency of main Efficiency of seco Jan Form Space heating recessions and second se	heat from sheat from reating from space hear dary/suppleb Maruirement (dary/suppleb 126.77 (204)] } x = 1 (secondary/suppleb 140.24	main systemain systematra Apr calculate 34.72 100 ÷ (20 38.41	y/supple em(s) stem 1 em 1 y heating May d above 5.87 06) 6.49	g system Jun 0	system 1, % Jul 0	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - 1	Oct 51.64 57.12	218.16	392.72	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Fraction of space Fraction of space Fraction of total h Efficiency of main Efficiency of seco Jan Form Space heating rece 369.59 225 (211)m = {[(98)m x 408.84 249]	heat from sheat from reating from space hear dary/suppleb Maruirement (dary/suppleb 126.77 (204)] } x = 1 (secondary/suppleb 140.24	main systemain systematra Apr calculate 34.72 100 ÷ (20 38.41	y/supple em(s) stem 1 em 1 y heating May d above 5.87 06) 6.49	g system Jun 0	system 1, % Jul 0	(202) = 1 · (204) = (2 Aug 0 Tota	- (201) = 02) × [1 - 0] Sep 0 0 0 kl (kWh/yea	Oct 51.64 57.12 ar) =Sum(2	218.16 241.32 211) _{15,1012}	392.72 434.42 =	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Fraction of space Fraction of space Fraction of total h Efficiency of main Efficiency of seco Jan Fraction of total h Efficiency of seco Jan Fraction of total h Efficiency of seco Jan Fraction of total h Efficiency of seco Jan Fraction of total h Efficiency of seco Jan Fraction of space [369.59 225] (211)m = {[(98)m x (201)] } Space heating fue = {[(98)m x (201)] }	heat from sheat from reating from space hear dary/suppleb Maruirement (continuity) 126.77 (204)] } x 1 (secondar x 100 ÷ (204) 204)	main systemain systemain systementar Apr Calculate 34.72 100 ÷ (20 38.41 ry), kWh/	y/supple tem(s) stem 1 em 1 y heating May d above 5.87 06) 6.49	g system Jun 0	system 1, % Jul 0	(202) = 1 · (204) = (2 Aug 0 Tota	- (201) = 02) × [1 - (201) = 02) × [1 - (201) = 0	Oct 51.64 57.12 ar) =Sum(2	218.16 241.32 211) _{15,1012}	392.72 434.42 =	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear

Water heating								
Output from water heater (calculated above) 194.27 169.7 176.56 156.6 151.62 1	133.53 127.94	142.62	144.19	164.19	175.27	189.71]	
Efficiency of water heater							80.3	(216)
(217)m= 86.65 85.76 84.23 81.96 80.64	80.3 80.3	80.3	80.3	82.51	85.6	86.84		(217)
Fuel for water heating, kWh/month	•						•	
(219) m = (64) m x $100 \div (217)$ m (219)m = 224.21 197.87 209.61 191.06 188.03 1	166.29 159.32	177.61	179.57	199.01	204.75	218.45]	
` '		Tota	al = Sum(2	19a) ₁₁₂ =			2315.77	(219)
Annual totals				k'	Wh/year	r	kWh/yea	<u></u> <u>r_</u>
Space heating fuel used, main system 1							1575.9	
Water heating fuel used							2315.77	
Electricity for pumps, fans and electric keep-hot								
mechanical ventilation - balanced, extract or pos	sitive input fro	m outside	е			148.07]	(230
central heating pump:						30	j	(230
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			178.07	(231
Electricity for lighting							317.63	(232)
12a. CO2 emissions – Individual heating system	ns including m	icro-CHF						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	_
Space heating (main system 1)	(211) x			0.2	16	=	340.39	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	500.21	(264)
Space and water heating	(261) + (262)	+ (263) + ((264) =				840.6	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	92.42	(267)
Electricity for lighting	(232) x			0.5	19	=	164.85	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		1097.87	(272)
Dwelling CO2 Emission Rate			(272)	÷ (4) =			15.26	(273)

El rating (section 14)

(274)

			User D	etail <u>s:</u>						
Assessor Name: Software Name:	Stroma FSAP 2	012		Strom Softwa				Versio	on: 1.0.4.16	
		Р	roperty .	Address	: Flat 06	5				
Address :										
1. Overall dwelling dimer	nsions:									
Basement				a(m²) 65.1	(1a) x		2.5	(2a) =	Volume(m 162.74	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n	1) (35.1	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	162.74	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	у + [other 0	7 = [total 0	x	40 =	m³ per hou	ır — _(6a)
Number of open flues	0 +	0	」	0]	0	x:	20 =	0	` (6b)
Number of intermittent fan					J L		=	10 =		(7a)
Number of passive vents	13				L	0		10 =	0	╡゛
					Ļ	0		40 =	0	(7b)
Number of flueless gas fin	es				L	0	X '		0	(7c)
	fluor and force	(6a) (6b) (7	(a) 1 (7b) 1 (70) -			_		nanges per h	_
Infiltration due to chimney If a pressurisation test has be					continue f	0 irom (9) to		÷ (5) =	0	(8)
Number of storeys in the		idea, present	. 10 (17), (10111 (0) 10	(70)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2	25 for steel or timbe	er frame or	0.35 for	r masoni	y const	ruction			0	(11)
if both types of wall are pre deducting areas of opening		responding to	the great	er wall are	a (after					
If suspended wooden flo		ealed) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente	er 0.05, else enter (0							0	(13
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	` '	-			0	(15
Infiltration rate						12) + (13)			0	(16)
Air permeability value, o	• •		•	•	•	netre of e	envelope	area	3	(17)
If based on air permeabilit	-					. ! - -			0.15	(18)
Air permeability value applies Number of sides sheltered		nas been don	e or a deg	gree air pe	гтеаршту	r is being u	isea		0	(19)
Shelter factor	•			(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified fo	or monthly wind spe	ed								
Jan Feb I	Mar Apr Ma	y Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7	•		-		•	•	-	•	
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a) = - (22)m ÷ 1								•	
Wind Factor (22a)m = (22 $(22a)$ m = 1.27 1.25 1)m ÷ 4 .23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
(223)11 1.21 1.20 1	0 1.1 1.00	0.33	0.00	L 0.02	L	1 1.00	1 1.12	1.10	l	

lajustea iriiliti	ation rat	<u> </u>	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	1	Т		İ	
0.19 Calculate effe	0.19	0.18	0.16	0.16 he annli	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanica		_	rate for t	пс аррп	cabic ca	.50					ĺ	0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				73.95	(23
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(24
b) If balance	d mech	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b)m = (22	2b)m + (23b)		•	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	•				.5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft	ļ	!	!		
if (22b)n				•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(2
B. Heat losse	s and he	eat loss i	paramet	er:								_	
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U		k-value		A X k kJ/K
in <mark>dows</mark> Type					17.75	<u> </u>	/[1/(1.2)+	_	20.32	$\stackrel{\prime}{\Box}$			(2
in <mark>dows</mark> Type					4.65		/[1/(1.2)+	<u> </u>	5.32	Ħ			(2
indows Type					4.65		/[1/(1.2)+	\ \ \ \ \ \	5.32	Ħ			(2
alls Type1	61.7	76	27.0	5	34.71		0.16		5.55	片 ,			(2
/alls Type2	26.6		0		26.68	_	0.16	╡┇	4.27	=		╡┝	(2
otal area of e					88.44		0.10		7.21				(3
or windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	as aiven in	paragraph	13.2	(3
include the area						a.oa aog	TOTTING T		,	uo giroii ii	pa.ag.ap	· •	
abric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				40.8	(3
eat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	11663.7	72 (3
nermal mass	parame	eter (TMF	⊃ = Cm ÷	- TFA) ir	n kJ/m²K	•		Indica	tive Value	: Medium	j	250	(3
r design assess n be used inste				construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
nermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						12.08	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	11)								
otal fabric he								(33) +	(36) =			52.88	(3
entilation hea		i -	· ·		ı		1		= 0.33 × (1	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 17.27	17.07	16.86	15.86	15.66	14.65	14.65	14.45	15.05	15.66	16.06	16.46		(3
eat transfer o	oefficie	nt, W/K						(39)m	= (37) + (38)m		•	
9)m= 70.15	69.95	69.74	68.74	68.54	67.53	67.53	67.33	67.93	68.54	68.94	69.34		
			_										(3

Heat loss para	ameter (l	HLP). W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.08	1.07	1.07	1.06	1.05	1.04	1.04	1.03	1.04	1.05	1.06	1.07		
. ,	<u> </u>								L Average =	Sum(40) _{1.}	12 /12=	1.06	(40)
Number of day	ys in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. 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)] + 0.0	0013 x (⁻	TFA -13.		12		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	welling is	designed t			se target o		.59		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 93.04	89.66	86.28	82.89	79.51	76.13	76.13	79.51	82.89	86.28	89.66	93.04		
										m(44) ₁₁₂ =		1015.03	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	ables 1b, 1	c, 1d)		
(45)m= 137.98	120.68	124.53	108.57	104.17	89.9	83.3	95.59	96.73	112.73	123.05	133.63		
If inst <mark>antane</mark> ous w	vator booti	na at naint	of was Inc	bat water	, ataxaga)	antar O in	havea (46		Total = Su	m(45) ₁₁₂ =	_	1330.87	(45)
													(40)
(46)m= 20.7 Water storage	18.1	18.68	16.29	15.63	13.48	12.5	14.34	14.51	16.91	18.46	20.04		(46)
Storage volum		includir	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h						7					<u> </u>		()
Otherwise if no	-			-				ers) ente	er '0' in (47)			
Water storage	loss:												
a) If manufact	turer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufact			-										(=4)
Hot water stor	_			e z (KVVI	n/iitie/ua	iy)					0		(51)
Volume factor	•		311 4.0								0		(52)
Temperature f			2b							-	0		(53)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or		•	,								0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					` '
(modified by				•	•	. ,	, ,		r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

				(0.1)	(00)	0= (44)							
Combi loss cal					<u> </u>	- ` ` `	_	2 1 40 00	1007	14400	17.44	[(61)
(61)m= 47.41	41.27	43.97	40.88	40.52	37.54	38.79	40.5	<u> </u>	43.97	44.22	47.41		(61)
Total heat requ							`		` 	ì 	`	(59)m + (61)m	(22)
(62)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.1		156.7	167.27	181.04		(62)
Solar DHW input o									r contribut	tion to wate	er heating)		
(add additional					- 	 	<u> </u>		Ι ,	1 0		1	(62)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa						1 .00.00				T		1	
(64)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.1		156.7	167.27	181.04	4020.24	(64)
			134/1/		- /	(45)		output from w				1838.24](04)
Heat gains from	r]	(CE)
(65)m= 57.73	50.44	52.4	46.32	44.77	39.28	37.4	41.9	L	48.47	51.97	56.29		(65)
include (57)r			. ,		ylinder i	s in the o	dwellir	ng or hot w	ater is f	rom com	munity h	eating	
5. Internal ga	ins (see	Table 5	and 5a):									
Metabolic gain				Ι	ı		ı	-	ī		1	Ī	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au		Oct	Nov	Dec		(2.2)
(66)m= 106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.0	_	106.08	106.08	106.08		(66)
Lighting gains	_		_		_								
(67)m= 16.55	14.7	11.95	9.05	6.76	5.71	6.17	8.02		13.67	15.95	17.01		(67)
App <mark>liance</mark> s gai	ns (ca <mark>lcı</mark>	<mark>ulat</mark> ed ir	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble 5				
(68)m= 185.6	187.52	182.67	172.34	159.3	147.04	138.85	136.9	141.78	152.11	165.15	177.41		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a	, also	see Table	5				
(69)m= 33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.6	33.61	33.61	33.61	33.61		(69)
Pumps and far	ns gains	(Table 5	āa)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)	_		_		_			
(71)m= -84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.8	6 -84.86	-84.86	-84.86	-84.86		(71)
Water heating	gains (T	able 5)											
(72)m= 77.6	75.06	70.43	64.33	60.17	54.55	50.26	56.3	3 58.86	65.15	72.18	75.65		(72)
Total internal	gains =				(66)m + (67)m	+ (68)	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 337.56	335.11	322.87	303.54	284.05	265.12	253.11	259.	1 269.23	288.75	311.11	327.89		(73)
6. Solar gains	:												
Solar gains are c		•					tions to	convert to the	ne applical		tion.		
Orientation: A	ccess Fable 6d	actor	Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
	able ou					DIE Ga	. –	Table ob	_ '	able oc		(()	,
Northeast _{0.9x}	0.77	X	4.6	35	X	11.28	×	0.55	x	0.7	=	14	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	x 2	22.97	x	0.55	x	0.7	=	28.49	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	X	11.38	x	0.55	x	0.7	=	51.34	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	x 6	67.96	x	0.55	x	0.7	=	84.31	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	x (91.35	X	0.55	x	0.7	=	113.33	(75)

Northea	st _{0.9x}	0.77	X	4.6	35	X	9	7.38	x		0.55	X	0.7	=	120.82	(75)
Northea	ıst _{0.9x}	0.77	X	4.6	35	x		91.1	x		0.55	×	0.7	=	113.02	(75)
Northea	ıst _{0.9x}	0.77	X	4.6	35	X	7	2.63	x		0.55	×	0.7	=	90.1	(75)
Northea	st _{0.9x}	0.77	X	4.6	35	X	5	0.42	x		0.55	x	0.7	=	62.55	(75)
Northea	ıst _{0.9x}	0.77	X	4.6	35	x	2	28.07	x		0.55	X	0.7	=	34.82	(75)
Northea	st _{0.9x}	0.77	X	4.6	35	x		14.2	X		0.55	x	0.7	=	17.61	(75)
Northea	st _{0.9x}	0.77	X	4.6	35	x	,	9.21	X		0.55	X	0.7	=	11.43	(75)
Southw	est _{0.9x}	0.77	X	4.6	35	x	3	86.79			0.55	X	0.7	=	45.65	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	x	6	32.67			0.55	X	0.7	=	77.76	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	8	35.75]		0.55	X	0.7	=	106.39	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	1	06.25			0.55	X	0.7	=	131.82	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	1	19.01			0.55	X	0.7	=	147.65	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	x	1	18.15]		0.55	X	0.7	=	146.58	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	1	13.91			0.55	X	0.7	=	141.32	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	1	04.39			0.55	X	0.7	=	129.51	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	x	9	2.85]		0.55	X	0.7	=	115.2	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	6	9.27			0.55	X	0.7	=	85.94	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	4	4.07			0.55	X	0.7	=	54.68	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	х	3	31.49] ,		0.55	x	0.7	=	39.07	(79)
Northwe	est _{0.9x}	0.77	X	17.	75	x	1	1.28	x		0.55	X	0.7	=	53.43	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	х	2	22.97] x		0.55	x	0.7	=	108.77	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	Х	4	1.38	X		0.55	x	0.7	=	195.96	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	X	6	67.96	X		0.55	x	0.7	=	321.82	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	x	9	1.35	X		0.55	x	0.7	=	432.6	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	X	9	7.38	X		0.55	X	0.7	=	461.19	(81)
Northwe	L	0.77	X	17.	75	X		91.1	X		0.55	X	0.7	=	431.44	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	x	7	2.63	X		0.55	X	0.7	=	343.95	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	x	5	0.42	X		0.55	X	0.7	=	238.78	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	x	2	28.07	X		0.55	X	0.7	=	132.92	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	x		14.2	X		0.55	X	0.7	=	67.23	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	X		9.21	X		0.55	X	0.7	=	43.64	(81)
ו		watts, ca		1		$\overline{}$		l	Ė	$\overline{}$	um(74)m .			I	1	(00)
(83)m=	113.08	215.01	353.69	537.95	693.57		28.59	685.78	563	3.56	416.53	253.68	139.52	94.13		(83)
Ī		nternal a							L 000		COF 70	F40.4	150.00	400.00	1	(84)
(84)m=	450.64	550.12	676.56	841.5	977.63		93.71	938.89	822	2.66	685.76	542.43	450.63	422.02]	(04)
		nal temp		•				_								_
-		_	•			_		from Tab	ole 9	, Th	1 (°C)				21	(85)
Utilisa		tor for g				Ť							1	l	1	
(00):	Jan	Feb	Mar	Apr	May	_	Jun	Jul	 	ug	Sep	Oct	_	Dec		(96)
(86)m=	1	0.99	0.96	0.84	0.63		0.43	0.32	0.3	აგ	0.65	0.93	0.99	1	J	(86)
ı						_		ps 3 to 7	1					Ι.	1	/a=:
(87)m=	19.94	20.15	20.47	20.81	20.97		21	21	2	1	20.97	20.7	20.25	19.91]	(87)

Tarana anatana akan	L C		6	ale 115 a	T	- I- I - O - T	LO (90)					
Temperature duri		.	1		1	1	· ` ´	20.04	20.02	20.02		(88)
` '		20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.03	20.03		(00)
Utilisation factor t	_ 	1		- ` `		- ´ 		·	1			
(89)m= 0.99 0.	0.95	0.8	0.57	0.37	0.25	0.3	0.58	0.91	0.99	1		(89)
Mean internal ter	perature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m= 18.62 18	92 19.37	19.84	20.01	20.05	20.05	20.05	20.03	19.71	19.07	18.58		(90)
							f	fLA = Livin	ig area ÷ (4	4) =	0.42	(91)
Mean internal ter	perature (f	or the wh	nole dwe	lling) = f	LA × T1	+ (1 – fL	_A) × T2					
(92)m= 19.18 19	 	20.25	20.41	20.45	20.45	20.45	20.43	20.13	19.57	19.14		(92)
Apply adjustment	to the mea	n interna	l temper	ature fro	m Table	4e, whe	ere appro	priate	•			
(93)m= 19.03 19	29 19.69	20.1	20.26	20.3	20.3	20.3	20.28	19.98	19.42	18.99		(93)
8. Space heating	requiremen	nt										
Set Ti to the mea		•		ned at st	ep 11 of	Table 9	b, so tha	it Ti,m=(76)m an	d re-calc	ulate	
Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor	or gains, hr	n:		•	•	•	•		•			
(94)m= 0.99 0.	0.94	0.8	0.58	0.39	0.27	0.32	0.59	0.91	0.98	0.99		(94)
Us <mark>eful gains, hm</mark>	Sm , W = (9	94)m x (8	4)m									
(95)m= 447.49 539	.79 635.78	676.28	571.43	383.6	249.91	262.48	407.75	491.23	443.48	419.86		(95)
Monthly average	ex <mark>terna</mark> l ter	nperature	e from T	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)
He <mark>at los</mark> s rate for		_	_	_		1		_				
(97)m= 1033.17 100			586.96	384.93	250.05	262.83	419.5	642.57	849.41	1025.56		(97)
Space heating re	1			Wh/mon	th = 0.02	24 x [(97)m – (95					
(98)m= 435.75 313	.51 211.2	67.49	11.56	0	0	0	0	112.6	292.27	450.64		_
						Tota	al per year	(kWh/year	r) = Sum(9	8)15,912 =	1895.02	(98)
Space heating re	quirement in	n kWh/m	²/year								29.11	(99)
9a. Energy require	ments – Inc	dividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heating:												_
Fraction of space				ementary	•					ļ	0	(201)
Fraction of space	heat from r	main syst	tem(s)			(202) = 1	- (201) =				1	(202)
Fraction of total h	eating from	main sy	stem 1			(204) = (2	(02) × [1 –	(203)] =			1	(204)
Efficiency of mair	space hea	ting syste	em 1								90.4	(206)
Efficiency of seco	ndary/supp	lementar	y heatin	g systen	ո, %						0	(208)
Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	— ear
<u> </u>		<u> </u>		L				<u> </u>			,	
Space heating re	fan en en en (oaioaiato										
Space heating re	` 	67.49	11.56	0	0	0	0	112.6	292.27	450.64		
435.75 313	.51 211.2	67.49	11.56	i	0	0	0	112.6	292.27	450.64		(211)
· — —	.51 211.2 (204)] } x	67.49 100 ÷ (20	11.56	i	0	0	0	112.6 124.55	292.27 323.31	450.64 498.5		(211)
435.75 313 (211)m = {[(98)m)	.51 211.2 (204)] } x	67.49 100 ÷ (20	11.56	0	I	0		124.55	323.31	498.5	2096.26	(211)
$ \begin{array}{c c} 435.75 & 313 \\ (211)m = \{[(98)m) \\ 482.02 & 346 \end{array} $.51 211.2 (204)] } x .81 233.63	67.49 100 ÷ (20 74.66	11.56 06) 12.79	0	I	0	0	124.55	323.31	498.5	2096.26	_
435.75 313 (211)m = {[(98)m)	.51 211.2 (204)] } x .81 233.63	67.49 100 ÷ (20 74.66 ry), kWh	11.56 06) 12.79	0	I	0	0	124.55	323.31	498.5	2096.26	_
435.75 313 (211)m = {[(98)m x) 482.02 346 Space heating fu = {[(98)m x (201)]	.51 211.2 (204)] } x .81 233.63	67.49 100 ÷ (20 74.66 ry), kWh	11.56 06) 12.79	0	I	0	0	124.55	323.31	498.5	2096.26	_
435.75 313 (211)m = {[(98)m x 482.02 346] Space heating fu = {[(98)m x (201)]	.51 211.2 (204)] } x .81 233.63 el (seconda x 100 ÷ (20	67.49 100 ÷ (20 74.66 ry), kWh/	11.56 06) 12.79 /month	0	0	0 Total	0 al (kWh/yea	124.55 ar) =Sum(2	323.31	498.5	2096.26	_

Water heating								
Output from water heater (calculated above)		1					1	
	27.44 122.09	136.11	137.61	156.7	167.27	181.04		7(040)
Efficiency of water heater		1					80.3	(216)
` '	80.3 80.3	80.3	80.3	84.23	86.44	87.25		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
` '	58.7 152.05	169.5	171.37	186.02	193.5	207.49		
		Tota	ıl = Sum(2	19a) ₁₁₂ =			2193.38	(219)
Annual totals				k\	Wh/year		kWh/year	
Space heating fuel used, main system 1							2096.26	
Water heating fuel used							2193.38	
Electricity for pumps, fans and electric keep-hot								_
mechanical ventilation - balanced, extract or pos	itive input froi	m outside	е			134.02		(230a)
central heating pump:						30		(230c)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			164.02	(231)
Electricity for lighting							292.21	(232)
12a. CO2 emissions – Individual heating systems	s including m	icro-CHF)			T		
	Ерокам			Emico	ion fac	tor	Emissions	
	Energy kWh/year			kg CO		tor	kg CO2/ye	
Space heating (main system 1)	(211) x			0.2		=	452.79	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	473.77	(264)
Space and water heating	(261) + (262)	+ (263) + ((264) =				926.56	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	85.13	(267)
Electricity for lighting	(232) x			0.5	19	=	151.66	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		1163.35	(272)
Dwelling CO2 Emission Rate			(272)	÷ (4) =			17.87	(273)

El rating (section 14)

(274)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12						Versio	n: 1.0.4.16	
		Pi	roperty	Address	: Flat 07	,				
Address :										
1. Overall dwelling dimer	nsions:									
Basement					(1a) x			(2a) =	Volume(m 179.81	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n	1) 7	1.92	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	179.81	(5)
2. Ventilation rate:										
Number of chimneys	heating	heating	у 		7 = [x	40 =	m³ per hou	ır — _(6a)
•			- - - - -		」		x	20 =		(6b)
·				0	J					╡`
	5				Ļ					(7a)
·					Ĺ	0			0	(7b)
Number of flueless gas fire	es				L	0	X	40 =	0	(7c)
								Air ch	anges per h	our
Infiltration due to chimney	Name Stroma FSAP 2012 Software Version: Version: 1.0.4.10			(8)						
	Stroma Number: Stroma FSAP 2012 Software Version: Version: 1.0.4.16			(0)						
	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
					•	ruction			0	(11)
		sponding to	ine great	ei wali ale	a (anei					
If suspended wooden flo	oor, enter 0.2 (unsea	aled) or 0.	1 (seale	ed), else	enter 0				0	(12
• • • • • • • • • • • • • • • • • • • •									0	(13)
· ·	and doors draught	stripped							0	(14)
				•	` '	-	. (45)		0	(15)
	.EO averaged in a	ibia maatua						0.00		(16)
•	•		•	•	•	ietre oi e	envelope	area		(17)
· ·	-					is beina u	sed		0.15	(18)
Number of sides sheltered			•	,	,	Ü			0	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified fo	r monthly wind spee	ed								
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
		1 5.55	3.00		<u> </u>	1			I	

0.19	0.19	0.18	0.16	0.16	o.14	0.14	0.14	0.15	0.16	0.17	0.18	1	
Calculate effec			l ' '		I -	· ·	0.14	0.10	0.10	0.17	0.10	l	
If mechanica	l ventila	ition:										0.5	(2
If exhaust air he	at pump	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	for in-use f	actor (fron	n Table 4h) =				73.9)5
a) If balance	d mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	covery (N	MV) (24b)m = (22	2b)m + (23b)		-	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(
c) If whole ho if (22b)m				•					5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural v									0.5]	•	•		
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)		•			
25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(;
3. Heat losses	and he	nat loce i	o aranzot	or:									
LEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·l		A X k kJ/K
/indows Type		(111)			17.75		/[1/(1.2)+		20.32		KO/III	`	(2
/indows Type					4.65	- 4	/[1/(1.2)+	<u> </u>	5.32	Ħ			
/indows Type					4.65	-	/[1/(1.2)+	\ \ \ \ \ \	5.32	Ħ			()
/alls Type1	68.6	·e	27.0		41.61		0.16	=	6.66	┞ ┌			
/alls Type2		=		<u>^</u>		=						ᆗ 늗	
• •	17.7		0		17.76	_	0.16	[2.84				(;
otal area of el for windows and			effective wi	ndow II w	86.42		r formula 1	/[/1/ volu	(0) (0,041 (a airan in	naraarank		(;
include the area						ateu using	j ioiiiiuia i	7[(17 0- vaiu	e)+0.04] a	as giveii iii	paragrapi	1 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				40.4	7 (
eat capacity (Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	11280	.49 (3
nermal mass	parame	ter (TMF	o = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250) (:
or design assessi				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
n be used instea						,							 ,
nermal bridge	•	,		•	•	1						12.4	(1
details of therma otal fabric hea		are not kii	OWII (30) -	- U. 13 X (3	11)			(33) +	(36) =			52.8	88 (3
entilation hea		alculated	l monthly	/						(25)m x (5))	02.0	<u> </u>
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 19.08	18.85	18.63	17.52	17.3	16.18	16.18	15.96	16.63	17.3	17.74	18.19		(;
eat transfer c		<u> </u>			<u>I</u>	I	<u>I</u>		= (37) + (37)	<u> </u>	1	I	
cat transier C	CHILLICIE	it, VV/T\						(55)111	- (31) + (1	1	1	
9)m= 71.96	71.74	71.51	70.4	70.18	69.07	69.07	68.84	69.51	70.18	70.62	71.07		

Heat Ic	ss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1	1	0.99	0.98	0.98	0.96	0.96	0.96	0.97	0.98	0.98	0.99		
ما مصد دا		:	-41- /T-1-1	la 4a\					/	Average =	Sum(40) ₁ .	12 /12=	0.98	(40)
Numbe	 		nth (Tabl		Mov	lun	ll	۸۰۰۰	Con	Oct	Nov	Doo		
(41)m=	Jan 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31		(41)
(+1)111	<u> </u>		01	00	01	- 00	<u> </u>	01	00	01		<u> </u>		(,
4 \//	tor boot	ing onc	gy requi	romont:								kWh/yea	or:	
4. VVC	ilei neal	ing ener	gy requi	rement.								KVVII/yea	al.	
if TF	ed occu A > 13.9 A £ 13.9	9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (1	ΓFA -13.		29		(42)
Reduce	the annua	l average	ater usag hot water person per	usage by	5% if the d	welling is	designed t			se target o		5.63		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	ı litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	97.5	93.95	90.41	86.86	83.31	79.77	79.77	83.31	86.86	90.41	93.95	97.5		
Energy	content of	hot water	used - cal	culated ma	onthly $= 4$	190 v Vd r	n v nm v F	Tm / 3600			m(44) ₁₁₂ =		1063.6	(44)
45)m=	144.58	126.45	130.49	113.76	109.16	94.2	87.29	100.16	101.36	118.12	128.94	140.02		
+3)111=	144.30	120.43	150.49	113.70	109.10	34.2	07.23	100.10			m(45) ₁₁₂ =	<u> </u>	1394.54	(45
f inst <mark>an</mark> i	taneous w	ater he <mark>ati</mark> i	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)			(10)112			`
46)m=	21.69	18.97	19.57	17.06	16.37	14.13	13.09	15.02	15.2	17.72	19.34	21		(46
	storage		includin	a any co	olar or M	/\/\LDC	etorago	within co	amo voce	col				(47
		,	nd no ta						airie ves	SCI		0		(47
	•	•	hot wate		•			` '	ers) ente	er '0' in (47)			
	storage													
•			eclared l		or is kno	wn (kWł	n/day):					0		(48
•			m Table									0		(49
			storage eclared o	-		or is not		(48) x (49)) =			0		(50
			factor fr	-								0		(51
	•	•	ee section	on 4.3										
	e factor			2h							-	0		(52
•			m Table					(47) v (E1)	. v. (EQ) v. (I	E2) -		0		(53
•	(50) or (storage 55)	, KVVII/ye	aı			(47) x (51)) X (32) X (55) –	_	0		(54 (55
	. , .	, ,	culated f	or each	month			((56)m = (55) × (41)r	m		<u> </u>		(
56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56
												m Appendix	Н	•
57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57
Primar	v circuit	loss (ar	ınual) fro	m Table	3							0		(58
	-	•	culated t			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor f	om Tabl	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59

													
Combi loss ca				` ´ 	<u> </u>	· ` `		1 40 04	10.07	T 40.00	T 40.00	1	(61)
(61)m= 49.68	43.24	46.07	42.84	42.46	39.34	40.65	42.46	<u> </u>	46.07	46.33	49.68]	(61)
						1	`		` ´ 	ì 	`	(59)m + (61)m	(00)
(62)m= 194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.6		164.19	175.27	189.71		(62)
Solar DHW input									r contribu	tion to wate	er heating)		
(add additiona						 	. 			1 0	1 0	1	(62)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w			1500	154.00	400.50	1,07,04	1400	0 1 444 40	1 404 40	1,75,07	1,00 74	1	
(64)m= 194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.6		164.19	175.27	189.71	1926.19	(64)
lla at mains for		la a a Cara	1.1.4.0- /	11- 0 0	F / [0 0F	(45)		utput from w](04)
Heat gains fro						T			 		- 	']]	(65)
(65)m= 60.49	52.86	54.91	48.54	46.91	41.15	39.19	43.92		50.79	54.46	58.98]	(03)
include (57)					ylinder i	s in the o	dwellin	g or hot w	ater is t	rom com	imunity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):									
Metabolic gair					I .			1 -		1	-	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	<u> </u>	Oct	Nov	Dec		(00)
(66)m= 114.6	114.6	114.6	114.6	114.6	114.6	114.6	114.6	_	114.6	114.6	114.6		(66)
Lighting gains	_		_					_		_		1	
(67)m= 17.99	15.97	12.99	9.84	7.35	6.21	6.71	8.72		14.86	17.34	18.49		(67)
App <mark>liance</mark> s ga		ulated ir	Append		uation L		3a), al	so see Ta	_			,	
(68)m= 201.75	203.84	198.56	187.33	173.16	159.83	150.93	148.8	4 154.11	165.34	179.52	192.84		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5				
(69)m= 34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46		(69)
Pumps and fa	ns gains	(Table 5	5a)					_					
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)							,	
(71)m= -91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.6	91.68	-91.68	-91.68	-91.68		(71)
Water heating	gains (T	able 5)										_	
(72)m= 81.31	78.66	73.8	67.41	63.05	57.16	52.67	59.03	61.68	68.27	75.63	79.27		(72)
Total internal	gains =	1			(66)m + (67)m	1 + (68)r	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 361.42	358.85	345.73	324.96	303.94	283.58	270.68	276.9	6 287.87	308.85	332.87	350.98		(73)
6. Solar gains													
Solar gains are		•					itions to	convert to th	e applical		tion.		
Orientation: A	Access F Fable 6d	actor	Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
_							, –	Table ob	, -, -				-
Northeast _{0.9x}	0.77	X	4.6	35	х	11.28	X	0.55	x	0.7	=	14	(75)
Northeast _{0.9x}	0.77	X	4.6	35	X 2	22.97	X	0.55	×	0.7	=	28.49	(75)
Northeast _{0.9x}	0.77	X	4.6	35	X 2	11.38	×	0.55	×	0.7	=	51.34	(75)
Northeast _{0.9x}	0.77	X	4.6	35	x (67.96	x	0.55	x	0.7	=	84.31	(75)
Northeast _{0.9x}	0.77	X	4.6	35	x (91.35	X	0.55	X	0.7	=	113.33	(75)

Northeast 0.9x 0.77	٦.,	1.05	1	07.00	1 .,	0.55	— "г			100.00	7(75)
Northwest] X]	4.65] X]	97.38] X]	0.55		0.7	_ = -	120.82	(75)
Neglected	X	4.65] X]	91.1] X]	0.55	X	0.7	_ =	113.02	(75)
Northood	」 × ¬	4.65	J X	72.63	J X	0.55	_	0.7	=	90.1	(75)
Northeast 0.9x 0.77	X	4.65	J X I	50.42	X	0.55	×	0.7	=	62.55	(75)
Northeast 0.9x 0.77	X	4.65	X	28.07	X	0.55	× [0.7	_ =	34.82	(75)
Northeast 0.9x 0.77	X	4.65	X	14.2	X	0.55	×	0.7	=	17.61	(75)
Northeast 0.9x 0.77	X	4.65	X	9.21	X	0.55	x [0.7	=	11.43	(75)
Southeast 0.9x 0.77	X	17.75	X	36.79	X	0.55	×	0.7	=	174.25	(77)
Southeast 0.9x 0.77	X	17.75	X	62.67	X	0.55	x [0.7	=	296.81	(77)
Southeast 0.9x 0.77	X	17.75	X	85.75	X	0.55	x	0.7	=	406.11	(77)
Southeast 0.9x 0.77	X	17.75	X	106.25	X	0.55	x	0.7	=	503.19	(77)
Southeast 0.9x 0.77	X	17.75	X	119.01	X	0.55	x [0.7	=	563.61	(77)
Southeast 0.9x 0.77	x	17.75	X	118.15	X	0.55	x [0.7	=	559.53	(77)
Southeast 0.9x 0.77	x	17.75	x	113.91	X	0.55	×	0.7	=	539.45	(77)
Southeast 0.9x 0.77	x	17.75	x	104.39	X	0.55	×	0.7	=	494.37	(77)
Southeast 0.9x 0.77	x	17.75	x	92.85	x	0.55		0.7	=	439.73	(77)
Southeast 0.9x 0.77	x	17.75	x	69.27	X	0.55	x [0.7	=	328.04	(77)
Southeast 0.9x 0.77	x	17.75	X	44.07	Х	0.55	х	0.7	=	208.71	(77)
Southeast 0.9x 0.77	X	17.75	x	31.49	X	0.55	×	0.7		149.12	(77)
Southwest _{0.9x} 0.77	X	4.65	X	36.79	i /	0.55	×	0.7		45.65	(79)
Southwest _{0.9x} 0.77	x	4.65	X	62.67	i /	0.55	×	0.7	-	77.76	(79)
Southwest _{0.9x} 0.77	i x	4.65	X	85.75	i	0.55	×	0.7	= =	106.39	(79)
Southwest _{0.9x} 0.77	i x	4.65	X	106.25	i	0.55	×	0.7	= =	131.82	(79)
Southwest _{0.9x} 0.77] x	4.65	X	119.01]]	0.55	×	0.7	_	147.65	(79)
Southwest _{0.9x} 0.77] x	4.65] x	118.15]]	0.55	x	0.7	= -	146.58	(79)
Southwest _{0.9x} 0.77]	4.65]	113.91]]	0.55	^ L x [0.7	= =	141.32	(79)
Southwest _{0.9x} 0.77] ^] x	4.65] ^] x	104.39]]	0.55	^ L x [0.7	= =	129.51	(79)
Southwest _{0.9x} 0.77] ^] x	4.65]	92.85]]	0.55	^ L x [0.7	= =	115.2	(79)
0	」^] ×		1]]		_ ^ L 		= -		(79)
01	╡	4.65] X] ,	69.27] 1	0.55	≓ ¦	0.7	- -	85.94	= ` ` `
0 11 1] X]	4.65] X]	44.07] 1	0.55		0.7	_	54.68	= (79)
Southwest _{0.9x} 0.77	X	4.65	X	31.49	J	0.55	X	0.7	=	39.07	(79)
Oalan maina in wetter and av		fa., a a a la a	4 1_		(00)	0(74)	(00)				
Solar gains in watts, calculus (83)m= 233.89 403.06 563	3.83	719.31 824.5		26.93 793.79	713	.99 617.48	(82)m 448.79	281	199.62		(83)
Total gains – internal and		!			1 , , ,	.00 011.10	110.10	1 20.	100.02		()
		1044.27 1128.5	`	110.51 1064.48	990	.95 905.35	757.64	613.87	550.6		(84)
` ' L L		<u> </u>			1 333			1 0.0.0.	000.0		
7. Mean internal tempera				f T-I	- I - O	Th4 (90)					7(05)
Temperature during heat	•		_		ole 9	, In1 (°C)				21	(85)
Utilisation factor for gains			Ť				0-4	T N			
 	/lar	Apr Ma	_	Jun Jul	 	ug Sep	Oct	Nov	Dec		(96)
(86)m= 0.99 0.97 0	.9	0.75 0.57		0.4 0.29	0.3	32 0.52	0.84	0.97	0.99		(86)
Mean internal temperatur			`	i	1			1		1	
(87)m= 20.18 20.44 20	.71	20.91 20.98	3	21 21	2	1 20.99	20.87	20.48	20.13		(87)

Tamananah wa di wina	h4:	!! . !.	4 -6	م دال د دام	. f T.	O T	LO (90)					
Temperature during		i	i		20.12	20.12		1 20.4	1 20.4	20.00		(88)
(88)m= 20.08 20.09	20.09	20.1	20.1	20.12	<u> </u>		20.11	20.1	20.1	20.09		(88)
Utilisation factor for	-	1		- ` ` 		- 	,				ı	
(89)m= 0.99 0.96	0.88	0.71	0.52	0.34	0.23	0.26	0.46	0.79	0.96	0.99		(89)
Mean internal temper	erature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)				
(90)m= 19.01 19.38	19.74	20.01	20.09	20.12	20.12	20.12	20.11	19.97	19.46	18.94		(90)
							f	fLA = Livin	ig area ÷ (4	4) =	0.42	(91)
Mean internal tempe	erature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m= 19.5 19.82	20.15	20.39	20.46	20.48	20.49	20.49	20.48	20.35	19.88	19.44		(92)
Apply adjustment to	the mear	n interna	l temper	ature fro	m Table	4e, whe	ere appr	opriate				
(93)m= 19.35 19.67	20	20.24	20.31	20.33	20.34	20.34	20.33	20.2	19.73	19.29		(93)
8. Space heating re	quiremen	t		•		•		•	•			
Set Ti to the mean i the utilisation factor		•		ned at st	ep 11 of	Table 9	b, so tha	at Ti,m=(76)m an	d re-calc	culate	
Jan Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for		<u> </u>	ay	1 04.1		1 7109			1.101			
(94)m= 0.98 0.95	0.87	0.72	0.53	0.36	0.24	0.27	0.47	0.8	0.96	0.99		(94)
Useful gains, hmGn	, W = (9	4)m x (8	4)m									
(95)m= 585.88 724.39	794.74	749.92	596.57	395.41	257.94	270.92	429.63	604.09	589.28	544.47		(95)
Monthly average ex	ternal tem	perature	e from T	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 m	ean interr	al temp	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m= 1082.64 1059.4	3 965.14	798.15	604.46	396.04	257.99	271.02	432.79	673.49	892.27	1072.32		(97)
Space heating requ	rement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 369.59 225.15	126.77	34.72	5.87	0	0	0	0	51.64	218.16	392.72		
						Tota	ıl per year	(kWh/yea	r) = Sum(9	8)15,912 =	1424.61	(98)
Space heating requ	rement in	ı kWh/m²	²/year								19.81	(99)
9a. Energy requirement	ents – Ind	lividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heating:										ı		_
Fraction of space he	at from s	econdar	y/supple	ementary	system						0	(201)
Fraction of space he	at from n	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of total hea	ting from	main sy	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main s	oace heat	ting syste	em 1								90.4	(206)
Efficiency of second	ary/suppl	ementar	y heatin	g systen	ո, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
			.				•		•	•	l	
Space heating requ	rement (d	calculate	d above)								
Space heating requ		34.72	d above	0	0	0	0	51.64	218.16	392.72		
·	126.77	34.72	5.87	`	0	0	0	51.64	218.16	392.72		(211)
369.59 225.15	126.77 (204)] } x 1	34.72	5.87	`	0	0 0	0	51.64	218.16	392.72 434.42		(211)
$369.59 225.15$ $(211)m = \{[(98)m \times (2010)] \}$	126.77 (204)] } x 1	34.72 100 ÷ (20	5.87	0	l .	0	0	57.12	1	434.42	1575.9	(211)
$369.59 225.15$ $(211)m = \{[(98)m \times (2010)] \}$	126.77 204)] } x 1 5 140.24	34.72 100 ÷ (20 38.41	5.87 06) 6.49	0	l .	0	0	57.12	241.32	434.42	1575.9	_
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	126.77 (204)] } x 1 (5 140.24 (secondar)	34.72 100 ÷ (20 38.41 Ty), kWh/	5.87 06) 6.49	0	l .	0	0	57.12	241.32	434.42	1575.9	_
369.59	126.77 (204)] } x 1 (5 140.24 (secondar)	34.72 100 ÷ (20 38.41 Ty), kWh/	5.87 06) 6.49	0	l .	0 Total	0 ol (kWh/yea	57.12 ar) =Sum(2	241.32	434.42	1575.9	(211)
369.59 225.15 (211)m = {[(98)m x (2 408.84 249.05] Space heating fuel (= {[(98)m x (201)]} x	204)] } x 1 5 140.24 (secondar 100 ÷ (20	34.72 100 ÷ (20 38.41 ry), kWh/	5.87 (6) 6.49 (month	0	0	0 Total	0 ol (kWh/yea	57.12 ar) =Sum(2	241.32	434.42	1575.9	_

Water heating								
Output from water heater (calculated above) 194.27 169.7 176.56 156.6 151.62 1	33.53 127.94	142.62	144.19	164.19	175.27	189.71]	
Efficiency of water heater	ļ						80.3	(216)
(217)m= 86.65 85.76 84.23 81.96 80.64	80.3 80.3	80.3	80.3	82.51	85.6	86.84		(217)
Fuel for water heating, kWh/month	•						•	
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 224.21 197.87 209.61 191.06 188.03 100	66.29 159.32	177.61	179.57	199.01	204.75	218.45]	
		Tota	I = Sum(2	19a) ₁₁₂ =			2315.77	(219)
Annual totals				k'	Wh/year	r	kWh/yea	 r
Space heating fuel used, main system 1							1575.9	
Water heating fuel used							2315.77	
Electricity for pumps, fans and electric keep-hot								
mechanical ventilation - balanced, extract or pos	itive input fror	n outside	Э			148.07]	(230
central heating pump:						30	j	(230
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			178.07	(231)
Electricity for lighting							317.63	(232)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHF)					
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x			0.2	16	=	340.39	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	500.21	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				840.6	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	92.42	(267)
Electricity for lighting	(232) x			0.5	19	=	164.85	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		1097.87	(272)
Dwelling CO2 Emission Rate			(272)	÷ (4) =			15.26	(273)

El rating (section 14)

(274)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Strom Softwa				Versio	on: 1.0.4.16	
		Pi	roperty .	Address	: Flat 08	3				
Address :										
1. Overall dwelling dimer	nsions:									
Basement				a(m²) 65.1	(1a) x		2.5	(2a) =	Volume(m 162.74	3) (3a)
Total floor area TFA = (1a	ı)+(1b)+(1c)+(1d)+(1	e)+(1n	1) (65.1	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	162.74	(5)
2. Ventilation rate:										
Number of chimneys	main s heating + [secondar heating	у + [other 0	7 = [total 0	x	40 =	m³ per hou	ır ─(6a)
Number of open flues	0 +	0	」	0]	0	x	20 =	0	(6b)
Number of intermittent far					J L			10 =		(7a)
Number of passive vents	10				L	0		10 =	0	=
					Ļ	0		40 =	0	(7b)
Number of flueless gas fir	es				L	0	X 1		nanges per h	(7c)
Infiltration due to chimney	n fluor and fans = ((6a)+(6b)+(7	a)+(7h)+(70) =	_					
If a pressurisation test has be					continue f	0 from (9) to		÷ (5) =	0	(8)
Number of storeys in th									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening		esponding to	the great	er wall are	a (after					
If suspended wooden fl		aled) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ento	er 0.05, else enter 0								0	(13
Percentage of windows	and doors draught	stripped							0	(14
Window infiltration				0.25 - [0.2	` '	-			0	(15
Infiltration rate				(8) + (10)					0	(16)
Air permeability value, o	• •		•	•	•	netre of e	envelope	area	3	(17)
If based on air permeabilit Air permeability value applies	-					rio boina u	ucod		0.15	(18)
Number of sides sheltered		as been don	e or a deg	gree air pe	тпеаышу	is being u	13 C U		0	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporati	ng shelter factor			(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified for	or monthly wind spee	ed						,		
Jan Feb I	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	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 = (22)m ÷ 4								-	
Wind Factor (22a)m = (22 $(22a)$ m = 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
,, 1.20 1	1.00	J 0.00	3.00	1 3.52	<u> </u>	1	1,2	Lo	l	

0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
alculate effec		•	rate for t	he appli	cable ca	se	l	l		ı	!	ı 	
If mechanica			l: N (0	(O.O.	/		15.) (1	. (00)	\ (00 \			0.5	(2:
If exhaust air he		0		, ,	, ,	. ,	,, .	•) = (23a)			0.5	(2:
If balanced with		-	-	_								73.95	(2:
a) If balance						- ` ` 	- ^ `	``	 		```	÷ 100]	
4a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(24
b) If balance						- 	<u> </u>	``	 			1	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (00)	,			
if (22b)n		r` ´	· ` `	<u> </u>	r i		ŕ	<u> </u>	· ` `			l	(2)
1c)m= 0	0	0		0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n				•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)		•	•		
5)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(2
Heat lease	and be	o logo i	o o ro n o o t	or:									_
. Heat losse					Net Ar	200	U-valı	10	AXU		k volu		ΑΧk
LEMENT	Gros area		Openin m		A, r		W/m2		(W/I	<)	k-value kJ/m²·l		kJ/K
in <mark>dows</mark> Type	1				17.75	₅ x1.	/[1/(1.2)+	0.04] =	20.32				(2
indows Type	2				4.65	x1.	/[1/(1.2)+	0.04] =	5.32	Ħ			(2
indows Type	3				4.65	×1.	/[1/(1.2)+	0.04] =	5.32	Ħ			(2
alls Type1	61.7	76	27.0	5	34.71		0.16		5.55	片 ,			(2
alls Type2		_	0			=		╣┇		륵 ¦		╡	(2
oof	26.6			_	26.68	=	0.16	-	4.27	륵 ¦		╡╞	
	64.7		0		64.78	_	0.12	= [7.77				(3
otal area of e					153.2			/r/4/11 1	\ 0.047		,		(3
or windows and include the area						ated using	i formula 1	/[(1/U-valu	ie)+0.04] a	is given in	paragrapr	1 3.2	
abric heat los				,			(26)(30)) + (32) =				48.57	(3
eat capacity		,	,					((28)	.(30) + (32	2) + (32a).	(32e) =	12246.7	
nermal mass		` ,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K	,		Indica	tive Value:	Medium		250	(3
r design assess	•	•		,			ecisely the	e indicative	values of	TMP in T	able 1f	200	(`
n be used instea	ad of a de	tailed calc	ulation.										
ermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix I	K						12.25	(3
letails of therma		are not kn	own (36) =	= 0.15 x (3	11)			(00)	(00)				
otal fabric he								• •	(36) =			60.82	(3
entilation hea		i e			Ι.				= 0.33 × (i	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		10
	17.07	16.86	15.86	15.66	14.65	14.65	14.45	15.05	15.66	16.06	16.46		(3
)m= 17.27			•										
eat transfer o	oefficie	nt, W/K						(39)m	= (37) + (3	38)m		•	

Heat loss para	ımeter (l	HP) W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.2	1.2	1.19	1.18	1.17	1.16	1.16	1.16	1.17	1.17	1.18	1.19		
	<u> </u>			<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	L Average =	Sum(40) ₁ .	12 /12=	1.18	(40)
Number of day	/s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•		•		•	•	•	•	•			
4. Water heat	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)] + 0.0	0013 x (⁻	TFA -13.		12		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.59		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pe	r day for ea			ctor from	Table 1c x		<u>'</u>	ļ.	!			
(44)m= 93.04	89.66	86.28	82.89	79.51	76.13	76.13	79.51	82.89	86.28	89.66	93.04		
									Total = Su	m(44) ₁₁₂ =		1015.03	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	ables 1b, 1	c, 1d)		
(45)m= 137.98	120.68	124.53	108.57	104.17	89.9	83.3	95.59	96.73	112.73	123.05	133.63		
W. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a.									Total = Su	m(45) ₁₁₂ =	<u> </u>	1330.87	(45)
If instantaneous w	_		ot use (no										
(46)m= 20.7 Water storage	18.1	18.68	16.29	15.63	13.48	12.5	14.34	14.51	16.91	18.46	20.04		(46)
Storage volum		includir	na any sa	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h								arrie ves	001		0		(47)
Otherwise if no	_			_			` '	ers) ente	er '0' in <i>(</i>	47)			
Water storage			. (o. o, o		, ,			
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
b) If manufact			-										
Hot water stora	•			le 2 (kW	h/litre/da	ay)					0		(51)
If community he Volume factor	_		on 4.3								. 1		(50)
Temperature factor			2h							-	0		(52) (53)
Energy lost fro				oor			(47) v (51)) v (52) v (53) -				. ,
Enter (50) or (•	, KVVII/y	zai			(47) X (31)) x (52) x (55) =		0		(54) (55)
Water storage	. , .	,	or each	month			((56)m = ((55) × (41)	m		0		(00)
										Ι .			(50)
(56)m= 0 If cylinder contains	0 a dadicata	0 d solar etc	0	0 = (56)m	0	0	0) also (5)	7)m = (56)	0 m whore (0	0 m Annond	iv Ll	(56)
				· · ·		1							
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by		rom Tab			i			<u> </u>		stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

				(0.1)	(00)	0= (44)							
Combi loss cal					<u> </u>	- ` ` `	_	2 1 40 00	1007	14400	17.44	[(61)
(61)m= 47.41	41.27	43.97	40.88	40.52	37.54	38.79	40.5	<u> </u>	43.97	44.22	47.41		(61)
Total heat requ							`		` 	ì 	`	(59)m + (61)m	(22)
(62)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.1		156.7	167.27	181.04		(62)
Solar DHW input o									r contribut	tion to wate	er heating)		
(add additional					- 	 	<u> </u>		Ι ,	1 0		1	(62)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa						1 .00.00				T		1	
(64)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.1		156.7	167.27	181.04	4020.24	(64)
			134/1/		- /	(45)		output from w				1838.24](04)
Heat gains from	r]	(CE)
(65)m= 57.73	50.44	52.4	46.32	44.77	39.28	37.4	41.9	L	48.47	51.97	56.29		(65)
include (57)r			. ,		ylinder i	s in the o	dwellir	ng or hot w	ater is f	rom com	munity h	eating	
5. Internal ga	ins (see	Table 5	and 5a):									
Metabolic gain				Ι	ı		ı	-	ī		1	Ī	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au		Oct	Nov	Dec		(2.2)
(66)m= 106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.0	_	106.08	106.08	106.08		(66)
Lighting gains	_		_		_								
(67)m= 16.55	14.7	11.95	9.05	6.76	5.71	6.17	8.02		13.67	15.95	17.01		(67)
App <mark>liance</mark> s gai	ns (ca <mark>lcı</mark>	<mark>ulat</mark> ed ir	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble 5				
(68)m= 185.6	187.52	182.67	172.34	159.3	147.04	138.85	136.9	141.78	152.11	165.15	177.41		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a	, also	see Table	5				
(69)m= 33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.6	33.61	33.61	33.61	33.61		(69)
Pumps and far	ns gains	(Table 5	āa)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)	_		_		_			
(71)m= -84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.8	6 -84.86	-84.86	-84.86	-84.86		(71)
Water heating	gains (T	able 5)											
(72)m= 77.6	75.06	70.43	64.33	60.17	54.55	50.26	56.3	3 58.86	65.15	72.18	75.65		(72)
Total internal	gains =				(66)m + (67)m	+ (68)	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 337.56	335.11	322.87	303.54	284.05	265.12	253.11	259.	1 269.23	288.75	311.11	327.89		(73)
6. Solar gains	:												
Solar gains are c		•					tions to	convert to the	ne applical		tion.		
Orientation: A	ccess Fable 6d	actor	Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
	able ou					DIE Ga	. –	Table ob	_ '	able oc		(()	,
Northeast _{0.9x}	0.77	X	4.6	35	X	11.28	×	0.55	x	0.7	=	14	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	x 2	22.97	x	0.55	x	0.7	=	28.49	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	X	11.38	x	0.55	x	0.7	=	51.34	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	x 6	67.96	x	0.55	x	0.7	=	84.31	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	x (91.35	X	0.55	x	0.7	=	113.33	(75)

Northeast 0.9s															
Northeast 0.0x	Northeast _{0.9x}	0.77	X	4.	65	X	9	7.38	x	0.55	X	0.7	=	120.82	(75)
Northeast 0.sx	Northeast _{0.9x}	0.77	×	4.	65	X		91.1	x	0.55	x	0.7	=	113.02	(75)
Northeast 0.50	Northeast _{0.9x}	0.77	X	4.	65	X	7	2.63	x	0.55	X	0.7	=	90.1	(75)
Northeast 0, 9x	Northeast _{0.9x}	0.77	X	4.	65	X	5	50.42	x	0.55	X	0.7	=	62.55	(75)
Northwest 0 9x	Northeast _{0.9x}	0.77	X	4.	65	X	2	28.07	x	0.55	X	0.7	=	34.82	(75)
Southwesto 9x	Northeast _{0.9x}	0.77	X	4.	65	X		14.2	x	0.55	X	0.7	=	17.61	(75)
Southwesto 9s	Northeast _{0.9x}	0.77	X	4.	65	X	9	9.21	x	0.55	X	0.7	=	11.43	(75)
Southwesto.gs, 0.77 x 4.65 x 106.25 0.55 x 0.7 = 106.39 (79) Southwesto.gs, 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 (79) Southwesto.gs, 0.77 x 4.65 x 118.15 0.55 x 0.7 = 147.65 (79) Southwesto.gs, 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 (79) Southwesto.gs, 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 (79) Southwesto.gs, 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 (79) Southwesto.gs, 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 (79) Southwesto.gs, 0.77 x 4.65 x 118.15 0.55 x 0.7 = 141.32 (79) Southwesto.gs, 0.77 x 4.65 x 118.15 0.55 x 0.7 = 141.32 (79) Southwesto.gs, 0.77 x 4.65 x 92.85 0.55 x 0.7 = 185.94 (79) Southwesto.gs, 0.77 x 4.65 x 6.92 0.55 x 0.7 = 185.94 (79) Southwesto.gs, 0.77 x 4.65 x 141.39 0.55 x 0.7 = 185.94 (79) Southwesto.gs, 0.77 x 4.65 x 141.39 0.55 x 0.7 = 185.94 (79) Southwesto.gs, 0.77 x 4.65 x 141.39 0.55 x 0.7 = 185.94 (79) Northwesto.gs, 0.77 x 17.75 x 112.2 y 0.55 x 0.7 = 334.3 (81) Northwesto.gs, 0.77 x 17.75 x 141.3 x 0.55 x 0.7 = 185.94 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 141.3 x 0.55 x 0.7 = 185.96 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 x 0.55 x 0.7 = 185.96 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 x 0.55 x 0.7 = 185.96 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 x 0.55 x 0.7 = 185.96 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 185.96 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 185.96 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 185.96 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 132.82 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 132.92 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 132.92 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 132.92 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 132.92 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 132.92 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 132.92 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 132.92 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 x 0.55 x 0.7 = 132.92 (81) Northwesto.gs, 0.77 x 17.75 x	Southwest _{0.9x}	0.77	X	4.	65	X	3	86.79]	0.55	X	0.7	=	45.65	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	X	4.	65	X	6	32.67]	0.55	X	0.7	=	77.76	(79)
Southwesto 9x	Southwest _{0.9x}	0.77	X	4.	65	X	8	35.75]	0.55	X	0.7	=	106.39	(79)
Southwesto 9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 (79) Southwesto 9x 0.77 x 4.65 x 118.19 0.55 x 0.7 = 141.32 (79) Southwesto 9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 (79) Southwesto 9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwesto 9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwesto 9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto 9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto 9x 0.77 x 4.65 x 112.8 x 0.55 x 0.7 = 85.94 (79) Southwesto 9x 0.77 x 1.75 x 112.8 x 0.55 x 0.7 = 108.77 (79) Northwest 0.9x 0.77 x 1.75 x 112.8 x 0.55 x 0.7 = 108.77 (81) Northwest 0.9x 0.77 x 17.75 x 12.297 x 0.55 x 0.7 = 108.77 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 12.297 x 0.55 x 0.7 = 195.96 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 17.75 x 0.55 x 0.7 = 195.96 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 321.82 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 321.82 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 432.6 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 432.6 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 431.44 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 431.44 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 431.44 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 334.395 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 131.99 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 131.99 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x	Southwest _{0.9x}	0.77	X	4.	65	X	1	06.25]	0.55	X	0.7	=	131.82	(79)
Southwesto 9x	Southwest _{0.9x}	0.77	X	4.	65	X	1	19.01]	0.55	X	0.7	=	147.65	(79)
Southwesto, 9x	Southwest _{0.9x}	0.77	X	4.	65	X	1	18.15]	0.55	X	0.7	=	146.58	(79)
Southwesto.gx	Southwest _{0.9x}	0.77	X	4.	65	X	1	13.91]	0.55	X	0.7	=	141.32	(79)
Southwesto 9x	Southwest _{0.9x}	0.77	×	4.	65	X	1	04.39]	0.55	X	0.7	=	129.51	(79)
Southwesto 9x 0.77	Southwest _{0.9x}	0.77	×	4.	65	X	9	2.85]	0.55	X	0.7	=	115.2	(79)
Southwest0.9x 0.77	Southwest _{0.9x}	0.77	×	4.	65	X	6	9.27]	0.55	X	0.7	=	85.94	(79)
Northwest 0.9x	Sout <mark>hwest_{0.9x}</mark>	0.77	×	4.	65	X	4	4.07		0.55	X	0.7	=	54.68	(79)
Northwest 0, 9x	Southwest _{0.9x}	0.77	×	4.0	65	Х	3	31.49] ,	0.55	X	0.7	_	39.07	(79)
Northwest 0, 9x	Northwest _{0.9x}	0.77	×	17	.75	X	1	1.28	×	0.55	X	0.7	=	53.43	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	17	.75	Х	2	22.97	x	0.55	x	0.7	=	108.77	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	×	17	.75	Х	4	1.38	х	0.55	x	0.7	=	195.96	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	×	17	.75	Х	6	67.96	×	0.55	x	0.7	=	321.82	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	17	.75	Х	9	1.35	x	0.55	X	0.7	=	432.6	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	×	17	.75	X	9	7.38	x	0.55	X	0.7	=	461.19	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	17	.75	X	,	91.1	x	0.55	X	0.7	=	431.44	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	17	.75	X	7	2.63	x	0.55	X	0.7	=	343.95	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	×	17	.75	X	5	0.42	x	0.55	X	0.7	=	238.78	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	17	.75	X	2	28.07	x	0.55	X	0.7	=	132.92	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 113.08	Northwest 0.9x	0.77	×	17	.75	X		14.2	x	0.55	X	0.7	=	67.23	(81)
(83) m= 113.08 215.01 353.69 537.95 693.57 728.59 685.78 563.56 416.53 253.68 139.52 94.13 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 450.64 550.12 676.56 841.5 977.63 993.71 938.89 822.66 685.76 542.43 450.63 422.02 (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 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Northwest _{0.9x}	0.77	×	17	.75	X	9	9.21	x	0.55	x	0.7	=	43.64	(81)
(83)m= 113.08 215.01 353.69 537.95 693.57 728.59 685.78 563.56 416.53 253.68 139.52 94.13 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 450.64 550.12 676.56 841.5 977.63 993.71 938.89 822.66 685.76 542.43 450.63 422.02 (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 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	_								-						
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 450.64 550.12 676.56 841.5 977.63 993.71 938.89 822.66 685.76 542.43 450.63 422.02 (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 0.99 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Solar gains in	watts, ca	alculate	d for eac	h mont	_			(83)m	n = Sum(74)m	(82)m	_		•	
(84)m= 450.64 550.12 676.56 841.5 977.63 993.71 938.89 822.66 685.76 542.43 450.63 422.02 (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 0.99 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	` '			<u> </u>	ļ				563	.56 416.53	253.6	8 139.52	94.13		(83)
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 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)				`	`	- `								7	
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 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	(84)m= 450.64	550.12	676.56	841.5	977.63	9	93.71	938.89	822	.66 685.76	542.4	3 450.63	422.02		(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 temp	erature	(heating	g seaso	n)									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature	during h	eating	periods i	n the liv	ing	area	from Tab	ole 9	, Th1 (°C)				21	(85)
(86)m= 1 0.99 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Utilisation fac	tor for g	ains for	living ar	ea, h1,r	n (s	ee Ta	ble 9a)							_
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Jan	Feb	Mar	Apr	May	<u>' </u>	Jun	Jul	Α	ug Sep	Oct	Nov	Dec]	
	(86)m= 1	0.99	0.97	0.87	0.68		0.48	0.35	0.4	12 0.7	0.95	0.99	1		(86)
(87)m= 19.78 19.99 20.32 20.72 20.93 20.99 21 21 20.94 20.6 20.11 19.74 (87)	Mean interna	I temper	ature in	living ar	ea T1 (follo	w ste	ps 3 to 7	in T	able 9c)					
	(87)m= 19.78	19.99	20.32	20.72	20.93	2	20.99	21	_ 2	1 20.94	20.6	20.11	19.74		(87)
														=	

Tanana anakuma alumba ali a			: -1 11:	. f T.	hi- o Ti	LO (90)					
Temperature during he		-	19.95	19.95	19.96	`	10.04	10.04	10.02		(88)
(88)m= 19.92 19.92	19.93 19	19.94	19.95	19.95	19.96	19.95	19.94	19.94	19.93		(88)
Utilisation factor for ga	-		h2,m (se	1	9a)						
(89)m= 0.99 0.99	0.95 0.	83 0.62	0.4	0.27	0.32	0.62	0.92	0.99	1		(89)
Mean internal tempera	ture in the	rest of dwell	ling T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)				
(90)m= 18.31 18.61	19.09 19	19.88	19.95	19.95	19.95	19.91	19.49	18.8	18.26		(90)
						1	fLA = Livin	g area ÷ (4	1) =	0.42	(91)
Mean internal tempera	ture (for th	e whole dwe	elling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m= 18.93 19.19		.09 20.33	20.39	20.39	20.39	20.34	19.96	19.35	18.89		(92)
Apply adjustment to th	e mean int	ernal tempe	rature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 18.78 19.04	19.46 19	.94 20.18	20.24	20.24	20.24	20.19	19.81	19.2	18.74		(93)
8. Space heating requi	rement	,		•							
Set Ti to the mean inte the utilisation factor for	•		ned at st	ep 11 of	Table 9l	b, so tha	it Ti,m=(76)m an	d re-calc	ulate	
Jan Feb		Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for ga		 	1		19						
(94)m= 0.99 0.98	-	83 0.63	0.42	0.29	0.35	0.64	0.92	0.99	0.99		(94)
Useful gains, hmGm,	W = (94)m	x (84)m				<u> </u>					
(95)m= 447.53 540.59	641.27 70	1.74 616.8	421.96	274.63	288.37	438.95	498.87	443.97	419.84		(95)
Monthly average exter	nal temper	ature from T	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	n internal to	emperature,	Lm , W :	=[(39)m	x [(93)m	– (96)m]				
(97)m= 1130.52 1101.34	1006.95 84	6.68 648.22	425.51	275.05	289.38	462.4	704.19	930.38	1123.5		(97)
Space heating require	ment fo <mark>r ea</mark>	ch month, k	Wh/mon	th = 0.02	24 x [(97	m - (95))m] x (4	1)m			
	i	4.36 23.37	0	0	0	0	152.75	350.21	523.52		_
	i	-	_		0	0	<u> </u>	350.21 -) = Sum(9		2311.26	(98)
	272.07 10-	4.36 23.37	_		0	0	<u> </u>			2311.26	(98) (99)
(98)m= 508.15 376.83	272.07 104 ment in kW	4.36 23.37 /h/m²/year	0	0	0 Tota	0 Il per year	<u> </u>				=
(98)m= 508.15 376.83 Space heating requirement Space heating:	ment in kW	4.36 23.37 h/m²/year ual heating s	0 systems i	0 ncluding	0 Total	0 Il per year	<u> </u>			35.5	(99)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat	ment in kW s – Individu	4.36 23.37 h/m²/year ual heating s ndary/supple	0 systems i	ncluding v system	0 Total	0 ol per year	<u> </u>				(99)
(98)m= 508.15 376.83 Space heating requirement Space heating:	ment in kW s – Individu	4.36 23.37 h/m²/year ual heating s ndary/supple	0 systems i	ncluding v system	0 Total	0 ol per year	<u> </u>			35.5	(99)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat	ment in kW s – Individu	4.36 23.37 h/m²/year ual heating s ndary/supple system(s)	0 systems i	ncluding v system	0 Total	0 Il per year CHP) - (201) =	(kWh/year			35.5	(99)
Space heating required 9a. Energy requirement Space heating: Fraction of space heat Fraction of space heat	ment in kW s – Individu from secon from main g from main	23.37 h/m²/year ual heating s ndary/supple system(s) n system 1	0 systems i	ncluding v system	0 Tota micro-C	0 Il per year CHP) - (201) =	(kWh/year			0 1	(99) (201) (202)
Space heating requirement Space heating: Fraction of space heat Fraction of total heatin	ment in kW s – Individu from secon from main g from main ce heating	23.37 2h/m²/year Lal heating solution andary/supple system(s) n system 1 system 1	o systems i ementary	ncluding v system	0 Tota micro-C	0 Il per year CHP) - (201) =	(kWh/year			0 1 1	(99) (201) (202) (204)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space	ment in kW s – Individu from secon from main g from main ce heating	23.37 2h/m²/year Lal heating solution andary/supple system(s) n system 1 system 1	o systems i ementary	ncluding v system	0 Tota micro-C	0 Il per year CHP) - (201) =	(kWh/year			0 1 1 90.4	(99) (201) (202) (204) (206) (208)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary	ment in kW s – Individu from secon from main g from main ce heating y/suppleme	23.37 ch/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating Apr May	systems in a system of the sys	ncluding v system	0 Tota micro-C (202) = 1 - (204) = (2	0 Il per year CHP) - (201) = 02) × [1 -	(kWh/year	r) = Sum(9	8) _{15,912} =	0 1 1 90.4	(99) (201) (202) (204) (206) (208)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer	ment in kW s – Individu from secon from main g from main ce heating sy/supplement Mar A ment (calculation)	23.37 ch/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating Apr May	systems in a system of the sys	ncluding v system	0 Tota micro-C (202) = 1 - (204) = (2	0 Il per year CHP) - (201) = 02) × [1 -	(kWh/year	r) = Sum(9	8) _{15,912} =	0 1 1 90.4	(99) (201) (202) (204) (206) (208)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer	ment in kW s – Individu from secon from main g from main ce heating y/suppleme Mar Mar Ament (calcu 272.07 10	23.37 h/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating Apr May ulated above 4.36 23.37	ementary g system Jun	ncluding v system n, %	0 Tota micro-C (202) = 1 - (204) = (2	0 Il per year CHP) - (201) = 02) × [1 -	(kWh/year	Nov	8) _{15,912} =	0 1 1 90.4	(99) (201) (202) (204) (206) (208)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer 508.15 376.83 (211)m = {[(98)m x (204)]	ment in kW s – Individu from secon from main g from main ge heating y/supplement Mar Mar Ment (calcu 272.07 100	23.37 h/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating Apr May ulated above 4.36 23.37	ementary g system Jun	ncluding v system n, %	0 Tota micro-C (202) = 1 - (204) = (2	0 Il per year CHP) - (201) = 02) × [1 -	(kWh/year	Nov	8) _{15,912} =	0 1 1 90.4	(99) (201) (202) (204) (206) (208) ear
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer 508.15 376.83 (211)m = {[(98)m x (204)]	ment in kW s – Individu from secon from main g from main ge heating y/supplement Mar Mar Ment (calcu 272.07 100	23.37 ch/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating Apr May ulated above 4.36 23.37 ÷ (206)	ementary Jun O	ncluding v system n, % Jul	0 Tota micro-C (202) = 1 - (204) = (2 Aug 0	0 Il per year CHP) - (201) = 02) × [1 - Sep 0	(kWh/year (203)] = Oct 152.75	Nov 350.21	Dec 523.52	0 1 1 90.4	(99) (201) (202) (204) (206) (208) ear
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer 508.15 376.83 (211)m = {[(98)m x (204)]	ment in kW s – Individu from secon from main g from main ge heating y/suppleme Mar Mar Ment (calcu 272.07 10 300.96 11	th/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating May ulated above 4.36 23.37 ÷ (206) 5.44 25.85	ementary Jun O	ncluding v system n, % Jul	0 Tota micro-C (202) = 1 - (204) = (2 Aug 0	0 Il per year CHP) - (201) = 02) × [1 - Sep 0	(kWh/year (203)] = Oct 152.75	Nov 350.21	Dec 523.52	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer 508.15 376.83 (211)m = {[(98)m x (204) 562.11 416.84]	ment in kW s – Individu from secon from main g from main ge heating y/suppleme Mar A ment (calcu 272.07 100 300.96 111	th/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating May ulated above 4.36 23.37 ÷ (206) 5.44 25.85	ementary Jun O	ncluding v system n, % Jul	0 Tota micro-C (202) = 1 - (204) = (2 Aug 0	0 Il per year CHP) - (201) = 02) × [1 - Sep 0	(kWh/year (203)] = Oct 152.75	Nov 350.21	Dec 523.52	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space heating required 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Jan Feb Space heating required 508.15 376.83 (211)m = {[(98)m x (204) 562.11 416.84]	ment in kW s – Individu from secon from main g from main ge heating y/suppleme Mar A ment (calcu 272.07 10 300.96 11:	th/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating May ulated above 4.36 23.37 ÷ (206) 5.44 25.85	ementary Jun O	ncluding v system n, % Jul	0 Tota micro-C (202) = 1 - (204) = (2 Aug 0 Tota	0 Il per year CHP) - (201) = 02) × [1 - Sep 0 Il (kWh/yea	(kWh/year (203)] = Oct 152.75 168.98 ar) =Sum(2	Nov 350.21 387.4 211) _{15,1012}	Dec 523.52 579.12 =	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer 508.15 376.83 (211)m = {[(98)m x (204)	ment in kW s – Individu from secon from main g from main ge heating y/suppleme Mar A ment (calcu 272.07 10 300.96 11:	th/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating May lated above 4.36 23.37 ÷ (206) 5.44 25.85	systems in a system of the systems of the systems of the system of the s	ncluding v system n, % Jul 0	0 Tota micro-C (202) = 1 - (204) = (2 Aug 0 Tota	0 Il per year CHP) - (201) = 02) × [1 - Sep 0 Il (kWh/yea	(kWh/year (203)] = Oct 152.75 168.98 ar) =Sum(2	Nov 350.21 387.4 211) _{15,1012}	Dec 523.52 579.12 =	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear

Water heating								
Output from water heater (calculated above) 185.4 161.95 168.5 149.45 144.69 1.	27.44 122.09	136.11	137.61	156.7	167.27	181.04]	
Efficiency of water heater		1					80.3	(216)
(217)m= 87.46 87.11 86.25 84.17 81.57	80.3 80.3	80.3	80.3	84.99	86.87	87.57		(217)
Fuel for water heating, kWh/month	•						•	
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 211.98 185.92 195.36 177.56 177.39 1	158.7 152.05	169.5	171.37	184.38	192.56	206.74		
	ļ.	Tota	I = Sum(2	19a) ₁₁₂ =			2183.5	(219)
Annual totals				k۱	Wh/year	•	kWh/yeaı	
Space heating fuel used, main system 1	2556.7							
Water heating fuel used	2183.5							
Electricity for pumps, fans and electric keep-hot								
mechanical ventilation - balanced, extract or pos	itive input fror	n outside	е			134.02		(230a)
central heating pump:						30		(230c)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			164.02	(231)
Electricity for lighting							292.21	(232)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHF)					
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Em<mark>issio</mark>ns kg CO2/ye	
Spa <mark>ce he</mark> ating (main system 1)	(211) x			0.2	16	=	552.25	(261)
Space heating (secondary)	(215) x			0.5	9	=	0	(263)
Water heating	(219) x			0.2	6	=	471.64	(264)
Space and water heating	(261) + (262)	+ (263) + ((264) =				1023.88	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	85.13	(267)
Electricity for lighting	(232) x			0.5	19	=	151.66	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		1260.67	(272)
Dwelling CO2 Emission Rate			(272)	÷ (4) =			19.37	(273)

El rating (section 14)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Strom Softwa				Versic	on: 1.0.4.16	
		Pi	roperty .	Address	: Flat 09)				
Address :										
1. Overall dwelling dimer	nsions:			4 0						
Basement				a(m²) 38.5	(1a) x		2.5	(2a) =	Volume(m 221.25	3) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n) [38.5	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	221.25	(5)
2. Ventilation rate:		_								
Number of chimneys		secondar heating	у] + [other 0] - [total 0	x -	40 =	m³ per hou	ır ─ _(6a)
Number of open flues	0 +	0	- - - - -	0]	0	x	20 =	0	(6b)
Number of intermittent fan					J L T	0	x	10 =	0	(7a)
Number of passive vents	-				L	0	x	10 =	0	(7b)
Number of flueless gas fire	ac				L		x	40 =	-	
Number of fideless gas in					L	0			nanges per h	(7c)
Infiltration due to chimney	s, flues and fans = (6a)+(6b)+(7	a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has be		ded, proceed	d to (17), d	otherwise o	continue f	rom (9) to	(16)			
Number of storeys in the	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration Structural infiltration: 0.2	25 for stool or timber	frame or	0.25 for	maaan	av oonet	ruotion	[(9)	-1]x0.1 =	0	(10)
if both types of wall are pre deducting areas of opening	esent, use the value corre				•	ruction			0	(11]
If suspended wooden flo		aled) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	stripped							0	(14)
Window infiltration				0.25 - [0.2	` '	-			0	(15
Infiltration rate						12) + (13)			0	(16)
Air permeability value, o	•		•	•	•	netre of e	envelope	area	3	(17)
If based on air permeabilit	-					to hoton			0.15	(18)
Air permeability value applies Number of sides sheltered		as been don	e or a deg	gree air pe	гтеаршту	r is being u	isea		0	(19)
Shelter factor	•			(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified fo	r monthly wind spee	ed								
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7								=	
	1.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4	'		•	-	•		-	•	
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
							-		ı	

1.19	Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
If mechanical ventilation: If exhaust air heat jump using Appendix N, (230) = (23a) × Fmv (equation (NS)), otherwise (23b) = (23a) =	,	1	· `				i ´	<u>` </u>	` 	0.16	0.17	0.18	1	
If ordinated air heat pump using Appendix N. (23b) = (23a) × Fmv (equation (NS)). otherwise (23b) = (23a) (3a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] (24a)m = (23			_	rate for t	he appli	cable ca	se					!		
If balanced with heat recovery efficiency in % allowing for in use factor (from Table 4h) = 73.95 23. a) if the balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) × 100] 22a)m = 0.32 0.32 0.31 0.3 0.29 0.27 0.27 0.27 0.28 0.29 0.3 0.31 b) if balanced mechanical ventilation with the trecovery (MVV) (24b)m = (22b)m + (23b) × [1 - (23c) × 100] 22b)m = 0 0 0 0 0 0 0 0 0 0													0.5	(23a
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] 24amm 032) = (23a)			0.5	(23b
28a)m	If balanced with	n heat reco	overy: effic	ency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				73.95	(230
b) if balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) 24b;mi	· -		1					- 	í `	- 		- ` ` `) ÷ 100]	
24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	` '					l		l .		L		0.31		(24a
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=						i		<u> </u>	· ·	<u> </u>	1	ı	1	
If (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)	,			,						0	0	0		(24b
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) 224d)m = 0	,				•	•				.5 × (23b	o)	_	_	
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] 24dym = 0	(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25 m										0.5]				
25)	(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings A, m² Nindows Type 1 17.75 17.75 17.75 17.75 17.71(1.2) + 0.04] = 20.32 (27. Nindows Type 2 Nindows Type 3 Nindows Type 4 11.88 17.17(1.2) + 0.04] = 5.32 (27. Nindows Type 4 11.88 17.17(1.2) + 0.04] = 5.32 (27. Nindows Type 4 11.88 17.17(1.2) + 0.04] = 13.6 (27. Feloor 16.167 18.167 19.18 11.81 11.	Effective air	change	rate - er	ter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
Nindows Type 1	(25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(25)
Nindows Type 1	3. Heat losse	s and he	eat loss r	paramete	er:								_	
Vindows Type 2	ELEMENT	Gros	ss	Openin	gs		/				K)			
Mindows Type 3	Win <mark>dows</mark> Type	1				17.75	₅ x1	/[1/(1.2)+	0.04] =	20.32				(27)
Vindows Type 4	Win <mark>dows</mark> Type	2				4.65	x1	/[1/(1.2)+	0.04] =	5.32	Ħ			(27)
Total area of elements, m2 204.64 31 38.93 37.4 x 0.16 = 5.98 3.78 38.93 37.4 x 0.16 = 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.78 3.89 3.78	Windows Type	3				4.65	x1	/[1/(1.2)+	0.04] =	5.32	Ħ			(27)
Total area of elements, m2 204.64 31 38.93 37.4 x 0.16 = 5.98 3.78 38.93 37.4 x 0.16 = 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.78 3.89 3.78	Windows Type	e 4				11.88	x1	/[1/(1.2)+	0.04] =	13.6	Ħ			(27)
Valls Type1	Floor						_	0.1	─ i		<u> </u>			
Nalls Type2	Walls Type1	76.3	33	38.93	3		=	0.16	-		=		7 F	
Roof 88.5 0 88.5 x 0.12 = 10.62 (30) (30) (31) (70 total area of elements, m² 204.64 (31) (70 total area of windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 (31) (32) (32) (33) (32) (33) (32) (33) (32) (33) (33) (32) (33) (33) (34) (32) (32) (33) (34) (32) (32) (33) (34)									= :		<u> </u>		-	
Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total fabric heat loss, W/K = S (A x U) Thermal mass parameter (TMP = Cm + TFA) in kJ/m ² K Thermal mass parameter (TMP = Cm + TFA) in kJ/m ² K Total fabric heat loss (L x Y) calculated using Appendix K Total fabric heat loss Total fabric heat loss Total fabric heat loss Total fabric heat loss calculated monthly Total fabric heat loss calculated monthly Total fabric heat loss calculated monthly Total fabric heat loss calculated monthly Total fabric heat loss Total fabric heat loss calculated monthly Total fabric heat loss calculated will part fabric heat loss calculated will part fa	Roof				=		=		=		북 ¦		-	====
Internal pridges		L					_	0.12		10.02				
# include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) Heat capacity Cm = S(A x k) ((28)(30) + (32) = (26)(32) + (32a)(32e) = (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K Indicative Value: Medium 250 (35) Total fabric heat loss (33) + (36) = (35) (34) (35) (36) (37) (38) (38) (39) (39) (39) (30) (31) (32) (32) (32) (33) (34) (35) (35) (35) (36) (37) (38) (38) (39) (39) (30) (31) (30) (31) (32) (32) (33) (34) (35) (35) (35) (36) (37) (38) (38) (38) (39) (39) (30) (31) (32) (31) (32) (32) (33) (34) (35) (35) (35) (36) (37) (38) (38) (38) (39) (39) (30)				ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	ue)+0.041 a	as aiven in	paragrapl	1 3.2	(01)
Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 13606.43 (34) (Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) (36) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f tan be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K (details of thermal bridging are not known (36) = 0.15 x (31)) Total fabric heat loss (33) + (36) = (37) (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38)m = 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m = 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78										, , .	J	7		
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K Indicative values of TMP in Table 1f than be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K Indicative values of TMP in Table 1f than be used instead of a detailed calculation. Indicative values of TMP in Table 1f than be used instead of a detailed calculation. Indicative values of TMP in Table 1f than be used instead of a detailed calculation. Indicative values: Medium Indicative values: Indicative values of TMP in Table 1f Indicative values: Indicative values of TMP in Table 1f Indicative values: Indicative values of TMP in Table 1f Indicative values: Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values	Fabric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				66.58	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f san be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K f details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38)m = 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m = 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78	Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	13606.4	(34)
Thermal bridges: S (L x Y) calculated using Appendix K f details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss /entilation heat loss calculated monthly Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38)m= 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78		•	`		,								250	(35)
f details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 82.4 (37) 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= 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78	=				construct	ion are no	t known pr	recisely the	e indicative	e values of	TMP in T	able 1f		
Total fabric heat loss (33) + (36) = 82.4 (37) Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	_	•	,		• .	•	<						15.82	(36)
/entilation heat loss calculated monthly			are not kn	own (36) =	= 0.15 x (3	1)			(33) ±	(36) =			00.1	(27)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38)m= 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78			alculated	monthly	,				` ,		(25)m v (5)	82.4	(37)
38)m= 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78						lun	lul	Διια	``			<u>, </u>	1	
Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78			_			-		Ť		†	 	+	1	(38)
39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78	` '			0		L	L	I	<u> </u>		<u> </u>	1	J	(-3)
0 (0) (0)				103.06	103.60	102 32	102 32	102.04				104 79	1	
Stroma FSAP 2012 Version: 1.0.4.16 (SAP 9.92) - http://www.stroma.com Average = Sum(39) ₁₁₂ /12= 103.89 _{age 2} of 39	` ′					<u> </u>	<u> </u>	102.04		<u> </u>	L		103.80	32 2 (39)

Heat loss para	ımeter (l	HP) W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.2	1.19	1.19	1.17	1.17	1.16	1.16	1.15	1.16	1.17	1.18	1.18		
	ļ	!		<u> </u>			<u> </u>	<u> </u>	L Average =	Sum(40) ₁	12 /12=	1.17	(40)
Number of day	/s in mo	nth (Tab	le 1a)								<u>'</u>		_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	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)] + 0.0	0013 x (⁻	TFA -13.		.6		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.06		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 105.67	101.82	97.98	94.14	90.3	86.45	86.45	90.3	94.14	97.98	101.82	105.67		
		•								m(44) ₁₁₂ =		1152.72	(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 (<mark>see Ta</mark>	ables 1b, 1	c, 1d)		
(45)m= 156.7	137.05	141.42	123.3	118.31	102.09	94.6	108.56	109.85	1 <mark>2</mark> 8.02	139.75	151.76		
If ins <mark>tantane</mark> ous w	vator hosti	ng at paint	of was Inc	hot water	r otorogo)	antar () in	hayaa (46		Total = Su	m(45) ₁₁₂ =	_	1511.4	(45)
_	_											1	(40)
(46)m= 23.5 Water storage	20.56	21.21	18.49	17.75	15.31	14.19	16.28	16.48	19.2	20.96	22.76	ı	(46)
Storage volum		includir	ıa anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h											<u> </u>		· /
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage	loss:												
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufact			-										(54)
Hot water storal If community h	_			ie z (KVV	ii/iitie/ua	iy <i>)</i>					0	i	(51)
Volume factor	•		JII 4.0								0		(52)
Temperature f	actor fro	m Table	2b							-	0		(53)
Energy lost fro	m wate	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or ((54) in (55)									0		(55)
Water storage	loss cal	culated t	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	<u>I</u> s dedicate	l d solar sto	L rage, (57)	<u>I</u> m = (56)m	x [(50) – (<u>l</u> H11)] ÷ (5	1 0), else (5	<u>I</u> 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 (ar	nual) fro	m Table	 e 3							0		(58)
Primary circuit	•	,			59)m = ((58) ÷ 36	65 × (41))m					
(modified by					•	. ,	. ,		r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Cambi lasa salaulatas	l for ooah	ma a matha d	(C1)	(CO) + 2	GE w (44	\							
Combi loss calculated (61)m= 50.96 46.03	49.93	46.42	(61)m = 46.01	(60) ÷ 3	65 × (41)m 46.01	46.42	49.93	49.32	50.96	1	(61)	
` '										<u> </u>	(50) (04)	(01)	
Total heat required fo	_	169.72	164.32	144.72	138.66	(62)m		(45)m + 177.95	(46)m + 189.06	(57)m + 202.71	(59)m + (61)m l	(62)	
` '	1	<u> </u>	<u> </u>		1				1	l		(02)	
Solar DHW input calculated (add additional lines in								r contribu	tion to wate	er neating)			
$\begin{array}{c cccc} (63)m = & 0 & 0 \\ \end{array}$	0	0	0	0	0 0	0	T 0	0	0	0	1	(63)	
(11)				Ů	<u> </u>	L °			1 –			(00)	
Output from water hea	_	169.72	164.32	144.72	138.66	154.5	7 156.28	177.95	189.06	202.71]		
(04)/11- 207.00 103.00	101.00	100.72	104.02	177.72	100.00	ļ	utput from wa		<u> </u>	l	2080.08	(64)	
Heat gains from wate	r heating	k\/\/h/m/	onth 0.2	5 ′ [O 8 <i>F</i>	5 x (45)m](, ,	
(65)m= 64.84 57.08	59.51	52.6	50.84	44.6	42.47	47.6	48.13	55.05	58.79	63.2]	(65)	
include (57)m in ca		<u> </u>	L		1				<u> </u>	<u> </u>] soating	(00)	
				yiiiiuei		uweiiii	g of flot w	alei is i	TOTTI COTTI	iiiiuiiity i	leating		
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts													
			Mov	lun	Jul	Ι Δ.,,	. I son	Oot	Nov	Doo	1		
Jan Feb (66)m= 130.23 130.23	Mar 130.23	Apr 130.23	May 130.23	Jun 130.23	130.23	Aug 130.23	· ·	Oct 130.23	Nov 130.23	Dec 130.23		(66)	
` '							1	130.23	100.20	100.20		(00)	
Lighting gains (calculation) (67)m= 21.07 18.71	15.22	11.52	L, equal	7.27	7.86	10.21		17.4	20.31	21.65	1	(67)	
									20.31	21.00		(01)	
Appliances gains (cal	_							_	1 240 20	005.07	1	(68)	
(68)m= 236.29 238.74		219.41	202.81	187.2	176.77	174.3		193.65	210.26	225.87		(00)	
Cooking gains (calcul			· ·	_	1				20.00	36.02	1	(60)	
(69)m= 36.02 36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02		(69)	
Pumps and fans gains	1	 			Ι.,	<u> </u>	1 .	<u> </u>	Τ .	Ι ,	1	(70)	
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3		(70)	
Losses e.g. evaporati	· ·		, ``		T		. 1		T	T	1	(74)	
(71)m= -104.19 -104.19		-104.19	-104.19	-104.19	-104.19	-104.1	9 -104.19	-104.19	-104.19	-104.19		(71)	
Water heating gains (T	1	T	1	(- 0)	
(72)m= 87.15 84.93	79.98	73.06	68.33	61.95	57.08	63.98		73.99	81.66	84.94		(72)	
Total internal gains	_		l		, , ,	·	n + (69)m + (·	<u>, , , , , , , , , , , , , , , , , , , </u>	<u>, </u>	1	(70)	
(73)m= 409.58 407.46	392.83	369.06	344.82	321.49	306.78	313.5	326.12	350.12	377.3	397.53		(73)	
6. Solar gains:	l uniona nolo	r flux from	Table 6a	and asses	siated agus	tions to	convert to the	o annlica	ble erientei	tion			
Solar gains are calculated Orientation: Access	•	Area		and assoc Flu	·	ilions to		іе аррііса	FF	uori.	Gains		
Table 6		M ²			ble 6a		g_ Table 6b	Т	able 6c		(W)		
N. 11 .		1.6	25	,	11 20	1 , [0.55				. ,	(75)	
Northeast 0.9x 0.77 Northeast 0.9x 0.77		4.6		_	11.28]	0.55		0.7	╡ -	14](75)](75)	
Northead		4.6			22.97	t ⊨	0.55	≓ ¦		╡ -	28.49](75)](75)	
Northand		4.6			41.38]	0.55	_	0.7	┥ [51.34	-	
Nedless		4.6			67.96]	0.55	_	0.7	=	84.31	(75)	
Northeast 0.9x 0.77	7 X	4.6	5	X	91.35	X	0.55	X	0.7	=	113.33	(75)	

Northeast 0 s	Northeast _{0.9x}	0.77	1	4.05	1 .,	07.00	1 .,	0.55	١.,	0.7	1 _	400.00	7(75)
Northeast 0.9x	<u> </u>	0.77	X	4.65	X	97.38	X	0.55	X	0.7	= 	120.82	(75)
Northeast 0 st 0 st 0 st 0 st 0 st 0 st 0 st 0	<u> </u>] 1]]]]] 1		╡ .
Northeast 0.9%	<u> </u>]]]]]]] 1		╡ .
Northeast 0.9x	<u> </u>] 1]]]]] 1		╡ .
Northeast 0.9x	<u> </u>]]]]]]] 1		╡``
Southeast 0, 9x	<u> </u>] 1]]]]] 1		╡゛
Southeast 0.9x	<u> </u>] 1] 1] 1] 1		╡ .
Southeast 0.9% 0.77	<u> </u>] 1		X		X	0.55	X] 1		╡゛
Southeast 0.9% 0.77	<u> </u>] 1]]]]] 		╡゛
Southeast 0.9x 0.77 x 17.75 x 119.01 x 0.55 x 0.7 = 563.61 (77) Southeast 0.9x 0.77 x 17.75 x 118.01 x 0.55 x 0.7 = 569.53 (77) Southeast 0.9x 0.77 x 17.75 x 118.01 x 0.55 x 0.7 = 559.53 (77) Southeast 0.9x 0.77 x 17.75 x 118.01 x 0.55 x 0.7 = 539.45 (77) Southeast 0.9x 0.77 x 17.75 x 104.39 x 0.55 x 0.7 = 449.37 (77) Southeast 0.9x 0.77 x 17.75 x 92.85 x 0.55 x 0.7 = 449.37 (77) Southeast 0.9x 0.77 x 17.75 x 92.85 x 0.55 x 0.7 = 439.73 (77) Southeast 0.9x 0.77 x 17.75 x 92.85 x 0.55 x 0.7 = 208.11 (77) Southeast 0.9x 0.77 x 17.75 x 44.07 x 0.55 x 0.7 = 149.12 (77) Southeast 0.9x 0.77 x 4.65 x 36.79 x 0.55 x 0.7 = 149.12 (77) Southeast 0.9x 0.77 x 4.65 x 85.75 x 0.55 x 0.7 = 149.12 (77) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 149.12 (77) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 149.12 (77) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.8 x 114.38 x 0.55 x 0.7 = 359.66 (81) Northwest 0.9x 0.77 x 11.88 x 112.8 x 0.55 x 0.7 = 359.66 (81) Northwest 0.9x 0.77 x 11.88 x 112.8 x 0.55 x 0.7 = 359.66 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 288.53 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 288.53 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 288.76 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 288.76 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 288.76 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 288.76 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 288.76 (81)	<u> </u>		X		X		X		X] 1		╡゛
Southeast 0 9x	<u> </u>	0.77	X	17.75	X	106.25	X	0.55	X] 1	503.19	╡``
Southeast 0.9x	<u> </u>	0.77	X	17.75	X	119.01	X	0.55	X	0.7	=	563.61	<u> </u> (77)
Southeast 0.9x	<u> </u>	0.77	X	17.75	X	118.15	X	0.55	X	0.7	=	559.53	╡゛
Southeast 0,9x	<u>L</u>	0.77	X	17.75	X	113.91	X	0.55	X	0.7	=	539.45	(77)
Southeast 0.9x	<u> </u>	0.77	X	17.75	X	104.39	X	0.55	X	0.7	=	494.37	(77)
Southeast 0.9x	<u> </u>	0.77	X	17.75	X	92.85	X	0.55	X	0.7	=	439.73	(77)
Southeast 0.9x 0.77	<u> </u>	0.77	X	17.75	X	69.27	X	0.55	X	0.7	=	328.04	(77)
Southwesto, 9x 0.77	<u> </u>	0.77	X	17.75	Х	44.07	Х	0.55	X	0.7	=	208.71	(77)
Southwest0.9x		0.77	X	17.75	X	31.49	×	0.55	X	0.7	=	149.12	(77)
Southwesto 9x 0.77		0.77	X	4.65	x	36.79		0.55	X	0.7	=	45.65	(79)
Southwesto.9x 0.77 x 4.65 x 106.25 0.55 x 0.7 = 131.82 (79) Southwesto.9x 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 (79) Southwesto.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 146.58 (79) Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwesto.9x 0.77		0.7 <mark>7</mark>	X	4.65	X	62.67		0.55	X	0.7	=	77.76	(79)
Southwesto.9x 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 (79) Southwesto.9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 (79) Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 129.51 (79) Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Northwesto.9x 0.77		0.77	X	4.65	Х	85.75		0.55	X	0.7	=	106.39	(79)
Southwesto.9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 (79) Southwesto.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 129.51 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 54.68 (79) Northwesto.9x 0.77 <t< td=""><td></td><td>0.77</td><td>X</td><td>4.65</td><td>Х</td><td>106.25</td><td></td><td>0.55</td><td>X</td><td>0.7</td><td>=</td><td>131.82</td><td>(79)</td></t<>		0.77	X	4.65	Х	106.25		0.55	X	0.7	=	131.82	(79)
Southwesto.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.65 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 54.68 (79) Northwesto.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 72.8 (81) Northwesto.9x 0.		0.77	X	4.65	X	119.01		0.55	X	0.7	=	147.65	(79)
Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 54.68 (79) Northwest 0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 39.07 (79) Northwest 0.9x 0.77 x 11.88 x 22.97 x 0.55 x 0.7 = 72.8 (81) Northwest 0.9	<u>L</u>	0.77	X	4.65	X	118.15		0.55	X	0.7	=	146.58	(79)
Southwest0.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwest0.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwest0.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwest0.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 (79) Northwest0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 39.07 (79) Northwest0.9x 0.77 x 11.88 x 22.97 x 0.55 x 0.7 = 35.76 (81) Northwest0.9x 0.77 x 11.88 x 41.38 x 0.55 x 0.7 = 131.16 (81) Northwest0.9x 0.77 x 11.88 x 91.35 x 0.55 <td< td=""><td><u> </u></td><td>0.77</td><td>X</td><td>4.65</td><td>X</td><td>113.91</td><td>]</td><td>0.55</td><td>X</td><td>0.7</td><td>=</td><td>141.32</td><td>(79)</td></td<>	<u> </u>	0.77	X	4.65	X	113.91]	0.55	X	0.7	=	141.32	(79)
Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 (79) Northwest 0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 35.76 (81) Northwest 0.9x 0.77 x 11.88 x 41.38 x 0.55 x 0.7 = 72.8 (81) Northwest 0.9x 0.77 x 11.88 x 67.96 x 0.55 x 0.7 = 131.16 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 215.4 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x <	<u> </u>	0.77	X	4.65	X	104.39		0.55	X	0.7	=	129.51	(79)
Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 (79) Northwest 0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 35.76 (81) Northwest 0.9x 0.77 x 11.88 x 22.97 x 0.55 x 0.7 = 72.8 (81) Northwest 0.9x 0.77 x 11.88 x 41.38 x 0.55 x 0.7 = 131.16 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 215.4 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 289.53 (81) Northwest 0.9x 0.77 x 11.88 x 97.38	<u>L</u>	0.77	X	4.65	X	92.85		0.55	X	0.7	=	115.2	(79)
Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 (79) Northwest 0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 35.76 (81) Northwest 0.9x 0.77 x 11.88 x 41.38 x 0.55 x 0.7 = 72.8 (81) Northwest 0.9x 0.77 x 11.88 x 67.96 x 0.55 x 0.7 = 131.16 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 215.4 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 289.53 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 =	<u> </u>	0.77	X	4.65	X	69.27]	0.55	X	0.7	=	85.94	(79)
Northwest 0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 35.76 (81) Northwest 0.9x 0.77 x 11.88 x 22.97 x 0.55 x 0.7 = 72.8 (81) Northwest 0.9x 0.77 x 11.88 x 41.38 x 0.55 x 0.7 = 131.16 (81) Northwest 0.9x 0.77 x 11.88 x 67.96 x 0.55 x 0.7 = 215.4 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 289.53 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 288.76 (81) Northwest 0.9x 0.77 x 11.88 x 72.63 x 0.55 x 0.7	<u> </u>	0.77	X	4.65	X	44.07]	0.55	X	0.7	=	54.68	(79)
Northwest 0.9x	<u>L</u>	0.77	X	4.65	X	31.49		0.55	X	0.7	=	39.07	(79)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	11.88	x	11.28	X	0.55	X	0.7	=	35.76	(81)
Northwest 0.9x	Northwest 0.9x	0.77	X	11.88	X	22.97	X	0.55	X	0.7	=	72.8	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	11.88	X	41.38	x	0.55	X	0.7	=	131.16	(81)
Northwest 0.9x	Northwest 0.9x	0.77	X	11.88	X	67.96	x	0.55	X	0.7	=	215.4	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	11.88	X	91.35	X	0.55	X	0.7	=	289.53	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	11.88	×	97.38	x	0.55	X	0.7	=	308.67	(81)
Northwest 0.9x 0.77 x 11.88 x 50.42 x 0.55 x 0.7 = 159.82 (81)	Northwest _{0.9x}	0.77	X	11.88	×	91.1	X	0.55	X	0.7	=	288.76	(81)
	Northwest _{0.9x}	0.77	x	11.88	x	72.63	x	0.55	x	0.7	=	230.2	(81)
Northwest $0.9x$ 0.77 x 11.88 x 28.07 x 0.55 x 0.7 = 88.96 (81)	Northwest 0.9x	0.77	×	11.88	x	50.42	x	0.55	x	0.7	=	159.82	(81)
	Northwest 0.9x	0.77	X	11.88	×	28.07	×	0.55	X	0.7	=	88.96	(81)

Northw	vest _{0.9x}	0.77	x	11.	00	x		14.2	l x 厂	0.55	□ x [0.7		45	(81)
	vest _{0.9x} [_		╎╶╞		≓		 		= `
NOLLIN	vest 0.9x	0.77	X	11.	88	X		9.21	X	0.55	X	0.7	=	29.21	(81)
	gains in		alculated	934.71		$\overline{}$	105.04		(83)m = 944.19	Sum(74)m	' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' 	200	200.00	1	(83)
(83)m=		475.85			1114.12		135.61	1082.55	944.18	777.29	537.76	326	228.82	J	(63)
•	gains – ir			<u> </u>	`	·					T	T		1	(0.4)
(84)m=	679.24	883.31	1087.82	1303.77	1458.94	1.	457.1	1389.33	1257.7	7 1103.42	887.87	703.29	626.35]	(84)
7. Me	ean inter	nal temp	perature	(heating	season	1)									
Tem	perature	during h	neating p	eriods ir	n the livi	ng	area	from Tab	ole 9, T	h1 (°C)				21	(85)
Utilis	ation fac	tor for g	ains for l	iving are	ea, h1,m	า (ร	ee Ta	ıble 9a)							
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(86)m=	0.99	0.98	0.94	0.82	0.63		0.44	0.32	0.37	0.62	0.9	0.99	1	1	(86)
, ,					T	<u></u>				<u> </u>			<u> </u>	ı	
	n interna		1		· `	1		i		<u> </u>	T	T	l	1	(07)
(87)m=	19.85	20.12	20.46	20.8	20.95	2	20.99	21	21	20.97	20.71	20.2	19.8]	(87)
Tem	perature	during h	neating p	eriods ir	n rest of	dw	elling	from Ta	ıble 9,	Th2 (°C)					
(88)m=	19.92	19.93	19.93	19.94	19.94	1	19.96	19.96	19.96	19.95	19.94	19.94	19.93		(88)
l Itilie	ation fac	tor for a	aine for i	rest of d	welling	h2	m (se	a Tahla	02)				•		
(89)m=		0.97	0.92	0.77	0.57	_	0.37	0.25	0.29	0.53	0.87	0.98	0.99		(89)
(09)111=	0.99	0.97	0.92	0.77	0.57	L'	0.57	0.23	0.29	0.55	0.07	0.90	0.95	ı,	(00)
Me <mark>a</mark> ı		temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	ps 3 to	7 in Tab	le 9 <mark>c)</mark>			,	
(90)m=	1 <mark>8.41</mark>	18.8	19.29	19.73	19.9	1	19.95	19.95	19.96	19.93	19.63	18.93	18.35		(90)
											fLA = Livir	ng area ÷ (4	4) =	0.4	(91)
Mear	n internal	l temper	ature (fo	r the wh	ole dwe	llin	a) = f	I A × T1	+ (1 –	fLA) × T2					
(92)m=		19.32	19.75	20.15	20.32	_	20.36	20.37	20.37	20.34	20.06	19.43	18.92	1	(92)
` ′						_				nere appr		10110		J	. ,
(93)m=		19.17	19.6	20	20.17	_	20.21	20.22	20.22	20.19	19.91	19.28	18.77	1	(93)
	pace hea				20.17			20.22	20:22	20.10	10:01	10.20	10.17		(3.5)
				mperatu	re obtair	200	latet	an 11 of	Table	9b, so tha	at Ti m-/	76)m an	d re calc	culato	
	itilisation					ieu	al Si	ер птог	lable	9D, SO 1112	11,111-	(10)III aII	u re-car	Julate	
	Jan	Feb	Mar	Apr	May	Г	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Utilis	ation fac		<u> </u>		1	_		00.	7 10 2	1 000		1		1	
(94)m=		0.97	0.91	0.78	0.58		0.39	0.27	0.31	0.55	0.86	0.98	0.99	1	(94)
	ul gains,				L 4)m	<u> </u>				-				1	
(95)m=	_	855.16	992.36	1013.26	848.17	5	70.97	369.75	388.86	609.71	767.7	685.74	621.68	1	(95)
	thly avera									1	1	1		J	` '
(96)m=	_	4.9	6.5	8.9	11.7	$\overline{}$	14.6	16.6	16.4	14.1	10.6	7.1	4.2	1	(96)
											ļ	7.1	٦.٢	J	(00)
			1380.07		877.88	_	74.28	370.11	389.6	n- (96)m 626.39	965.04	1270.07	1526.93	1	(97)
(97)m=			ļ								ļ	Į	1520.93]	(31)
•		•	1	1	I	vvn T				7)m – (95	í - `	Τ΄	070.54	1	
(98)m=	644.53	438.35	288.46	101.24	22.11	L	0	0	0	0	146.82	420.71	673.51	<u> </u>	—
									To	tal per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	2735.72	(98)
Spac	e heatin	g require	ement in	kWh/m²	²/year									30.91	(99)
9a Fr	nerav rec	ıuiremer	nts – Indi	vidual h	eating s	vst	ems i	ncludina	micro	·CHP)					
9a. Energy requirements – Individual heating systems including micro-CHP) Space heating:															
-	tion of sp	_	at from so	econdar	v/supnle	eme	entarv	system						0	(201)
	o. op	5.00 1100	5.11 5		,		y	-, 5.5						<u> </u>	(=0.)

								_
Fraction of space heat from main system(s)		(202) = 1	- (201) =				1	(202)
Fraction of total heating from main system 1		(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1							90.4	(206)
Efficiency of secondary/supplementary heating s	system, %						0	(208)
Jan Feb Mar Apr May	Jun Ju	I Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)				440.00	100 74	1 070 54		
644.53 438.35 288.46 101.24 22.11	0 0	0	0	146.82	420.71	673.51		(0.4.4)
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $	0 0	0	0	162.41	465.39	745.03		(211)
712.50 404.5 010.00 111.50 24.40	<u> </u>			ar) =Sum(2			3026.24	(211)
Space heating fuel (secondary), kWh/month					10, 10	-		`
= {[(98)m x (201)]} x 100 ÷ (208)								
(215)m= 0 0 0 0 0	0 0	0	0	0	0	0		_
		Tota	l (kWh/yea	ar) =Sum(2	215) _{15,101}	=	0	(215)
Water heating								
Output from water heater (calculated above) 207.66 183.08 191.35 169.72 164.32 14	44.72 138.	66 154.57	156.28	177.95	189.06	202.71		
Efficiency of water heater	I		I.		l		80.3	(216)
(217)m= 87.71 87.17 86.08 83.8 81.38	80.3 80.3	80.3	80.3	84.57	87.01	87.84		(217)
Fuel for water heating, kWh/month								
(219) m = (64) m x $100 \div (217)$ m (219)m = 236.75 210.02 222.29 202.54 201.92 11	80.23 172.	67 192.49	194.62	210.42	217.29	230.77		
		01 102.70	104.02		211.20			
			I = Sum(2		217.29		2472.01	(219)
Annual totals				19a) ₁₁₂ =	Wh/yea		2 <mark>472.01</mark> kWh/year	
Annual totals Space heating fuel used, main system 1				19a) ₁₁₂ =				
				19a) ₁₁₂ =			kWh/year	
Space heating fuel used, main system 1				19a) ₁₁₂ =			kWh/year 3026.24	
Space heating fuel used, main system 1 Water heating fuel used		Tota	I = Sum(2	19a) ₁₁₂ =			kWh/year 3026.24	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot		Tota	I = Sum(2	19a) ₁₁₂ =		,	kWh/year 3026.24	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or positive system 1		Total	I = Sum(2	19a) ₁₁₂ =	Wh/yea	182.2	kWh/year 3026.24	(230a)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or posicentral heating pump:		Total	I = Sum(2	19a) ₁₁₂ = k ¹	Wh/yea	182.2	kWh/year 30 <mark>26.24</mark> 2472.01	(230a) (230c)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or post central heating pump: Total electricity for the above, kWh/year	itive input f	rom outside	e of (230a).	19a) ₁₁₂ = k ¹	Wh/yea	182.2	2472.01	(230a) (230c) (231)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or post central heating pump: Total electricity for the above, kWh/year Electricity for lighting	itive input f	rom outside sum	e of (230a).	19a) ₁₁₂ = k \footnote{1} \ldots (230g) =	Wh/yea	182.2	212.2 372.02	(230a) (230c) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or post central heating pump: Total electricity for the above, kWh/year Electricity for lighting	itive input f	rom outside sum	e of (230a).	19a) ₁₁₂ = k \footnote{1} \ldots (230g) =	Wh/yea	182.2	2472.01	(230a) (230c) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or post central heating pump: Total electricity for the above, kWh/year Electricity for lighting	itive input f	rom outside sum	e of (230a).	19a) ₁₂ = k¹(230g) =	ion fac	182.2	212.2 372.02	(230a) (230c) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems	s including Energy kWh/ye	rom outside sum	e of (230a).	(230g) = Emiss kg CO	ion fac 2/kWh	182.2 30	212.2 372.02 Emissions kg CO2/year	(230a) (230c) (231) (232) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems Space heating (main system 1)	s including Energy kWh/ye (211) x	rom outside sum	e of (230a).	(230g) = Emiss kg CO: 0.2	ion fac 2/kWh	182.2 30	212.2 372.02 Emissions kg CO2/yes	(230a) (230c) (231) (232) (232) (261) (263)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary) Water heating	s including Energy kWh/ye (211) x (215) x (219) x	rom outside sum	e of (230a).	(230g) = Emiss kg CO:	ion fac 2/kWh	182.2 30	212.2 372.02 Emissions kg CO2/yes 653.67 0 533.95	(230a) (230c) (231) (232) (261) (263) (264)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or post central heating pump: Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	s including Energy kWh/ye (211) x (215) x (219) x (261) + (261)	rom outside sum	e of (230a).	19a) ₁₁₂ = k¹(230g) = Emiss kg CO: 0.2 0.5	ion fac 2/kWh	182.2 30	kWh/year 3026.24 2472.01 212.2 372.02 Emissions kg CO2/year 653.67 0 533.95 1187.62	(230a) (230c) (231) (232) (261) (263) (264) (265)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating systems Space heating (main system 1) Space heating (secondary) Water heating	s including Energy kWh/ye (211) x (215) x (219) x	rom outside sum	e of (230a).	(230g) = Emiss kg CO: 0.2	ion fac 2/kWh 16 19	182.2 30	212.2 372.02 Emissions kg CO2/yes 653.67 0 533.95	(230a) (230c) (231) (232) (261) (263) (264)

Total CO2, kg/year

Dwelling CO2 Emission Rate

El rating (section 14)

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

 $(272) \div (4) =$

1490.83 (272)

16.85 (273)

85 (274)

eight associates

Appendix Energy Assessment Barrie House

GREEN Scenario

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.4.16 Property Address: Flat 01 Address: 1. Overall dwelling dimensions Area(m²) Av. Height(m) Volume(m³) **Basement** 64.54 (1a) x 2.7 (2a) =174.26 (3a) Ground floor (1b) x (2b) (3b) 32 28 3.27 105.56 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)96 82 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 279.82 2. Ventilation rate: main secondary other total m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c)0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 1 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.15 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4.9

4.4

5

3.8

4.3

3.8

3.7

4

4.3

4.5

4.7

(22)m=

5.1

Wind Factor (22a)n	`		4.00					1 4 00		T 4.40	1	
(22a)m= 1.27 1.2	5 1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	
Adjusted infiltration	rate (allowi	ing for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.19 0.1		0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18]	
Calculate effective If mechanical ver	•	rate for ti	ne appli	cable ca	se						0.5	(23a)
If exhaust air heat pu		endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othei	wise (23b) = (23a)			0.5	
If balanced with heat		•	, ,	,		,,	,	, , ,			73.9	
a) If balanced me	echanical ve	entilation	with hea	at recove	erv (MVI	HR) (24a	ı)m = (2	2b)m + (23b) × I	1 – (23c)		(200)
(24a)m= 0.32 0.3		0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31]	(24a)
b) If balanced me	echanical ve	entilation	without	heat rec	covery (N	иV) (24b)m = (2:	2b)m + (2	23b)		1	
(24b)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole house	extract ver	ntilation o	r positiv	e input v	ventilatio	n from c	utside				•	
if (22b)m < 0	.5 × (23b), 1	then (24c	;) = (23b); other	wise (24	c) = (22b) m + 0	.5 × (23b)	_	-	
(24c)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural venti if (22b)m = 1			•	•				0.5]				
(24d)m= 0 0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air char	ige rate - er	nter (24a)	or (24b	o) or (24	c) or (2 <mark>4</mark>	d) in box	(25)					
(25)m= 0.32 0.3	2 0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(25)
3. Heat losses and	heat loss	paramete						_			_	
	t heat loss p Gross rea (m²)	oaramete Opening m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	〈)	k-value	-	A X k kJ/K
ELEMENT	Gross	Opening	gs		m²		K		<)		-	
ELEMENT G	Gross	Opening	gs	A ,r	m² x1.	W/m2	K 0.04] =	(W/I	<) 		-	kJ/K
ELEMENT of all Windows Type 1	Gross	Opening	gs	A ,r	m² x1.	W/m2 /[1/(1.2)+	(K) 0.04] = 0.04] =	(W/F	<) 		-	kJ/K (27)
Windows Type 1 Windows Type 2	Gross	Opening	gs	A ,r	x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+	(No.04] = 0.04] = 0.04] =	8.2 1.15	<) 		-	kJ/K (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3	Gross	Opening	gs	A ,r 7.16 1 2.3	x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	(No.04] = 0.04] = 0.04] =	8.2 1.15 2.63			-	kJ/K (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor	Gross	Opening	gs	A ,r 7.16 1 2.3 9.45	x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] =	(W/H 8.2 1.15 2.63 10.82			-	kJ/K (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1	Pross rea (m²)	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/k 8.2 1.15 2.63 10.82 6.4539			-	kJ/K (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2	Pross rea (m²)	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 	(C) (C) (C) (C) (C) (C) (C) (C) (C) (C)	(W/k 8.2 1.15 2.63 10.82 6.4539 3.77			-	kJ/K (27) (27) (27) (27) (28)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3	23.54 54.89	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/N 8.2 1.15 2.63 10.82 6.4539 3.77 5.6			-	kJ/K (27) (27) (27) (27) (28) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3	23.54 24.89 23.95	0 19.91	gs 2	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	(W/N 8.2 1.15 2.63 10.82 6.4539 3.77 5.6 4.98			-	kJ/K (27) (27) (27) (27) (28) (29) (29)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of element	23.54 24.89 31.15 33.95 ents, m ² vindows, use e	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15 208.0 alue calcula	x1. x1. x1. y2. x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	8.2 1.15 2.63 10.82 6.4539 3.77 5.6 4.98		kJ/m²-	K C	kJ/K (27) (27) (27) (27) (28) (29) (29) (29) (30)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of elements	23.54 54.89 31.15 33.95 ents, m² vindows, use eleptoth sides of in	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15 208.0 alue calcula	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	(Control of the contr	8.2 1.15 2.63 10.82 6.4539 3.77 5.6 4.98		kJ/m²-	K C	kJ/K (27) (27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of elements of windows and roof windows and roof with include the areas on the same and the sam	23.54 23.54 54.89 31.15 33.95 ents, m² vindows, use e coth sides of in	Opening m	gs 2	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15 208.0 alue calcula	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.16 0.12	(K 0.04] = 0.0	8.2 1.15 2.63 10.82 6.4539 3.77 5.6 4.98	as given in	kJ/m²·	h 3.2	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Floor Walls Type1 Walls Type2 Walls Type3 Roof Total area of elements of the windows and roof with include the areas on the Fabric heat loss, Windows Type 1	23.54 54.89 31.15 33.95 ents, m ² vindows, use elepoth sides of in VK = S (A x k)	Opening m	gs 2 andow U-va s and part	A ,r 7.16 1 2.3 9.45 64.53 23.54 34.98 31.15 33.95 208.0 alue calculatitions	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.16 0.12	(28).	(W/k 8.2 1.15 2.63 10.82 6.4539 3.77 5.6 4.98 4.07	as given in (32a)	kJ/m²·	n 3.2	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31) (33) 3.3 (34)

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

12.29

(36)

	eat loss							(33) +	(36) =			59.96	(3
entilation he	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 29.69	29.34	28.99	27.26	26.92	25.19	25.19	24.84	25.88	26.92	27.61	28.3		(38
eat transfer	coefficier	nt, W/K						(39)m	= (37) + (38)m			
9)m= 89.65	89.3	88.95	87.22	86.88	85.14	85.14	84.8	85.84	86.88	87.57	88.26		
		\							•	Sum(39) ₁ .	12 /12=	87.14	(3
eat loss par	- 				0.00	0.00			= (39)m ÷	·			
0.93	0.92	0.92	0.9	0.9	0.88	0.88	0.88	0.89	0.9	0.9	0.91	0.0	(4
umber of da	ays in mor	nth (Tabi	le 1a)					,	Average =	Sum(40) ₁ .	12 / 1 Z=	0.9	(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
. Water hea	ating ener	rgy requi	rement:								kWh/ye	ear:	
oumad aac	unanay l	N I									1		
ssumed occ if TFA > 13			[1 - exp	(-0.0003	49 x (TF	A -13.9)2)1 + 0.0)013 x (ΓFA -13.		71		(4
if TFA £ 13				())	,		/,]	,		-,			
nnual avera											.52		(4
edu <mark>ce the</mark> annu t more that 12	_					-	o acnieve	a water us	se target o	ľ			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage			<u> </u>	,				Sep	Oct	INOV	Dec		
4)m= 108.37	104.43	100.49	96.55	92.61	88.67	88.67	92.61	96.55	100.49	104.43	108.37		
,,,		/ 100110		0=101						m(44) ₁₁₂ =		1182.2	(4
nergy content o	of hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600				L		
5)m= 160.71	140.56	145.04	126.45	121.33	104.7	97.02	111.33	112.66	131.3	143.32	155.64		
									Γotal = Su	m(45) ₁₁₂ =	=	1550.06	(4
		ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,	to (61)			_		
nstantaneous	water heatii		07 000 (770										
S)m= 24.11	21.08	21.76	18.97	18.2	15.71	14.55	16.7	16.9	19.69	21.5	23.35		(4
S)m= 24.11 ater storage	21.08 e loss:	21.76	18.97	18.2			<u> </u>				<u> </u>		
3)m= 24.11 ater storage orage volur	21.08 e loss: me (litres)	21.76 includin	18.97 ng any so	18.2 Dlar or W	WHRS	storage	within sa				23.35		
ater storage orage volur community	21.08 e loss: me (litres) heating a	21.76) includin	18.97 g any so nk in dw	18.2 Dlar or W	/WHRS nter 110	storage litres in	within sa	ıme ves	sel		<u> </u>		
ater storage orage volur community cherwise if r	21.08 e loss: me (litres) heating a no stored	21.76) includin	18.97 g any so nk in dw	18.2 Dlar or W	/WHRS nter 110	storage litres in	within sa	ıme ves	sel		<u> </u>		
nstantaneous 6)m= 24.11 ater storage orage volur community therwise if r ater storage) If manufac	21.08 e loss: me (litres) heating a no stored e loss:	21.76 including and no ta hot water	18.97 Ig any so In dw In this in	18.2 Dlar or W relling, e	/WHRS nter 110 nstantar	storage litres in neous co	within sa	ıme ves	sel	47)	<u> </u>		(4
ater storage orage volur community herwise if r ater storage	21.08 e loss: me (litres) heating a no stored e loss: cturer's de	21.76 including and no tath hot water	18.97 ng any so nk in dw er (this in	18.2 Dlar or W relling, e	/WHRS nter 110 nstantar	storage litres in neous co	within sa	ıme ves	sel	47)	0		(4
ater storage orage volur community therwise if r	21.08 e loss: me (litres) heating a no stored e loss: cturer's de	21.76 including and no tale hot water eclared loans Table	18.97 Ig any so Ik in dw Ir (this in Ir coss factor Ir 2b	18.2 plar or W relling, e ocludes in	/WHRS nter 110 nstantar	storage litres in neous co n/day):	within sa	ame vess	sel	47)	0		(4
ater storage volur community therwise if rater storage of the manuface of the	21.08 e loss: me (litres) heating a no stored e loss: cturer's de factor fro com water cturer's de	21.76 including and no tath hot water eclared to make the storage eclared to the storage ec	18.97 ng any so nk in dw er (this in oss facto 2b , kWh/ye	18.2 Dlar or Warelling, ear oss factors	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) ombi boil	ame vess	sel	47)	0 0		(4 (4 (4 (5
ater storage volur community therwise if rater storage of manuface emperature nergy lost from the water storage of water stor	21.08 e loss: me (litres) heating a no stored e loss: cturer's de factor fro rom water cturer's de	21.76 including and no tale hot water the clared learning attention to the color of the color o	18.97 Ig any so nk in dw r (this in oss facto 2b , kWh/ye cylinder loom Tabl	18.2 Dlar or Warelling, ear oss factors	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) ombi boil	ame vess	sel	47)	0 0		(4
ater storage volur community therwise if rater storage of manufacture mergy lost from the storage of water s	21.08 e loss: me (litres) heating a no stored e loss: cturer's de factor fro rom water cturer's de prage loss heating s	21.76 including and no tale hot water eclared learning astorage eclared of factor fraces sections.	18.97 Ig any so nk in dw r (this in oss facto 2b , kWh/ye cylinder loom Tabl	18.2 Dlar or Warelling, ear oss factors	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) ombi boil	ame vess	sel	47)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4 (4 (4 (5 (5
ater storage volur community therwise if rater storage of manuface mergy lost from the storage of water stor	21.08 e loss: me (litres) heating a no stored e loss: cturer's de factor fro rom water cturer's de rage loss heating s r from Tal	21.76 including and no tale hot water eclared learning storage eclared of factor from the eclared to factor from the eclared of the eclared	18.97 Ing any so the ser (this in the s	18.2 Dlar or Warelling, eacludes in the control of	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) ombi boil	ame vess	sel	47)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4) (4) (5) (5) (5)
ater storage volur community therwise if rater storage of the manuface of the	21.08 e loss: me (litres) heating a no stored e loss: cturer's de factor fro rom water cturer's de rage loss heating s r from Tal factor fro	21.76 including and no tale hot water eclared learning storage eclared of factor from the eclared of	18.97 ng any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl on 4.3	olar or Welling, encludes in the second of t	/WHRS nter 110 nstantar wn (kWh	storage litres in neous co n/day): known:	within sa (47) ombi boil	ers) ente	sel er 'O' in (47)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(4)

Water storage loss of	alculated	for each	month			((56)m = (55) × (41)	m				
(56)m= 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedica	ted solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss (annual) fro	om Table	e 3							0		(58)
Primary circuit loss of	alculated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified by factor	from Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculate	d for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 50.96 46.03	50.96	47.61	47.19	43.73	45.18	47.19	47.61	50.96	49.32	50.96		(61)
Total heat required for	or water h	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 211.67 186.5	3 196	174.06	168.52	148.43	142.2	158.52	160.27	182.26	192.64	206.6		(62)
Solar DHW input calculate	ed 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 water he	eater											
(64)m= 211.67 186.5	3 196	174.06	168.52	148.43	142.2	158.52	160.27	182.26	192.64	206.6		
						Outp	out from wa	ater heate	r (annual) ₁	12	2127.75	(64)
Heat gains from water	er heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m] + 0.8 x	د [(4 <mark>6)</mark> m	+ (57)m	+ (59)m	1	
(65)m= 66.18 58.24	60.97	53.95	52.14	45.74	43.55	48.82	49.36	56.4	59.98	64.49		(65)
			02		40.00	40.02	49.30	30.4	39.90	04.49		(00)
in <mark>clude</mark> (57)m in ca	alculation										l leating	(00)
include (57)m in ca		of (65)m	only if c								eating	(66)
	ee Table s	of (65)m 5 and 5a	only if c								eating	(66)
5. Internal gains (s	ee Table s	of (65)m 5 and 5a	only if c								eating	(66)
5. Internal gains (s Metabolic gains (Tab	ee Table sole 5), Wat	of (65)m 5 and 5a tts	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	rom com	munity h	eating	(66)
5. Internal gains (s Metabolic gains (Tab	Mar 135.4	of (65)m 5 and 5a tts Apr 135.4	only if control is the control of th	Jun 135.4	Jul 135.4	Aug 135.4	Sep	ater is fr	om com	munity h	peating	
5. Internal gains (s Metabolic gains (Tab Jan Feb (66)m= 135.4 135.4	Mar 135.4 lated in A	of (65)m 5 and 5a tts Apr 135.4	only if control is the control of th	Jun 135.4	Jul 135.4	Aug 135.4	Sep	ater is fr	om com	munity h	eating	
5. Internal gains (s Metabolic gains (Tab Jan Fet (66)m= 135.4 135.4 Lighting gains (calculate)	Mar 135.4 lated in A	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29	only if co): May 135.4 L, equat	Jun 135.4 ion L9 or	Jul 135.4 r L9a), a	Aug 135.4 Iso see	Sep 135.4 Table 5	Oct 135.4	Nov	Dec	peating	(66)
5. Internal gains (s Metabolic gains (Tat Jan Fet (66)m= 135.4 135.4 Lighting gains (calcumus) (67)m= 22.48 19.97	Mar 135.4 lated in A 16.24	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append	only if co): May 135.4 L, equat	Jun 135.4 ion L9 or	Jul 135.4 r L9a), a	Aug 135.4 Iso see	Sep 135.4 Table 5	Oct 135.4	Nov	Dec	leating	(66)
5. Internal gains (s Metabolic gains (Tak Jan Fek (66)m= 135.4 135.4 Lighting gains (calcumus) (67)m= 22.48 19.97 Appliances gains (calcumus)	Mar 135.4 lated in A 16.24 lculated ir	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15	only if co): May 135.4 L, equat 9.19 dix L, eq 215.5	Jun 135.4 ion L9 or 7.76 uation L	Jul 135.4 r L9a), a 8.38 13 or L1 187.84	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 see Ta	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4	peating	(66) (67)
5. Internal gains (s Metabolic gains (Tab Jan Fet (66)m= 135.4 135.4 Lighting gains (calcul (67)m= 22.48 19.97 Appliances gains (calcul (68)m= 251.08 253.6	Mar 135.4 lated in A 16.24 lculated in A 247.12	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15	only if co): May 135.4 L, equat 9.19 dix L, eq 215.5	Jun 135.4 ion L9 or 7.76 uation L	Jul 135.4 r L9a), a 8.38 13 or L1 187.84	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 see Ta	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4	peating	(66) (67)
5. Internal gains (s Metabolic gains (Tat Jan Fet (66)m= 135.4 135.4 Lighting gains (calcumus) (67)m= 22.48 19.97 Appliances gains (calcumus) (68)m= 251.08 253.6 Cooking gains (calcumus)	Mar 135.4 lated in A 16.24 lculated in 9 247.12 lated in A 36.54	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54	only if construction only in construction only in construction only in c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a)	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 See Ta 191.8	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4 23.11	leating	(66) (67) (68)
5. Internal gains (s Metabolic gains (Tak Jan Fek (66)m= 135.4 135.4 Lighting gains (calcumos) (67)m= 22.48 19.97 Appliances gains (canon) (68)m= 251.08 253.6 Cooking gains (calcumos) (69)m= 36.54 36.54	Mar 135.4 lated in A 16.24 lculated in 9 247.12 lated in A 36.54	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54	only if construction only in construction only in construction only in c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a)	Aug 135.4 Iso see 10.9 3a), also 185.23	Sep 135.4 Table 5 14.63 See Ta 191.8	Oct 135.4 18.57 ble 5 205.78	Nov 135.4 21.68	Dec 135.4 23.11	peating	(66) (67) (68)
5. Internal gains (s Metabolic gains (Tat Jan Fet (66)m= 135.4 135.4 Lighting gains (calcul (67)m= 22.48 19.97 Appliances gains (calcul (68)m= 251.08 253.6 Cooking gains (calcul (69)m= 36.54 36.54 Pumps and fans gain	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 ns (Table s	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15 ppendix 36.54 5a) 3	only if only i	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42	Dec 135.4 23.11 240.01 36.54	leating	(66) (67) (68) (69)
5. Internal gains (s Metabolic gains (Tat Jan Fet (66)m= 135.4 135.4 Lighting gains (calcument (67)m= 22.48 19.97) Appliances gains (calcument (68)m= 251.08 253.6) Cooking gains (calcument (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 as (Table s 3	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54 5a) 3 tive valu	only if only i	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42	Dec 135.4 23.11 240.01 36.54	leating	(66) (67) (68) (69)
5. Internal gains (s Metabolic gains (Tak Jan Fek (66)m= 135.4 135.4 Lighting gains (calcul (67)m= 22.48 19.97 Appliances gains (calcul (68)m= 251.08 253.6 Cooking gains (calcul (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3 Losses e.g. evapora	Mar 135.4 lated in A 16.24 lculated ir A 247.12 lated in A 36.54 as (Table s 3 cion (nega 2 -108.32	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54 5a) 3 tive valu	only if construction only if c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42 36.54	Dec 135.4 23.11 240.01 36.54	peating	(66) (67) (68) (69) (70)
5. Internal gains (s Metabolic gains (Tak Jan Fet Jan Fet (66)m= 135.4 135.4 Lighting gains (calcul (67)m= 22.48 19.97 Appliances gains (calcul (68)m= 251.08 253.6 Cooking gains (calcul (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3 Losses e.g. evapora (71)m= -108.32 -108.3	Mar 135.4 lated in A 16.24 lculated in A 36.54 ls (Table 5) 3 lcion (nega 2 -108.32	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 n Append 233.15 ppendix 36.54 5a) 3 tive valu	only if construction only if c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 5 36.54	Nov 135.4 21.68 223.42 36.54	Dec 135.4 23.11 240.01 36.54	leating	(66) (67) (68) (69) (70)
5. Internal gains (s Metabolic gains (Tak Jan Fek (66)m= 135.4 135.4 Lighting gains (calcu (67)m= 22.48 19.97 Appliances gains (ca (68)m= 251.08 253.6 Cooking gains (calcu (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3 Losses e.g. evapora (71)m= -108.32 -108.3 Water heating gains	Mar	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15 ppendix 36.54 5a) 3 tive valu -108.32	only if construction only if c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54 3 ole 5) -108.32	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 9 see Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 3 -108.32	Nov 135.4 21.68 223.42 36.54 3	Dec 135.4 23.11 240.01 36.54 3	leating	(66) (67) (68) (69) (70)
5. Internal gains (s Metabolic gains (Tak Jan Fek (66)m= 135.4 135.4 Lighting gains (calcul (67)m= 22.48 19.97 Appliances gains (calcul (68)m= 251.08 253.6 Cooking gains (calcul (69)m= 36.54 36.54 Pumps and fans gain (70)m= 3 3 Losses e.g. evapora (71)m= -108.32 -108.3 Water heating gains (72)m= 88.94 86.67	Mar 135.4 lated in A 16.24 lculated ir A 36.54 ls (Table s 3 lcion (nega 2 -108.32 (Table 5) 81.94	of (65)m 5 and 5a tts Apr 135.4 ppendix 12.29 Appendix 233.15 ppendix 36.54 5a) 3 tive valu -108.32	only if construction only if c	Jun 135.4 ion L9 or 7.76 uation L 198.92 tion L15 36.54 3 ole 5) -108.32	Jul 135.4 r L9a), a 8.38 13 or L1 187.84 or L15a) 36.54	Aug 135.4 Iso see 10.9 3a), also 185.23), also se 36.54	Sep 135.4 Table 5 14.63 See Ta 191.8 ee Table 36.54	Oct 135.4 18.57 ble 5 205.78 3 -108.32	Nov 135.4 21.68 223.42 36.54 3	Dec 135.4 23.11 240.01 36.54 3	leating	(66) (67) (68) (69) (70)

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

Orientation: Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x} 0.77	x	2.3	x	11.28	X	0.55	x	0.7	=	6.92	(75)
Northeast _{0.9x} 0.77	X	2.3	X	22.97	X	0.55	X	0.7	=	14.09	(75)
Northeast 0.9x 0.77	X	2.3	x	41.38	X	0.55	X	0.7	=	25.39	(75)
Northeast _{0.9x} 0.77	x	2.3	x	67.96	x	0.55	x	0.7	=	41.7	(75)
Northeast _{0.9x} 0.77	x	2.3	x	91.35	x	0.55	x	0.7	=	56.05	(75)
Northeast 0.9x 0.77	X	2.3	x	97.38	x	0.55	x	0.7	=	59.76	(75)
Northeast _{0.9x} 0.77	X	2.3	x	91.1	X	0.55	x	0.7	=	55.9	(75)
Northeast _{0.9x} 0.77	X	2.3	x	72.63	X	0.55	X	0.7	=	44.57	(75)
Northeast _{0.9x} 0.77	X	2.3	x	50.42	X	0.55	x	0.7	=	30.94	(75)
Northeast _{0.9x} 0.77	X	2.3	X	28.07	X	0.55	X	0.7	=	17.22	(75)
Northeast _{0.9x} 0.77	X	2.3	X	14.2	X	0.55	X	0.7	=	8.71	(75)
Northeast _{0.9x} 0.77	x	2.3	x	9.21	X	0.55	x	0.7	=	5.65	(75)
Northwest 0.9x 0.77	X	7.16	X	11.28	X	0.55	X	0.7	=	21.55	(81)
Northwest 0.9x 0.77	X	1	X	11.28	X	0.55	X	0.7	=	3.01	(81)
Northwest 0.9x 0.77	x	9.45	x	11.28	X	0.55	x	0.7	=	28.45	(81)
Northwest 0.9x 0.77	X	7.16	X	22.97	Х	0.55	X	0.7	-	43.87	(81)
Northwest 0.9x 0.77	x	1	х	22.97	х	0.55	X	0.7	=	6.13	(81)
Northwest _{0.9x} 0.77	x	9.45	x	22.97	×	0.55	x	0.7	=	57.91	(81)
Northwest 0.9x 0.77	x	7.16	х	41.38	x	0.55	x	0.7	=	79.05	(81)
Northwest 0.9x 0.77	x	1	х	41.38	×	0.55	x	0.7	=	11.04	(81)
Northwest 0.9x 0.77	x	9.45	х	41.38	х	0.55	x	0.7	=	104.33	(81)
Northwest 0.9x 0.77	X	7.16	х	67.96	X	0.55	x	0.7	=	129.82	(81)
Northwest 0.9x 0.77	X	1	X	67.96	x	0.55	X	0.7	=	18.13	(81)
Northwest 0.9x 0.77	X	9.45	X	67.96	X	0.55	X	0.7	=	171.34	(81)
Northwest 0.9x 0.77	X	7.16	x	91.35	x	0.55	X	0.7	=	174.5	(81)
Northwest 0.9x 0.77	x	1	x	91.35	x	0.55	x	0.7	=	24.37	(81)
Northwest 0.9x 0.77	X	9.45	x	91.35	x	0.55	X	0.7	=	230.31	(81)
Northwest 0.9x 0.77	X	7.16	X	97.38	x	0.55	x	0.7	=	186.04	(81)
Northwest 0.9x 0.77	X	1	X	97.38	X	0.55	x	0.7	=	25.98	(81)
Northwest 0.9x 0.77	X	9.45	X	97.38	X	0.55	X	0.7	=	245.54	(81)
Northwest 0.9x 0.77	X	7.16	X	91.1	X	0.55	x	0.7	=	174.03	(81)
Northwest 0.9x 0.77	X	1	X	91.1	X	0.55	x	0.7	=	24.31	(81)
Northwest 0.9x 0.77	X	9.45	X	91.1	X	0.55	X	0.7	=	229.69	(81)
Northwest 0.9x 0.77	x	7.16	X	72.63	X	0.55	x	0.7	=	138.74	(81)
Northwest 0.9x 0.77	X	1	x	72.63	x	0.55	X	0.7	=	19.38	(81)
Northwest 0.9x 0.77	X	9.45	x	72.63	x	0.55	x	0.7	<u> </u>	183.11	(81)
Northwest 0.9x 0.77	X	7.16	x	50.42	x	0.55	x	0.7] =	96.32	(81)
Northwest 0.9x 0.77	X	1	x	50.42	x	0.55	x	0.7] =	13.45	(81)
Northwest 0.9x 0.77	X	9.45	x	50.42	x	0.55	x	0.7] =	127.13	(81)

_															
Northwest 0.9x	0.77	X	7.1	6	x	2	8.07	X		0.55	X	0.7	=	53.62	(81)
Northwest 0.9x	0.77	X	1		X	2	8.07	X		0.55	X	0.7	=	7.49	(81)
Northwest 0.9x	0.77	X	9.4	·5	x	2	8.07	X		0.55	x	0.7	=	70.77	(81)
Northwest 0.9x	0.77	X	7.1	6	x	•	14.2	X		0.55	x	0.7	=	27.12	(81)
Northwest 0.9x	0.77	X	1		x	•	14.2	X		0.55	x	0.7	=	3.79	(81)
Northwest 0.9x	0.77	X	9.4	·5	x	,	14.2	X		0.55	x	0.7		35.79	(81)
Northwest 0.9x	0.77	X	7.1	6	x	(9.21	X		0.55	x	0.7	=	17.6	(81)
Northwest _{0.9x}	0.77	X	1		x	(9.21	X		0.55	x	0.7	=	2.46	(81)
Northwest 0.9x	0.77	X	9.4	.5	x	(9.21	X		0.55	x	0.7	=	23.23	(81)
_					•										
Solar gains in	watts, cal	culated	for eacl	n month				(83)m	= St	um(74)m	(82)m				
(83)m= 59.94	122	219.81	360.99	485.24	51	17.31	483.94	385	5.8	267.84	149.1	75.41	48.95		(83)
Total gains – i	nternal an	id solar	(84)m =	(73)m ·	+ (8	33)m	, watts	•	•			•		•	
(84)m= 489.07	548.95	631.74	747.98	846.63	85	4.15	805.32	714.	.17	609.45	515.87	470.44	465.36		(84)
7. Mean inter	nal tempe	erature (heating	season)										
Temperature						area f	from Tah	nle 9	Th	1 (°C)				21	(85)
Utilisation fac	_	•			-			JIC 0,	• • • • •	. (0)				21	(00)
Jan	Feb	Mar		May	È	Jun	Jul			Sep	Oct	Nov	Dec]	
(86)m= 1	1	0.99	0.96	0.84		.62	0.46	0.5	ug :4	0.85	0.99	1	1		(86)
											0.99				(00)
Me <mark>an int</mark> erna				·	_									,	
(87)m= 19.98	20.1	20.33	20.66	20.9	2	0.99	21	21	1	20.92	20.6	20.24	19.97		(87)
Temperature	during he	eating pe	eriods ir	rest of	dw	elling	from Ta	able 9	, Tr	12 (°C)					
(88)m= 20.15	20.15	20.15	20.17	20.17	2	0.19	20.19	20.	19	20.18	20.17	20.16	20.16		(88)
Utilisation fac	tor for gai	ins for r	est of d	welling.	h2.	m (se	e Table	9a)							
(89)m= 1	1	0.99	0.95	0.79	_).55	0.38	0.4	5	0.79	0.98	1	1]	(89)
Maan intarna	l tomporo	turo in t	ho root	of dwalli	na.	T2 /f	allow oto	L	+o 7	in Tabl	o 0o)	!		ı	
Mean interna (90)m= 18.77	18.94	19.28	19.76	20.07	Ť	1 ∠ (10 0.18	20.18	20.	$\overline{}$	20.12	e 9c) 19.68	19.16	18.76	1	(90)
(90)111- 18.77	10.94	19.20	19.70	20.07		0.16	20.16	20.	19			ng area ÷ (4			` ′
											LA - LIVII	ig area · (-	") =	0.22	(91)
Mean interna	I tempera	ture (for	r the wh	ole dwe	lling	g) = fl	_A × T1	+ (1	– fL	A) × T2		_			
(92)m= 19.03	19.2	19.51	19.96	20.26	2	0.36	20.36	20.3	36	20.29	19.89	19.4	19.02		(92)
Apply adjustr	nent to the	e mean	internal	temper	atu	re fro	m Table	4e, v	whe	re appro	priate			,	
(93)m= 18.88	19.05	19.36	19.81	20.11	2	0.21	20.21	20.2	21	20.14	19.74	19.25	18.87		(93)
8. Space hea	ting requi	rement													
Set Ti to the					ed	at ste	ep 11 of	Tabl	e 9b	, so that	t Ti,m=((76)m an	d re-cal	culate	
the utilisation	1 1				_	_						T	T _	1	
Jan	Feb	Mar	Apr	May	<u>_</u>	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Utilisation fac					_					1				1	(04)
(94)m= 1	1 1	0.99	0.94	0.79).55	0.38	0.4	.5	0.78	0.97	1	1		(94)
Useful gains,	- i	`	<u> </u>		1-	74.07	007.0		00	477.55	500.54	100.00	404.77	1	(OE)
(95)m= 488.23	<u> </u>	623.77	703.45	668.46		71.67	307.2	322.	.23	477.55	502.54	468.66	464.77		(95)
Monthly aver		- i			_		10.0	10	<u>, 1</u>	444	10.0	7.4	4.0	1	(06)
(96)m= 4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.		14.1	10.6	7.1	4.2	J	(96)
Heat loss rate									' T	<u> </u>		1062 77	1205.04	1	(97)
(97)m= 1307.25	1263.27	1143.91	951.34	730.29	L 4/	77.24	307.66	323.	.45	518.74	793.62	1063.77	1295.04	J	(31)

Space heating	481.41	386.98	178.48	46	0	0	0	0	216.56	428.48	617.72		
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2964.98	(98)
Space heating	require	ement in	kWh/m²	/year							Ī	30.62	(99)
a. Energy requ	uiremen	ıts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)			-		
Space heating	_	1 frama a.		مامم بیمار		a vata na					ſ		7,20
Fraction of spa			•		mentary	-	(202) = 1 -	_ (201) =			[[0	(20)
Fraction of spa			•	, ,				, ,	(203)] =		l I	1	(20/
Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = Efficiency of main space heating system 1											90.4	(20)	
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, %											0	(20)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Λιια	Sep	Oct	Nov	Dec	kWh/ye	
Space heating			•			Jui	Aug	Seb	OCI	INOV	Dec	KVVIIIye	aı
· 	481.41	386.98	178.48	46	0	0	0	0	216.56	428.48	617.72		
11)m = {[(98)	m x (20	4)] } x 1	00 ÷ (20	6)			•		•	•			(21
674.06	532.53	428.08	197.43	50.89	0	0	0	0	239.56	473.98	683.32		_
							Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	3279.85	(21
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)													
15)m= 0	0 } X	00 + (20	0	0	0	0	0	0	0	0	0		
							Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}		0	(21
at <mark>er he</mark> ating											L		_
utput from wa					110 10	140.0	450 50	100.07	400.00	400.04			
fficiency of wa	186.58	196 ter	174.06	168.52	148.43	142.2	158.52	160.27	182.26	192.64	206.6	80.3	(21
17)m= 87.56	87.33	86.73	85.11	82.27	80.3	80.3	80.3	80.3	85.49	87.01	87.64	00.3	' ^د ' لـ 21)
uel for water h													Ì
(19)m = (64)n	n x 100	÷ (217)	m										
19)m= 241.74	213.65	225.98	204.5	204.84	184.84	177.09	197.41 Tota	199.59 I = Sum(2	213.2	221.41	235.74	2540.00	7,04
nnual totals							Tota	T Guill(2		Wh/year		2519.99 kWh/year	(21
pace heating t	fuel use	d, main	system	1					N.	vvii y cai		3279.85	7
ater heating f	uel use	d									ĺ	2519.99	Ħ.
ectricity for pu	umps, fa	ans and	electric l	keep-ho	t						L		_
nechanical ve	•			•		nout fron	n outside	9			230.43		(23
central heating			.,	F		,					30		(23
otal electricity			:Wh/vea	r			sum	of (230a)	(230g) =		لـــٽـــا ا	260.43	(23
		above, r	www.yca				34.11	, (00a).	·(====)		[[╡
ectricity for lig		D) /									[-	397.05	(23
ectricity gene	rated by	y PVS										-271.71	(23

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	708.45 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	544.32 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1252.76 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	135.16 (267)
Electricity for lighting	(232) x	0.519	206.07 (268)
Energy saving/generation technologies Item 1		0.519 =	-141.02 (269)
Total CO2, kg/year	sun	n of (265)(271) =	1452.98 (272)
Dwelling CO2 Emission Rate	(27	2) ÷ (4) =	15.01 (273)
El rating (section 14)			86 (274)



		User Details:				
Assessor Name: Software Name:	Stroma FSAP 2012	Stroma N Software		Versio	n: 1.0.4.16	
		Property Address: Fla				
Address :						
Overall dwelling dimens	sions:					
.		Area(m²)	Av. Height(m	1)	Volume(m³)	
Basement		52.41 (1a)		(2a) =	141.51	(3a)
Ground floor		32.02 (1b)	x 3.27	(2b) =	104.71	(3b)
Total floor area TFA = (1a)-	+(1b)+(1c)+(1d)+(1e)+(1n) 84.43 (4)				_
Dwelling volume)+(3b)+(3c)+(3d)+(3e)+	(3n) =	246.22	(5)
2. Ventilation rate:					240.22	
2. Ventilation rate.	main seconda		total		m³ per hour	•
Number of chimneys	heating heating + 0		= 0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	= 0	x 20 =	0	(6b)
Number of intermittent fans			0	x 10 =	0	」 (7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fires	s		0	x 40 =	0	(7c)
Infiltration due to chimneys	flues and fans = (6a)+(6b)+ n carried out or is intended, proce		0 0 (16)	A ir ch	anges per hou	ur](8)
Number of storeys in the		ed to (17), otherwise contin	1011 (9) 10 (10)	1	0	(9)
Additional infiltration			[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25	for steel or timber frame of	or 0.35 for masonry co	enstruction	İ	0	(11)
if both types of wall are pres deducting areas of openings	ent, use the value corresponding	to the greater wall area (aft	er	•		_
	or, enter 0.2 (unsealed) or	0.1 (sealed), else ente	er O	[0	(12)
If no draught lobby, enter	,	, ,,		ļ	0	(13)
•	and doors draught stripped			[0	(14)
Window infiltration	д си	0.25 - [0.2 x (14	4) ÷ 100] =	L [0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	l I	0	(16)
	50, expressed in cubic met	res per hour per squar	e metre of envelor	i oe area - [3	(17)
If based on air permeability	•		·	[0.15	(18)
Air permeability value applies it	a pressurisation test has been d	one or a degree air permea	bility is being used	L		
Number of sides sheltered					0	(19)
Shelter factor		(20) = 1 - [0.07]	5 x (19)] =	İ	1	(20)
Infiltration rate incorporating	g shelter factor	(21) = (18) x (2	0) =	j	0.15	(21)
Infiltration rate modified for	monthly wind speed					
Jan Feb M	ar Apr May Jun	Jul Aug S	Sep Oct No	v Dec		
Monthly average wind spee	ed from Table 7					

4.9

4.4

4.3

3.8

3.8

3.7

4.3

4.5

4.7

5

Wind Factor (22a)m - (22)m + 4	
Wind Factor (22a)m = (22)m ÷ 4 (22a)m= 1.27	
Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.19 0.19 0.18 0.16 0.16 0.14 0.14 0.14 0.15 0.16 0.17 0.18 Calculate effective air change rate for the applicable case	
	23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 73.95	23c)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]	
(24a)m= 0.32 0.31 0.3 0.29 0.27 0.27 0.28 0.29 0.3 0.31 (2	24a)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)	
(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)
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 =	24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	
(25)m= 0.32 0.32 0.31 0.3 0.29 0.27 0.27 0.28 0.29 0.3 0.31 (2	25)
	25)
3. Heat losses and heat loss parameter: ELEMENT Gross Openings Net Area U-value A X U k-value A X k	25)
3. Heat losses and heat loss parameter: ELEMENT Gross Openings Met Area U-value A X U k-value A X k kJ/m²·K kJ/m²·K kJ/m²·K	
3. Heat losses and heat loss parameter: ELEMENT Gross Openings m^2 Net Area U-value A X U (W/K) k-value kJ/m²·K M/M^2 ·K $M/M^$	25) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross Openings m² Net Area $A, m²$ W/m2K $A \times U$ (W/K) $A \times V$ Windows Type 1	27) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross Openings m² Net Area A , m² W/m2K (W/K) k-value kJ/m²-K (W/K) Windows Type 1 Windows Type 2 2.3 $x^{1/[1/(1.2) + 0.04]} = 9.74$ (2 Windows Type 3 $x^{1/[1/(1.2) + 0.04]} = 10.82$ (2	27) 27) 27)
3. Heat losses and heat loss parameter: 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 Windows Type 1 8.51 $x^{1/[1/(1.2) + 0.04]} = 9.74$ (2 Windows Type 2 2.3 $x^{1/[1/(1.2) + 0.04]} = 2.63$ (2 Windows Type 3 9.45 $x^{1/[1/(1.2) + 0.04]} = 10.82$ (2 Windows Type 4 9.56 $x^{1/[1/(1.2) + 0.04]} = 10.95$ (2	27) 27) 27) 27)
3. Heat losses and heat loss parameter: 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 Windows Type 1 8.51 $x1/[1/(1.2) + 0.04] = 9.74$ 9.74 (2 Windows Type 2 2.3 $x1/[1/(1.2) + 0.04] = 2.63$ (2 Windows Type 3 9.45 $x1/[1/(1.2) + 0.04] = 10.82$ (2 Windows Type 4 9.56 $x1/[1/(1.2) + 0.04] = 10.95$ (2 Windows Type 5 4.65 $x1/[1/(1.2) + 0.04] = 5.32$ (2	27) 27) 27) 27) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross	27) 27) 27) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	27) 27) 27) 27) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	27) 27) 27) 27) 27) 27)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)	227) 227) 227) 227) 227) 228)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A ,m² W/m2K (W/K) kJ/m²-K kJ/K Windows Type 1	227) 227) 227) 227) 227) 227) 228) 229)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Floor Walls Type 1 Walls Type 2 Walls Type 3 Walls Type 3 Walls Type 3 Walls Type 3 Walls Type 3 Walls Type 3 Walls Type 4 Walls Type 4 Walls Type 5 Walls Type 5 Walls Type 6 Walls Type 7 Wal	227) 227) 227) 227) 227) 227) 228) 229)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A , m² W/m2K (W/K) kJ/m²-K Windows Type 1 Windows Type 2 2.3 x1/[1/(1.2) + 0.04] = 9.74 Windows Type 3 Windows Type 4 9.56 x1/[1/(1.2) + 0.04] = 10.82 Windows Type 5 Floor 52.412 x 0.1 = 5.2412 Walls Type1 27.27 0 27.27 x 0.16 = 4.36 Walls Type2 76.5 34.47 42.03 x 0.16 = 6.73 Walls Type3 12.09 0 12.09 x 0.16 = 1.93 Roof 20.39 0 20.39 x 0.12 = 2.45	227) 227) 227) 227) 227) 228) 229) 229)
3. Fleat losses and heat loss parameter: ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Floor Walls Type 1 Walls Type 2 Walls Type 2 Walls Type 3 Walls Type 3 Walls Type 3 Walls Type 4 Walls Type 4 Walls Type 5 A. S. A. A. W. Windows A. A. W. Windows A. A. W. Windows A. A. W. Windows A. A. W. Windows A. A. W. Windows A. W. W. Windows A.	227) 227) 227) 227) 227) 228) 229) 229)
3. Heat losses and heat loss parameter: ELEMENT Gross area (n²) Openings m² Net Area A ,m² W/m²2K (W/K) kJ/m²-K kJ/K Windows Type 1 Windows Type 2 2.3 x1/[1/(1.2)+0.04] = 9.74 Windows Type 3 Windows Type 4 9.56 x1/[1/(1.2)+0.04] = 10.82 Windows Type 5 Floor 52.412 x 0.1 = 5.2412 Walls Type 1 27.27 0 27.27 x 0.16 = 4.36 Walls Type 2 76.5 34.47 42.03 x 0.16 = 6.73 Walls Type 3 12.09 0 12.09 x 0.16 = 1.93 Roof 20.39 0 20.39 x 0.12 = 2.45 Total area of elements, m² 188.66 * 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)	227) 227) 227) 227) 227) 227) 228) 229) 229) 229) 330)

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.

	•	,	•		using Ap	•	<						12.8	(36)
	of therma abric he		are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			72.98	(37)
			alculated	d monthly	y				. ,		25)m x (5)		72.90	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	26.12	25.82	25.51	23.99	23.68	22.16	22.16	21.86	22.77	23.68	24.29	24.9		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	99.1	98.8	98.49	96.97	96.66	95.14	95.14	94.84	95.75	96.66	97.27	97.88		_
Heat Ic	oss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) _{1.} (4)	.12 /12=	96.89	(39)
(40)m=	1.17	1.17	1.17	1.15	1.14	1.13	1.13	1.12	1.13	1.14	1.15	1.16		
Numbe	er of day	s in mor	nth (Tah	le 1a)					,	Average =	Sum(40) _{1.}	.12 /12=	1.15	(40)
rambe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			<u> </u>	<u> </u>			<u> </u>							
4. Wa	ater heat	ting ener	rgy requ	irement:								kWh/ye	ear:	
۸۵۵۰۰۳	and annu	ınanavı İ	N I										1	(40)
if TF				[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		54		(42)
			ater usag	ge in litre	es per da	ıy Vd,av	erage =	(25 x N)	+ 36		94	.56		(43)
					5% if the d		-	o achieve	a water us	e target o				
not more										2 /			1	
Hot wate	Jan er usage ii	Feb	Mar day for ea	Apr	May Vd,m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	104.02	100.24	96.45	92.67	88.89	85.11		(.0)						
(++)11	104.02	100.24	00.70				1 85 11	88 89	92 67	96.45	100 24	104 02		
			!		00.00	00.1	85.11	88.89	92.67	96.45	100.24 n(44) ₁₁₂ =	104.02	1134.76	1 (44)
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.					Γotal = Su	m(44) ₁₁₂ =		1134.76	(44)
Energy (45)m=	content of	hot water 134.91	used - cal	culated mo						Γotal = Su	m(44) ₁₁₂ =		1134.76	
(45)m=	154.26	134.91	139.22	121.38	onthly = 4.	190 x Vd,r	93.13	0Tm / 3600 106.86	108.14	Fotal = Sui th (see Ta	m(44) ₁₁₂ =	c, 1d)	1134.76 1487.84	(44)
(45)m=	154.26	134.91	139.22	121.38	onthly = 4.	190 x Vd,r	93.13	0Tm / 3600 106.86	108.14	Fotal = Sui th (see Ta	m(44) ₁₁₂ = ables 1b, 1 137.57	c, 1d)		
(45)m= If instant (46)m= Water	taneous w 23.14 storage	134.91 vater heatin 20.24 loss:	139.22 ng at point 20.88	121.38 f of use (no	onthly = 4. 116.46 hot water 17.47	190 x Vd,r. 100.5 storage),	93.13 enter 0 in	07m / 3600 106.86 boxes (46) 16.03	108.14 106.14 16.22	Total = Sui th (see Ta 126.03 Total = Sui 18.9	m(44) ₁₁₂ = sbles 1b, 1. 137.57 m(45) ₁₁₂ =	c, 1d)		(45)
(45)m= If instant (46)m= Water Storag	taneous w 23.14 storage e volum	134.91 vater heatin 20.24 loss: e (litres)	139.22 ng at point 20.88 includir	121.38 f of use (no 18.21 ng any so	onthly = 4. 116.46 hot water 17.47 Dlar or W	190 x Vd,ri 100.5 storage), 15.07	93.13 enter 0 in 13.97 storage	07m / 3600 106.86 boxes (46) 16.03 within sa	108.14 106.14 16.22	Total = Sui th (see Ta 126.03 Total = Sui 18.9	m(44) ₁₁₂ = bles 1b, 112 = 20.64	c, 1d)		(45)
(45)m= If instant (46)m= Water Storag If comm	taneous w 23.14 storage e volum munity h	134.91 vater heatin 20.24 loss: e (litres) eating a	139.22 ng at point 20.88 includir and no ta	121.38 f of use (not) 18.21 ng any so	onthly = 4. 116.46 hot water 17.47 clar or W yelling, e	190 x Vd,r. 100.5 storage), 15.07 /WHRS	93.13 enter 0 in 13.97 storage	106.86 boxes (46) 16.03 within sa	108.14 108.14 1 to (61) 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 112 = 20.64	22.41		(45) (46)
(45)m= If instant (46)m= Water Storag If commotherw	taneous w 23.14 storage e volum munity h	134.91 20.24 loss: e (litres) eating a o stored	139.22 ng at point 20.88 includir and no ta	121.38 f of use (not) 18.21 ng any so	onthly = 4. 116.46 hot water 17.47 Dlar or W	190 x Vd,r. 100.5 storage), 15.07 /WHRS	93.13 enter 0 in 13.97 storage	106.86 boxes (46) 16.03 within sa	108.14 108.14 1 to (61) 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 112 = 20.64	22.41		(45) (46)
(45)m= If instant (46)m= Water Storag If commotherw Water	taneous w 23.14 storage e volum munity h vise if no	134.91 20.24 loss: e (litres) eating a stored loss:	139.22 ng at point 20.88 includir and no ta hot wate	121.38 fof use (not) 18.21 ng any so ank in dw er (this in	onthly = 4. 116.46 hot water 17.47 clar or W yelling, e	190 x Vd,r 100.5 storage), 15.07 /WHRS nter 110	93.13 enter 0 in 13.97 storage litres in neous co	106.86 boxes (46) 16.03 within sa	108.14 108.14 1 to (61) 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46)
(45)m= If instant (46)m= Water Storag If comr Otherw Water a) If m	taneous w 23.14 storage e volum munity h vise if no storage	134.91 20.24 loss: e (litres) eating a stored loss:	139.22 ng at point 20.88 includir and no ta hot wate	121.38 for use (not) 18.21 ng any so ank in dw er (this in	onthly = 4. 116.46 hot water 17.47 olar or W velling, e	190 x Vd,r 100.5 storage), 15.07 /WHRS nter 110	93.13 enter 0 in 13.97 storage litres in neous co	106.86 boxes (46) 16.03 within sa	108.14 108.14 1 to (61) 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47)
(45)m= If instant (46)m= Water Storag If comr Otherw Water a) If m Tempe Energy	taneous w 23.14 storage e volum munity h vise if no storage nanufact erature fa	134.91 20.24 loss: e (litres) eating a costored loss: urer's de actor fro	139.22 ng at point 20.88 includir and no ta hot wate eclared I m Table	121.38 for use (not) 18.21 ng any so ank in dw er (this in) oss facto 2b e, kWh/ye	onthly = 4. 116.46 hot water 17.47 clar or Water velling, encludes in the control of the co	190 x Vd,r 100.5 storage), 15.07 WHRS nter 110 nstantar	93.13 enter 0 in 13.97 storage litres in neous co	106.86 boxes (46) 16.03 within sa	108.14 108.14 10.22 16.22 16.22 16.22 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47) (48)
(45)m= If instant (46)m= Water Storag If commotherw Water a) If m Tempe Energy b) If m	taneous w 23.14 storage e volum munity h vise if no storage nanufact erature fa	134.91 20.24 loss: e (litres) eating a o stored loss: urer's de actor fro m water urer's de	139.22 ng at point 20.88 includir and no ta hot wate eclared I m Table storage	121.38 for use (not) 18.21 Ing any so ank in dwer (this in oss factors) 2b c, kWh/ye cylinder (1)	onthly = 4. 116.46 hot water 17.47 plar or W velling, e ncludes in or is known ear	190 x Vd,r. 100.5 storage), 15.07 /WHRS nter 110 nstantar wn (kWh	93.13 enter 0 in 13.97 storage litres in neous con/day):	106.86 boxes (46) 16.03 within sa (47)	108.14 108.14 10.22 16.22 16.22 16.22 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47) (48) (49) (50)
(45)m= If instant (46)m= Water Storag If commotherw Water a) If m Tempe Energy b) If m Hot wa	taneous w 23.14 storage e volum munity h vise if no storage nanufact erature fa y lost fro nanufact ater storage	134.91 20.24 loss: lee (litres) leating a lostored loss: lurer's de actor fro m water urer's de age loss	139.22 ng at point 20.88 includir and no ta hot wate eclared I m Table eclared of	121.38 for use (not) 18.21 Ing any so ank in dweer (this in oss factors) 2b c, kWh/ye cylinder left om Table	onthly = 4. 116.46 hot water 17.47 clar or Water velling, encludes in the control of the co	190 x Vd,r. 100.5 storage), 15.07 /WHRS nter 110 nstantar wn (kWh	93.13 enter 0 in 13.97 storage litres in neous con/day):	106.86 boxes (46) 16.03 within sa (47)	108.14 108.14 10.22 16.22 16.22 16.22 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47) (48) (49)
(45)m= If instant (46)m= Water Storag If comr Otherw Water a) If m Tempe Energy b) If m Hot wa If comr	taneous w 23.14 storage e volum munity h vise if no storage nanufact erature fa / lost fro nanufact ater stora munity h	134.91 20.24 loss: e (litres) eating a o stored loss: urer's de actor fro m water urer's de	139.22 ng at point 20.88 includir and no ta hot wate eclared I m Table storage eclared of	121.38 for use (not) 18.21 Ing any so ank in dweer (this in oss factors) 2b c, kWh/ye cylinder left om Table	onthly = 4. 116.46 hot water 17.47 plar or W velling, e ncludes in or is known ear	190 x Vd,r. 100.5 storage), 15.07 /WHRS nter 110 nstantar wn (kWh	93.13 enter 0 in 13.97 storage litres in neous con/day):	106.86 boxes (46) 16.03 within sa (47)	108.14 108.14 10.22 16.22 16.22 16.22 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47) (48) (49) (50)
(45)m= If instant (46)m= Water Storag If commotherw Water a) If m Tempe Energy b) If m Hot wa If commotherw Volume	taneous w 23.14 storage e volum munity h vise if no storage nanufact erature fa / lost fro nanufact ater stora munity h e factor	134.91 20.24 loss: e (litres) eating a control stored loss: urer's defactor from water urer's defage loss leating s	139.22 ng at point 20.88 includir and no ta hot wate eclared I m Table storage eclared of factor fr see secti	121.38 for use (not) 18.21 Ing any so ank in dweer (this in oss factors 2b expected, kWh/ye cylinder I from Table on 4.3	onthly = 4. 116.46 hot water 17.47 plar or W velling, e ncludes in or is known ear	190 x Vd,r. 100.5 storage), 15.07 /WHRS nter 110 nstantar wn (kWh	93.13 enter 0 in 13.97 storage litres in neous con/day):	106.86 boxes (46) 16.03 within sa (47)	108.14 108.14 10.22 16.22 16.22 16.22 16.22	Fotal = Sunth (see Tail 126.03 Fotal = Sunth 18.9	m(44) ₁₁₂ = bbles 1b, 1 137.57 m(45) ₁₁₂ = 20.64	22.41		(45) (46) (47) (48) (49) (50) (51)

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	= 0		(5	54)
Enter (50) or (54) in (55)		0		(5	55)
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	(5	56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else (57)m = (56)m wh	here (H11) is fron	n Appendi	×Н	
(57)m= 0 0 0 0 0 0 0	0 0	0 0	0	(5	57)
Primary circuit loss (annual) from Table 3		0		(5	58)
Primary circuit loss calculated for each month (59)m = (58) \div	365 × (41)m				
(modified by factor from Table H5 if there is solar water hea	ating and a cylinder the	ermostat)			
(59)m= 0 0 0 0 0 0 0	0 0	0 0	0	(5	59)
Combi loss calculated for each month (61)m = (60) \div 365 × (4	l1)m				
(61)m= 50.96 46.03 49.15 45.7 45.3 41.97 43.37	45.3 45.7 49	9.15 49.32	50.96	(6	61)
Total heat required for water heating calculated for each mon	th (62)m = $0.85 \times (45)$ i	m + (46)m + (57)m +	(59)m + (61)m	
(62)m= 205.22 180.94 188.37 167.08 161.76 142.47 136.5	5 152.16 153.84 175	5.18 186.88	200.35	(6	62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan	tity) (enter '0' if no solar con	ntribution to water	heating)		
(add additional lines if FGHRS and/or WWHRS applies, see A	Appendix G)				
(63)m= 0 0 0 0 0 0	0 0	0 0	0	(6	63)
Output from water heater					
(64)m= 205.22 180.94 188.37 167.08 161.76 142.47 136.5	5 152.16 153.84 175	5.18 186.88	200.35		
	Output from water h	heater (annual) ₁	12	2050.74	64)
Heat gains from water heating, kWh/month 0.25 [0.85 × (45]	m + (61)m] + 0.8 x [(4)	6)m + (57)m -	+ (<mark>5</mark> 9)m]	
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ (65) m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81		6)m + (57)m - 4.19 58.07	+ (59)m 62.41		65)
	46.86 47.38 54	1.19 58.07	62.41	(6	65)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81	46.86 47.38 54	1.19 58.07	62.41	(6	65)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):	46.86 47.38 54	1.19 58.07	62.41	(6	65)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the	46.86 47.38 54 e dwelling or hot water	1.19 58.07	62.41	(6	65)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	e dwelling or hot water Aug Sep C	1.19 58.07 r is from comm	62.41 nunity he	eating	65) 66)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 127.08 127.08 127.08 127.08 127.08 127.08	Aug Sep C 8 127.08 127.08 127	r is from comn	62.41 nunity he	eating	
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep C 8 127.08 127.08 127	r is from comn	62.41 nunity he	eating (6	
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16	1.19 58.07 r is from comm Oct Nov 7.08 127.08 5.82 19.64	Dec 127.08	eating (6	66)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 127.0	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16	7 is from common	Dec 127.08	eating (6	66)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187	7 is from common	Dec 127.08	eating (6	66) 67)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 12	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5	7 is from common	Dec 127.08	eating (6	66) 67)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 127.0	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5	7.23 203.29	Dec 127.08	eating (6	66) 67)
(65)m= 64.03 56.37 58.58 51.78 50.05 43.91 41.81 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 127.08 (67)m= 20.37 18.09 14.71 11.14 8.33 7.03 7.59 Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 228.45 230.82 224.85 212.13 196.08 180.99 170.9 Cooking gains (calculated in Appendix L, equation L15 or	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5 1 35.71 35.71 35	7.23 203.29	Dec 127.08	eating (6	66) 67)
include (57)m in calculation of (65)m only if cylinder is in the state of (57)m in calculation of (65)m only if cylinder is in the state of (57)m in calculation of (65)m only if cylinder is in the state of (57)m in calculation of (65)m only if cylinder is in the state of (57)m in calculation of (65)m only if cylinder is in the state of (57)m only if cylinder is in the state of (65)m only if cylinder is in the state of (65)m only if cylinder is in the state of (66)m. State of (65)m only if cylinder is in the state of (65)m only if cylinder is in the state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m Jul (66)m only if cylinder is in the state of (66)m. It is state of (66)m only if cylinder is in the state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m Jul (66)m only if cylinder is in the state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m Jul (66)m. Jan Feb Mar Apr May Jun Jul (66)m. Jul (66)m Jul (66)m. Jul (66)m.	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5 35.71 35.71 35	1.19 58.07 r is from common co	Dec 127.08 20.93 35.71	eating (6	66) 67) 68)
include (57)m in calculation of (65)m only if cylinder is in the include (57)m in calculation of (65)m only if cylinder is in the first include (57)m in calculation of (65)m only if cylinder is in the first include (57)m in calculation of (65)m only if cylinder is in the first include (57)m in calculate 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 1	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1.13a), also see Table 5 1.168.54 174.51 187 5a), also see Table 5 3.35.71 35.71 35	1.19 58.07 r is from common co	Dec 127.08 20.93 35.71	eating	66) 67) 68)
include (57)m in calculation of (65)m only if cylinder is in the final state of (57)m in calculation of (65)m only if cylinder is in the final state of (57)m in calculation of (65)m only if cylinder is in the final state of (57)m in calculation of (65)m only if cylinder is in the final state of (57)m in calculation of (65)m only if cylinder is in the final state of (57)m only if cylinder is in the final state of (65)m only if cylinder is in the final state of (65)m only if cylinder is in the final state of (65)m only if cylinder is in the final state of (66)m. Here are the final state of (65)m only if cylinder is in the final state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m Jul (66)m only if cylinder is in the final state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m Jul (66)m only if cylinder is in the final state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m. Jul (66)m Jul (66)m only if cylinder is in the final state of (66)m. Jan Feb Mar Apr May Jun Jul (66)m. Jul (66)m Jul (66)m. Jul (66)m Jul (65)m. Appendix L, equation L9 or L9a), (67)m. Jul (66	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1.13a), also see Table 5 1.168.54 174.51 187 5a), also see Table 5 3.35.71 35.71 35	1.19 58.07 r is from common co	Dec 127.08 20.93 35.71 3	eating	66) 67) 68) 69)
include (57)m in calculation of (65)m only if cylinder is in the state of the state	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5 3 35.71 35.71 35	1.19 58.07 r is from common co	Dec 127.08 20.93 35.71 3	eating	66) 67) 68) 69)
include (57)m in calculation of (65)m only if cylinder is in the final gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 1	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5 35.71 35.71 35	1.19 58.07 r is from common state of the sta	Dec 127.08 20.93 35.71 3 -101.66 83.89	eating	66) 67) 68) 69) 70)
include (57)m in calculation of (65)m only if cylinder is in the final gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 127.08 1	Aug Sep C 8 127.08 127.08 127 also see Table 5 9.87 13.25 16 1 168.54 174.51 187 5a), also see Table 5 35.71 35.71 35 3 3 6 -101.66 -101.66 -10 6 62.98 65.81 72 7)m + (68)m + (69)m + (70)m	1.19 58.07 r is from common state of the sta	Dec 127.08 20.93 35.71 3 -101.66 83.89	eating	66) 67) 68) 69) 70)

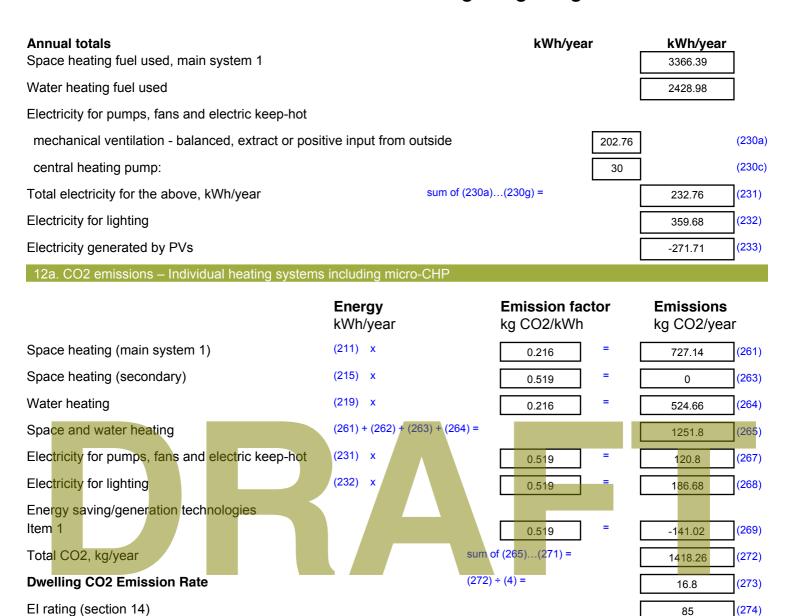
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation: Access F Table 6d	actor	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x 0.77	X	9.56	x	11.28	x	0.55	x	0.7	=	28.78	(75)
Northeast _{0.9x} 0.77	X	4.65	x	11.28	x	0.55	x	0.7	=	14	(75)
Northeast 0.9x 0.77	X	9.56	х	22.97	x	0.55	x	0.7	=	58.58	(75)
Northeast 0.9x 0.77	X	4.65	x	22.97	x	0.55	x	0.7] =	28.49	(75)
Northeast _{0.9x} 0.77	X	9.56	x	41.38	x	0.55	x	0.7	=	105.54	(75)
Northeast 0.9x 0.77	X	4.65	x	41.38	x	0.55	x	0.7	=	51.34	(75)
Northeast _{0.9x} 0.77	X	9.56	x	67.96	x	0.55	x	0.7	=	173.33	(75)
Northeast _{0.9x} 0.77	X	4.65	x	67.96	x	0.55	x	0.7	=	84.31	(75)
Northeast _{0.9x} 0.77	X	9.56	x	91.35	x	0.55	x	0.7	=	232.99	(75)
Northeast _{0.9x} 0.77	X	4.65	x	91.35	x	0.55	x	0.7	=	113.33	(75)
Northeast 0.9x 0.77	X	9.56	x	97.38	x	0.55	x	0.7	=	248.39	(75)
Northeast 0.9x 0.77	X	4.65	x	97.38	x	0.55	x	0.7	=	120.82	(75)
Northeast 0.9x 0.77	X	9.56	x	91.1	x	0.55	x	0.7	=	232.37	(75)
Northeast 0.9x 0.77	X	4.65	x	91.1	x	0.55	x	0.7	=	113.02	(75)
Northeast 0.9x 0.77	X	9.56	x	72.63	x	0.55	x	0.7	=	185.25	(75)
Northeast 0.9x 0.77	X	4.65	X	72.63	X	0.55	X	0.7		90.1	(75)
Northeast 0.9x 0.77	x	9.56	х	50.42	x	0.55	x	0.7		128.61	(75)
Northeast 0.9x 0.77	x	4.65	x	50.42] x	0.55	x	0.7	=	62.55	(75)
Northeast 0.9x 0.77	X	9.56	х	28.07	x	0.55	x	0.7	=	71.59	(75)
Northeast 0.9x 0.77	x	4.65	x	28.07	_x	0.55	x	0.7	=	34.82	(75)
Northeast 0.9x 0.77	x	9.56	х	14.2	х	0.55	x	0.7	=	36.21	(75)
Northeast 0.9x 0.77	X	4.65	x	14.2	x	0.55	x	0.7	=	17.61	(75)
Northeast 0.9x 0.77	X	9.56	x	9.21	x	0.55	X	0.7	=	23.5	(75)
Northeast 0.9x 0.77	X	4.65	X	9.21	x	0.55	X	0.7	=	11.43	(75)
Southwest _{0.9x} 0.77	X	2.3	X	36.79		0.55	X	0.7	=	22.58	(79)
Southwest _{0.9x} 0.77	X	2.3	x	62.67]	0.55	X	0.7	=	38.46	(79)
Southwest _{0.9x} 0.77	X	2.3	x	85.75]	0.55	X	0.7	=	52.62	(79)
Southwest _{0.9x} 0.77	X	2.3	x	106.25]	0.55	X	0.7	=	65.2	(79)
Southwest _{0.9x} 0.77	X	2.3	X	119.01]	0.55	X	0.7	=	73.03	(79)
Southwest _{0.9x} 0.77	X	2.3	x	118.15]	0.55	X	0.7	=	72.5	(79)
Southwest _{0.9x} 0.77	X	2.3	X	113.91]	0.55	x	0.7	=	69.9	(79)
Southwest _{0.9x} 0.77	X	2.3	X	104.39]	0.55	X	0.7	=	64.06	(79)
Southwest _{0.9x} 0.77	X	2.3	x	92.85]	0.55	x	0.7	=	56.98	(79)
Southwest _{0.9x} 0.77	X	2.3	x	69.27]	0.55	X	0.7	=	42.51	(79)
Southwest _{0.9x} 0.77	X	2.3	x	44.07]	0.55	X	0.7	=	27.04	(79)
Southwest _{0.9x} 0.77	X	2.3	X	31.49]	0.55	X	0.7	=	19.32	(79)
Northwest 0.9x 0.77	X	8.51	x	11.28	X	0.55	X	0.7	=	25.62	(81)
Northwest 0.9x 0.77	X	9.45	x	11.28	x	0.55	x	0.7] =	28.45	(81)
Northwest 0.9x 0.77	Х	8.51	X	22.97	×	0.55	X	0.7] =	52.15	(81)

Nawthwest F		_		_			1		_			Γ	–
Northwest 0.9x	0.77	×	9.45	×		2.97	X	0.55	X	0.7	_ =	57.91	(81)
Northwest 0.9x	0.77	×	8.51	×	4	1.38	X	0.55	X	0.7	=	93.95	(81)
Northwest 0.9x	0.77	×	9.45	×	4	1.38	X	0.55	X	0.7	=	104.33	(81)
Northwest 0.9x	0.77	X	8.51	X	6	7.96	X	0.55	X	0.7	=	154.29	(81)
Northwest 0.9x	0.77	X	9.45	X	6	7.96	X	0.55	X	0.7	=	171.34	(81)
Northwest 0.9x	0.77	X	8.51	X	9	1.35	X	0.55	X	0.7	=	207.4	(81)
Northwest 0.9x	0.77	X	9.45	X	9	1.35	x	0.55	X	0.7	=	230.31	(81)
Northwest 0.9x	0.77	X	8.51	X	9	7.38	X	0.55	X	0.7	=	221.11	(81)
Northwest 0.9x	0.77	X	9.45	X	9	7.38	X	0.55	X	0.7	=	245.54	(81)
Northwest 0.9x	0.77	x	8.51	x	(91.1	x	0.55	X	0.7	=	206.85	(81)
Northwest _{0.9x}	0.77	×	9.45	×	9	91.1	x	0.55	X	0.7	=	229.69	(81)
Northwest _{0.9x}	0.77	×	8.51	×	7	2.63	x	0.55	X	0.7	=	164.9	(81)
Northwest _{0.9x}	0.77	×	9.45	x	7	2.63	x	0.55	×	0.7		183.11	(81)
Northwest _{0.9x}	0.77	x	8.51	×	5	0.42	x	0.55	x	0.7	=	114.48	(81)
Northwest _{0.9x}	0.77	x	9.45	×	5	0.42	x	0.55	x	0.7	<u> </u>	127.13	(81)
Northwest _{0.9x}	0.77	×	8.51	×	2	8.07	x	0.55	x	0.7		63.73	(81)
Northwest 0.9x	0.77	×	9.45	×	2	8.07	x	0.55	x	0.7	-	70.77	(81)
Northwest 0.9x	0.77	×	8.51	X	<u> </u>	14.2	Х	0.55	X	0.7	=	32.23	(81)
Northwest 0.9x	0.77	= x	9.45	= x		14.2	х	0.55	X	0.7	= -	35.79	(81)
Northwest _{0.9x}	0.77	×	8.51	x	9	9.21	×	0.55	X	0.7	╡ =	20.92	(81)
Northwest _{0.9x}	0.77	×	9.45	x	9	9.21	x	0.55	x	0.7	=	23.23	(81)
_							_				_		
Solar gains in	watts, calcu	ılated	for each mo	onth			(83)m	ı = Sum(74)m .	(8 <mark>2</mark>)m				
(83)m= 119.42	235.59 40	7.78	648.47 857	.06	908.37	851.83	687	.42 489.75	283.4	1 148.9	98.41		(83)
Total gains – ii	nternal and	solar	(84)m = (73))m +	(83)m	, watts	-				-		
(84)m= 518.43	632.5	90.2	1007.79 119	2.86 1	221.49	1150.65	992	.94 807.44	624.4	3 516.6	485.73		(84)
7. Mean inter	nal tempera	ature (heating sea	son)									
Temperature	during heat	ting pe	eriods in the	living	area t	from Tab	ole 9	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	s for li	iving area, h	1,m (s	see Ta	ble 9a)							
Jan	Feb I	Mar	Apr N	lay	Jun	Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99 0).98	0.89 0.	7	0.49	0.36	0.4		0.96	1	1		(86)
Mean interna	l temperatu	re in I	iving area T	1 (follo	ow ste	ns 3 to 7	7 in T	able 9c)	•	•	•	•	
(87)m= 19.74		0.27	20.69 20	<u> </u>	20.99	21	2		20.55	20.07	19.71		(87)
Tomporatura	during boot	tina n	oriodo in roc	t of d	vallina	from To	hla (<u> </u>	<u> </u>	<u> </u>	l	
Temperature (88)m= 19.94		9.95	19.96 19		19.98	19.98	19.		19.96	19.96	19.95		(88)
` '			I	!_				10.07	10.00	7 13.30	10.00		(00)
Utilisation fac					<u> </u>		T .			1	Γ.	1	(00)
(89)m= 1	0.99 0).97	0.86 0.	54	0.42	0.28	0.3	0.66	0.95	0.99	1		(89)
Mean interna	l temperatu	re in t		velling	72 (f	ollow ste	eps 3	to 7 in Tabl	le 9c)		1	1	
(90)m= 18.27	18.55	9.04	19.62 19	.9	19.97	19.98	19.		19.45		18.23		(90)
								1	fLA = Li	ving area ÷ (4) =	0.25	(91)
Mean interna	l temneratu	re (foi	r the whole	hwellir	na) = fl	Δ x T1	+ (1	_ fl Δ) x T2					

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

(92)m= 18.63													
(32)111- 10.03	18.89	19.34	19.89	20.16	20.23	20.23	20.23	20.17	19.73	19.08	18.6		(92)
Apply adjustr	nent to t	he mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate	<u>!</u>			
93)m= 18.48	18.74	19.19	19.74	20.01	20.08	20.08	20.08	20.02	19.58	18.93	18.45		(93)
8. Space hea	ting requ	uirement											
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	:										
94)m= 1	0.99	0.96	0.85	0.64	0.42	0.29	0.35	0.66	0.94	0.99	1		(94
Useful gains,	hmGm	, W = (94	1)m x (84	1)m									
95)m= 516.06	624.99	758.4	857.9	763.78	517.18	330.92	348.25	535.5	585.83	511.45	484.09		(95
Monthly average	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								<u> </u>				ı	
97)m= 1405.51	1367.78	ļ!	1051.2	803.03	521.05	331.33	349.32	567.26	867.65	1151.1	1395		(97)
Space heatin	ř	1						<u> </u>	<u> </u>			1	
98)m= 661.75	499.15	366	139.17	29.2	0	0	0	0	209.67	460.55	677.72		_
							Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3043.22	(98
Space heatin	g require	ement in	kWh/m²	/year								36.04	(99
a. Energy red	nuiremer	nts – Indi	vidual h	eating sv	/stems i	ncluding	micro-C	CHP)					
Space heatir													
Fraction of sp	_	t from se	econdary	//supple	<mark>men</mark> tary	system						0	(20
Fraction of sp	ace hea	t from m	ain syst	em(s)			(202) = 1	- (201) =				1	(20:
Fraction of to													
Efficiency of I		9					(204) = (2)	02) × [1 –	(203)] =			1	(20
	main sna	ce heati					(204) = (2	02) × [1 –	(203)] =				╡`
			ng syste	em 1	a evetom		(204) = (2	02) × [1 –	(203)] =			90.4	(20
Efficiency of	seconda	ry/supple	ng syste	em 1 y heating		າ, %					_	90.4	(20
Efficiency of s	seconda Feb	ry/supple Mar	ng syste ementary Apr	em 1 y heating May	Jun		(204) = (2 Aug	02) × [1 -	(203)] = Oct	Nov	Dec	90.4	(20
Efficiency of s Jan Space heatin	seconda Feb g require	ry/supple Mar ement (c	ng systementary Apr alculated	em 1 y heating May d above)	Jun	n, %	Aug	Sep	Oct			90.4	(20
Efficiency of s Jan Space heatin 661.75	Feb g require 499.15	ry/supple Mar ement (c 366	ng systementary Apr alculated	em 1 y heating May d above) 29.2	Jun	າ, %				Nov 460.55	Dec 677.72	90.4	(20) (20) ear
Efficiency of S Jan Space heatin 661.75 211)m = {[(98)	Feb g require 499.15	ry/supple Mar ement (c 366 4)] } x 1	Apr alculated 139.17 00 ÷ (20	em 1 y heating May d above; 29.2	Jun) 0	n, % Jul 0	Aug 0	Sep 0	Oct 209.67	460.55	677.72	90.4	(20) (20) ear
Efficiency of s Jan Space heatin 661.75	Feb g require 499.15	ry/supple Mar ement (c 366	ng systementary Apr alculated	em 1 y heating May d above) 29.2	Jun	n, %	Aug 0	Sep 0	Oct 209.67	460.55 509.46	677.72 749.68	90.4 0 kWh/ye	(20) (20) ear
Efficiency of S Jan Space heatin 661.75 211)m = {[(98)	Feb g require 499.15	ry/supple Mar ement (c 366 4)] } x 1	Apr alculated 139.17 00 ÷ (20	em 1 y heating May d above; 29.2	Jun) 0	n, % Jul 0	Aug 0	Sep 0	Oct 209.67	460.55 509.46	677.72 749.68	90.4	(20) ear
Efficiency of s Jan Space heatin 661.75 211)m = {[(98) 732.03 Space heatin	Feb g require 499.15 s)m x (20 552.16 g fuel (s	mar Mar ement (c. 366 4)] } x 1 404.87	Apr alculated 139.17 00 ÷ (20 153.95	em 1 y heating May d above; 29.2 6) 32.3	Jun) 0	n, % Jul 0	Aug 0	Sep 0	Oct 209.67	460.55 509.46	677.72 749.68	90.4 0 kWh/ye	(20) (20) ear
Jan Space heatin 661.75 211)m = {[(98 732.03 Space heatin [(98)m x (20	seconda Feb g require 499.15 m x (20 552.16 g fuel (s	mar Mar	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/	m 1 y heating May d above; 29.2 6) 32.3 month	Jun 0 0	o 0	Aug 0 Tota	Sep 0 0 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2	460.55 509.46 211) _{15,1012}	749.68	90.4 0 kWh/ye	(20) ear
Space heatin Space heatin 661.75 211)m = {[(98) 732.03 Space heatin {[(98)m x (20)	Feb g require 499.15 s)m x (20 552.16 g fuel (s	mar Mar ement (c. 366 4)] } x 1 404.87	Apr alculated 139.17 00 ÷ (20 153.95	em 1 y heating May d above; 29.2 6) 32.3	Jun) 0	n, % Jul 0	Aug 0 Tota	Sep 0 0 I (kWh/yea	Oct 209.67 231.93 ar) =Sum(2	460.55 509.46 211) _{15.1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21)
Jan Space heatin 661.75 211)m = {[(98 732.03 Space heatin ([(98)m x (20	seconda Feb g require 499.15 m x (20 552.16 g fuel (s	mar Mar	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/	m 1 y heating May d above; 29.2 6) 32.3 month	Jun 0 0	o 0	Aug 0 Tota	Sep 0 0 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2	460.55 509.46 211) _{15.1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21)
Efficiency of s Jan Space heatin 661.75 211)m = {[(98) 732.03 Space heatin {[(98)m x (20) 215)m= 0 Vater heating	seconda Feb g require 499.15 s)m x (20 552.16 g fuel (s 01)] } x 1	mar ement (c 366 4)] } x 1 404.87 econdary 00 ÷ (20	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/68)	em 1 y heating May d above) 29.2 6) 32.3 month	Jun 0 0	o 0	Aug 0 Tota	Sep 0 0 I (kWh/yea	Oct 209.67 231.93 ar) =Sum(2	460.55 509.46 211) _{15.1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21)
Jan Space heatin 661.75 211)m = {[(98 732.03 732.03 Space heatin ([(98)m x (20 215)m = 0 Output from w	seconda Feb g require 499.15 552.16 g fuel (s 01)] } x 1 0 ater hea	mar Mar ement (c 366 4)] } x 1 404.87 econdary 00 ÷ (20 0	Apr alculated al	em 1 y heating May d above) 29.2 6) 32.3 month 0	Jun) 0 0 0	o 0	O Tota	Sep 0 1 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2 0 ar) =Sum(2	460.55 509.46 211) _{15,1012} 0 215) _{15,1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21)
Efficiency of s Jan Space heatin 661.75 211)m = {[(98) 732.03 Space heatin [(98)m x (20) 215)m = 0 Vater heating Output from w 205.22	seconda Feb g require 499.15 f)m x (20 552.16 g fuel (s 01)] } x 1 0 ater hea 180.94	ry/supplement (c 366 4)] } x 1 404.87 econdary 00 ÷ (20 0 condary 188.37	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/68)	em 1 y heating May d above) 29.2 6) 32.3 month	Jun 0 0	o 0	Aug 0 Tota	Sep 0 0 I (kWh/yea	Oct 209.67 231.93 ar) =Sum(2	460.55 509.46 211) _{15.1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21) (21)
Jan Space heatin 661.75 211)m = {[(98 732.03 732.03 Space heatin {[(98)m x (20 215)m = 0 Output from w 205.22 Efficiency of w	seconda Feb g require 499.15 m x (20 552.16 g fuel (s 01)] } x 1 0 ater hea 180.94 vater hea	mar Mar	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/ 8) 0	em 1 y heating May d above; 29.2 6) 32.3 month 0	Jun 0 0 0 142.47	0 0 136.5	O Tota 152.16	Sep 0 0 1 (kWh/yea 153.84	Oct 209.67 231.93 ar) =Sum(2 0 ar) =Sum(2	460.55 509.46 211) _{15,1012} 0 215) _{15,1012}	749.68 = 0 =	90.4 0 kWh/ye	(20) (20) ear (21)
Efficiency of s Jan Space heatin 661.75 211)m = {[(98) 732.03 Space heatin = {[(98)m x (20) 215)m = 0 Water heating Output from w 205.22 Efficiency of w 217)m = 87.79	seconda Feb g require 499.15 552.16 g fuel (s 01)] } x 1 0 ater hea 180.94 rater hea 87.47	ry/supplement (c 366 4)] } x 1 404.87 econdary 00 ÷ (20 0 188.37 ter 86.69	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/8 0 ulated al 167.08	em 1 y heating May d above) 29.2 6) 32.3 month 0	Jun) 0 0 0	o 0	O Tota	Sep 0 1 (kWh/yea	Oct 209.67 231.93 ar) =Sum(2 0 ar) =Sum(2	460.55 509.46 211) _{15,1012} 0 215) _{15,1012}	749.68	90.4 0 kWh/ye	(20) (20) ear (21)
Jan Space heatin 661.75 211)m = {[(98 732.03	seconda Feb g require 499.15 552.16 g fuel (s 01)] } x 1 0 ater hea 180.94 rater hea 87.47 heating,	ry/supplement (c. 366 4)] } x 1 404.87 econdary 00 ÷ (20 0	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/8 0 ulated al 167.08 84.6 onth	em 1 y heating May d above; 29.2 6) 32.3 month 0	Jun 0 0 0 142.47	0 0 136.5	O Total	Sep 0 0 1 (kWh/yea 153.84	Oct 209.67 231.93 ar) =Sum(2 0 ar) =Sum(2	460.55 509.46 211) _{15,1012} 0 215) _{15,1012}	749.68 = 0 =	90.4 0 kWh/ye	(20) (20) (20) (21)
Jan Space heatin 661.75 211)m = {[(98 732.03 732.03 Space heatin {[(98)m x (20 215)m 0	seconda Feb g require 499.15 552.16 g fuel (s 01)] } x 1 0 ater hea 180.94 rater hea 87.47 heating,	ry/supplement (c. 366 4)] } x 1 404.87 econdary 00 ÷ (20 0	Apr alculated 139.17 00 ÷ (20 153.95 y), kWh/8 0 ulated al 167.08 84.6 onth	em 1 y heating May d above; 29.2 6) 32.3 month 0	Jun 0 0 0 142.47	0 0 136.5	O Total	Sep 0 0 1 (kWh/yea 153.84	Oct 209.67 231.93 ar) =Sum(2 0 ar) =Sum(2	460.55 509.46 211) _{15,1012} 0 215) _{15,1012}	749.68 = 0 =	90.4 0 kWh/ye	(204 (206 (208 ear (211 (211) (216 (217)



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.4.16 Property Address: Flat 03 Address: 1. Overall dwelling dimensions Area(m²) Av. Height(m) Volume(m³) **Basement** 63.22 (1a) x 2.7 (2a) =170.69 (3a) Ground floor (1b) x (2b) (3b) 39.79 3.27 130.12 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)103.01 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 300.81 2. Ventilation rate: main secondary other total m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c)0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 1 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.15 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4.9

4.4

5

3.8

4.3

3.8

3.7

4

4.3

4.5

4.7

(22)m=

5.1

Wind Fa	actor (2	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted	d infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
	0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculat		<i>tive air</i> Il ventila	_	rate for t	he appli	cable ca	se	-	-	-		-	-	(23a)
				endix N. (2	(3b) = (23a	a) × Fmv (e	eguation (N	N5)) . othe	rwise (23b) = (23a)			0.8	 -
			overy: effic							, (,			73.9	
			•	-	_				a)m = (2:	2h)m + (23b) × [1 – (23c)		(200)
(24a)m=	0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(24a)
b) If b	alance	d mech	anical ve	ntilation	without	heat red	covery (N	л ЛV) (24t	o)m = (22	2b)m + (23b)	<u> </u>	J	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If w	/hole h	ouse ex	tract ver	tilation o	or positiv	e input	ventilatio	n from o	outside	l .			ı	
if	(22b)m	า < 0.5 ×	(23b), t	hen (24	c) = (23b); other	wise (24	c) = (22l	b) m + 0.	5 × (23b)		_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
			on or wh											
	<u>` </u>		<u> </u>	<u> </u>		<u> </u>			2b)m² x					(244)
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
	_	_	rate - er				<u> </u>			0.00	0.0	T 0 04	1	(25)
(25)m=	0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31	J	(25)
3. Heat	t losses	s and he	eat loss r	paramete										
			_		51.					_	_			_
ELEIVII	ENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value kJ/m²-		A X k kJ/K
Window	-	area	SS	Openin	gs		m²		2K		K)			
	s Type	area	SS	Openin	gs	A ,r	m² x1.	W/m2	2K · 0.04] =	(W/	K)			kJ/K
Window	s Type	area 1	SS	Openin	gs	A ,r	m² x1.	W/m2 /[1/(1.2)+	2K · 0.04] = · 0.04] =	9.74	K)			kJ/K (27)
Window Window	s Type s Type s Type	area 1 2 3	SS	Openin	gs	A ,r 8.51	m² x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+	2K · 0.04] = · 0.04] = · 0.04] =	9.74 2.63	K)			kJ/K (27) (27)
Window Window Window	s Type s Type s Type s Type	area 1 2 3 4	SS	Openin	gs	A ,r 8.51 2.3 9.45	x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82	K)			kJ/K (27) (27) (27)
Window Window Window Window	s Type s Type s Type s Type s Type s Type	area 1 2 3 4 5 5	SS	Openin	gs	A ,r 8.51 2.3 9.45 6.41	x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82 7.34	K)			kJ/K (27) (27) (27) (27)
Window Window Window Window	s Type s Type s Type s Type s Type s Type s Type	area 1 2 3 4 5 6	SS	Openin	gs	A ,r 8.51 2.3 9.45 6.41 2.3	x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82 7.34 2.63 2.63	K)			kJ/K (27) (27) (27) (27) (27) (27)
Window Window Window Window Window	s Type s Type s Type s Type s Type s Type s Type	area 1 2 3 4 5 6	SS	Openin	gs	A ,r 8.51 2.3 9.45 6.41 2.3	x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82 7.34 2.63	K)			kJ/K (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window	s Type s Type s Type s Type s Type s Type s Type s Type s Type	area 1 2 3 4 5 6 7	ss (m²)	Openin m	gs	A ,r 8.51 2.3 9.45 6.41 2.3 2.3 4.65 63.22	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322	K)			kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Floor Walls Ty	s Type s Type s Type s Type s Type s Type s Type s Type ype1	area 1 2 3 4 5 6 7	ss (m²)	Openin m	gs 1 ²	A ,r 8.51 2.3 9.45 6.41 2.3 2.3 4.65 63.22 29.04	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322 4.65	K)			kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Window Window Floor Walls Ty Walls Ty	s Type s Type s Type s Type s Type s Type s Type ype1 ype2	area 1 2 3 4 5 6 7	ss (m²)	0 35.92	gs 1 ²	A ,r 8.51 2.3 9.45 6.41 2.3 2.3 4.65 63.22 29.04 44.9	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] =	9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322 4.65 7.19	K)			kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Window Window Window Window Window Window Window Window Floor Walls Ty Walls Ty	s Type s Type s Type s Type s Type s Type s Type ype1 ype2	area 1 2 3 4 5 6 7 29.0 80.8	(m²)	0 35.92	gs 1 ²	A ,r 8.51 2.3 9.45 6.41 2.3 4.65 63.22 29.04 44.9°	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W// 9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322 4.65 7.19 2.15	K)			kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (29) (29)
Window Window Window Window Window Window Window Window Floor Walls Ty Walls Ty Roof	s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3	area 1 2 3 4 5 6 7 29.0 80.8 13.4 24.9	3 3 11	0 35.92	gs 1 ²	A ,r 8.51 2.3 9.45 6.41 2.3 2.3 4.65 63.22 29.04 44.91 13.42 24.91	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = = =	9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322 4.65 7.19	K)			kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (30)
Window Window Window Window Window Window Floor Walls Ty Walls Ty Roof Total are	s Type s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3 ea of e	area 1 2 3 4 5 6 7 29.0 80.8 13.4 24.9 lements	65 (m²) 14 (m²) 13 (m²) 14 (m²)	0 35.9:	gs 1 ²	A ,r 8.51 2.3 9.45 6.41 2.3 4.65 63.22 29.02 44.9° 13.42 24.9°	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W// 9.74 2.63 10.82 7.34 2.63 2.63 5.32 4.65 7.19 2.15 2.99		kJ/m²·	k	kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (29) (29)
Window Window Window Window Window Window Window Window Floor Walls Ty Walls Ty Roof Total are * for window	s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3 ea of e	area 1 2 3 4 5 6 7 29.0 80.8 13.4 24.9 lements	65 (m²) 14 (m²) 13 (m²) 14 (m²)	Openin m 0 35.92 0 offective wi	gs 1 ² 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A ,r 8.51 2.3 9.45 6.41 2.3 4.65 63.22 29.02 44.9° 13.42 24.9° 211.4	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = =	(W// 9.74 2.63 10.82 7.34 2.63 2.63 5.32 4.65 7.19 2.15 2.99		kJ/m²·	k	kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (30)
Window Window Window Window Window Window Floor Walls Ty Walls Ty Roof Total are * for winde ** include Fabric h	s Type s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3 ea of e ows and the area leat los	area 1 2 3 4 5 6 7 29.0 80.8 13.4 24.9 lements roof winders on both s, W/K	14 13 12 11 11 12 11 12 11 12 11 12 11 12 11 12 13 14 15 16 17 17 18 18 18 18 18 18 18 18 18 18 18 18 18	Openin m 0 35.92 0 offective with ternal wall	gs 1 ² 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A ,r 8.51 2.3 9.45 6.41 2.3 4.65 63.22 29.02 44.9° 13.42 24.9° 211.4	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W// 9.74 2.63 10.82 7.34 2.63 2.63 5.32 4.65 7.19 2.15 2.99		kJ/m²·	k	kJ/K (27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (30) (31)
Window Window Window Window Window Window Window Window Floor Walls Ty Walls Ty Roof Total are * for windo ** include	s Type s Type s Type s Type s Type s Type s Type ype1 ype2 ype3 ea of e ows and the area eat los pacity (area 1 2 3 4 5 6 7 29.0 80.8 13.4 24.9 Ilements roof winders on both s, W/K: Cm = S((m²) (m²) (m²) (m²) (m²) (m²) (m²) (m²) (m²) (m²)	Openin m 35.92 0 0 offective winternal walk U)	gs g² 2 indow U-va	A ,r 8.51 2.3 9.45 6.41 2.3 4.65 63.22 29.04 44.91 13.42 24.91 211.4 alue calculatitions	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.12	2K 0.04] = 0.	9.74 2.63 10.82 7.34 2.63 2.63 5.32 6.322 4.65 7.19 2.15 2.99		kJ/m²·	K	(27) (27) (27) (27) (27) (27) (27) (28) (29) (29) (30) (31)

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

an be used inste	au or a uci	anca carce	ilation.										
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<						13.7	(36
details of therma		are not kn	own (36) =	= 0.15 x (3	1)			(22)	(20) -				— ,,,
otal fabric he		مام داماه	الطائم مصا					(33) +		OF\ \((F)		78.12	(3
entilation hea					lun	1	Aug		`	25)m x (5)		1	
Jan 38)m= 31.91	Feb 31.54	Mar 31.17	Apr 29.31	May 28.94	Jun 27.08	Jul 27.08	Aug 26.7	Sep 27.82	Oct 28.94	Nov 29.68	Dec 30.43		(3
			29.01	20.94	27.00	27.00	20.7			<u> </u>	30.43		(0
Heat transfer of 110.04			107.10	407.00	405.0	105.0	104.00	. ,	= (37) + (37)		100.55	1	
39)m= 110.04	109.67	109.29	107.43	107.06	105.2	105.2	104.83	105.94	107.06	107.81 Sum(39) ₁	108.55	107.34	(3
leat loss para	meter (H	HLP), W/	m²K						= (39)m ÷	` '	12 / 12-	107.54	(
1.07	1.06	1.06	1.04	1.04	1.02	1.02	1.02	1.03	1.04	1.05	1.05		
								,	Average =	Sum(40) ₁	12 /12=	1.04	(4
lumber of day												1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(4
11)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
											138/1/		
4. Water heat	ting ener	gy requi	rement:								kWh/y	ear:	
ssumed occu	inancy	d .										1	(1
		V								1 2	77		(4
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	013 x (ΓFA -13.		.77		(4
if TFA £ 13.9	9, N = 1 9, N = 1	+ 1.76 x			·			`	ΓFA -13.		77		(4
if <mark>TFA £</mark> 13.9 Inn <mark>ual av</mark> erag	9, N = 1 9, N = 1 ge hot wa	+ 1.76 x	je in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		9)	0.89		
if TFA £ 13.9 Annual averag Reduce the annua	9, N = 1 9, N = 1 ge hot wa al average	+ 1.76 x ater usag	ge in litre	es per da 5% if the d	ay Vd,av	erage =	(25 x N)	+ 36		9)			
if TFA £ 13.9 Annual average deduce the annual of more that 125	9, N = 1 9, N = 1 ge hot wa al average	+ 1.76 x ater usag	ge in litre usage by a day (all w	es per da 5% if the d vater use, h	ay Vd,av	erage =	(25 x N) to achieve	+ 36 a water us		9)	0.89		`
if TFA £ 13.9 Annual average annual at the	9, N = 1 9, N = 1 ge hot wa al average i litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, h	ay Vd,av lwelling is hot and co	erage = designed (d)	(25 x N) to achieve	+ 36	se target o	9)			
if TFA £ 13.9 Annual average deduce the annual of more that 125 Jan lot water usage in	9, N = 1 9, N = 1 ge hot wa al average i litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, h	ay Vd,av lwelling is hot and co	erage = designed (d)	(25 x N) to achieve	+ 36 a water us	se target o	9)	0.89		`
if TFA £ 13.9 Annual average deduce the annual of more that 125 Jan Jan Jot water usage in 14)m= 109.87	9, N = 1 9, N = 1 ge hot was all average if litres per per per per per per per per per per	ter usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, l May Vd,m = fat 93.89	ay Vd,av welling is not and co Jun ctor from 1	erage = designed (d) Jul Table 1c x 89.9	(25 x N) to achieve Aug (43) 93.89	+ 36 a water us Sep 97.89	Oct 101.88 Fotal = Su	9) 99 Nov 105.88 m(44) ₁₁₂ =	Dec 109.87	1198.63	(4
if TFA £ 13.9 Annual average deduce the annual of more that 125 Jan Jan Jan 109.87	9, N = 1 9, N = 1 ge hot was all average if litres per per per per per per per per per per	ter usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, l May Vd,m = fat 93.89	ay Vd,av welling is not and co Jun ctor from 1	erage = designed (d) Jul Table 1c x 89.9	(25 x N) to achieve Aug (43) 93.89	+ 36 a water us Sep 97.89	Oct 101.88 Fotal = Su	9) 99 Nov 105.88 m(44) ₁₁₂ =	Dec 109.87	1198.63	(4
if TFA £ 13.9 Annual average annual of more that 125 Jan Jan 14)m= 109.87	9, N = 1 9, N = 1 ge hot was all average if litres per per per per per per per per per per	ter usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, l May Vd,m = fat 93.89	ay Vd,av welling is not and co Jun ctor from 1	erage = designed (d) Jul Table 1c x 89.9	(25 x N) to achieve Aug (43) 93.89	+ 36 a water us Sep 97.89	Oct 101.88 Fotal = Su	9) 99 Nov 105.88 m(44) ₁₁₂ =	Dec 109.87	1198.63	(4
if TFA £ 13.9 Annual average annual average annual average in a second more that 125 Jan Hot water usage in a second more than a second more than 125 Jan Hot water usage in a second more than a second	9, N = 1 9, N = 1 ge hot waal average litres per p Feb n litres per 105.88	+ 1.76 x ter usag hot water person per Mar day for ea 101.88 used - calc 147.06	ge in litre usage by a day (all w Apr ach month 97.89 culated mo	es per da 5% if the da 5% if th	y Vd,av lwelling is not and co Jun ctor from 7 89.9 190 x Vd,r	erage = designed ald) Jul Table 1c x 89.9 m x nm x E 98.37	(25 x N) to achieve Aug (43) 93.89 07m / 3600 112.88	+ 36 a water us Sep 97.89 0 kWh/mor	Oct 101.88 Fotal = Su th (see Ta 133.12	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1	Dec 109.87 = c, 1d) 157.8	1198.63	(4
if TFA £ 13.9 Annual average annual of more that 125 Jan Hot water usage in 149m= 109.87 Energy content of 145)m= 162.94	9, N = 1 9, N = 1 ge hot waal average litres per p 105.88 f hot water 142.51	ter usaghot water person per Mar day for ea 101.88 147.06	pe in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21	es per da 5% if the d vater use, h May Vd,m = fax 93.89 onthly = 4.	y Vd,av lwelling is not and co Jun ctor from 7 89.9 190 x Vd,r 106.15	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 97m / 3600 112.88 boxes (46)	+ 36 a water us Sep 97.89 9 kWh/mor 114.23	Oct 101.88 Fotal = Sulth (see Tail 133.12) Fotal = Sulth (see Tail 133.12)	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ =	Dec 109.87 = c, 1d) 157.8		(4
if TFA £ 13.9 Annual average annual average annual average annual average in the annual average in the annual average in the annual average in the annual average in the average annual average annual average in the average annual average in the average annual average in the a	9, N = 1 9, N = 1 ge hot waal average I litres per p 105.88 142.51 vater heatin 21.38	+ 1.76 x ter usag hot water person per Mar day for ea 101.88 used - calc 147.06	ge in litre usage by a day (all w Apr ach month 97.89 culated mo	es per da 5% if the da 5% if th	y Vd,av lwelling is not and co Jun ctor from 7 89.9 190 x Vd,r	erage = designed ald) Jul Table 1c x 89.9 m x nm x E 98.37	(25 x N) to achieve Aug (43) 93.89 07m / 3600 112.88	+ 36 a water us Sep 97.89 0 kWh/mor	Oct 101.88 Fotal = Su th (see Ta 133.12	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31	Dec 109.87 = c, 1d) 157.8		(4
if TFA £ 13.9 Annual average annual average annual average annual average in the annual average in the annual average in the a	9, N = 1 9, N = 1 ge hot was all average is litres per per per per per per per per per per	ter usage hot water person per Mar day for ear 101.88 147.06 147.06	ge in litre usage by a day (all w Apr ach month 97.89 128.21 of use (no	es per da 5% if the da 5% if th	y Vd,av welling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage),	erage = designed ald) Jul Table 1c x 89.9 m x nm x E 98.37 enter 0 in 14.76	(25 x N) to achieve Aug (43) 93.89 07m / 3600 112.88 boxes (46) 16.93	+ 36 a water us Sep 97.89 0 kWh/mor 114.23 0 to (61) 17.13	Oct 101.88 Total = Su 133.12 Total = Su 19.97	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67		(4
if TFA £ 13.9 Annual average annual average annual average annual average in annual average in a section and a section average in a se	9, N = 1 9, N = 1 ge hot waal average is litres per p 105.88 105.88 142.51 21.38 1058: ne (litres)	ter usage hot water person per day for each 101.88 used - calce 147.06 ag at point 22.06	ge in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21 of use (no 19.23	es per da 5% if the de 5% if the 5% if the de 5% if the de 5% if the de 5% if the de 5% if the d	ay Vd,av lwelling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage), 15.92	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 77m / 3600 112.88 boxes (46) 16.93 within sa	+ 36 a water us Sep 97.89 0 kWh/mor 114.23 0 to (61) 17.13	Oct 101.88 Total = Su 133.12 Total = Su 19.97	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8		(4
if TFA £ 13.9 Annual average annual average annual average annual average in annual average in a second annual average in a second annual average in a second annual average in a second annual average in a second annual average average volume is community in annual average annual average average volume is a second annual average average volume is annual average annual average annual average annual average annual average annual average annual average annual average annual average annual average annual average annual average annual average in a second annua	9, N = 1 9, N = 1 19e hot was all average is litres per per per per per per per per per per	ter usage hot water person per Mar day for ear 101.88 147.06 147.06 includin nd no ta	ge in litre usage by a day (all w Apr 97.89 culated mo 128.21 of use (no 19.23 ng any so nk in dw	es per da 5% if the d vater use, f May Vd,m = fat 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e	y Vd,av welling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7Tm / 3600 112.88 boxes (46) 16.93 within sa (47)	+ 36 a water us Sep 97.89 9 kWh/mor 114.23 1 to (61) 17.13 ame vesi	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67		(4)
if TFA £ 13.9 Annual average annual of more that 125 Jan Hot water usage in 149m= 109.87 Energy content of 159m= 162.94 It instantaneous water storage of 160m= 24.44 Vater storage volume for community in 160 of 160	9, N = 1 9, N = 1 19e hot was all average is litres per per per per per per per per per per	ter usage hot water person per Mar day for ear 101.88 147.06 147.06 includin nd no ta	ge in litre usage by a day (all w Apr 97.89 culated mo 128.21 of use (no 19.23 ng any so nk in dw	es per da 5% if the d vater use, f May Vd,m = fat 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e	y Vd,av welling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7Tm / 3600 112.88 boxes (46) 16.93 within sa (47)	+ 36 a water us Sep 97.89 9 kWh/mor 114.23 1 to (61) 17.13 ame vesi	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67		(4
if TFA £ 13.9 Annual average annual average annual average annual average in the second annual average in the second average annual average in the second average aver	9, N = 1 9, N = 1 19, N = 1 19e hot water all average is litres per per per per per per per per per per	ter usage hot water person per day for ear 101.88 147.06 147.06 including and no talk to the water the same	ge in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ag any so nk in dw er (this in	es per da 5% if the d vater use, h May Vd,m = fac 93.89 onthly = 4. 123.02 o hot water 18.45 olar or W velling, e	ay Vd,av lwelling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7Tm / 3600 112.88 boxes (46) 16.93 within sa (47)	+ 36 a water us Sep 97.89 9 kWh/mor 114.23 1 to (61) 17.13 ame vesi	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67		(4)
if TFA £ 13.9 Annual average annual of more that 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Journal of water usage in 125 Jan Jan Jan Jan Jan Jan Jan Ja	9, N = 1 9, N = 1 19, N = 1 19e hot was all average is litres per per per per per per per per per per	tter usage hot water person per Mar day for ear 101.88 147.06 147.06 including at point 22.06 including the twater the calculation and the twater the calculation and the calculation	Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ng any so nk in dw er (this in	es per da 5% if the d vater use, h May Vd,m = fac 93.89 onthly = 4. 123.02 o hot water 18.45 olar or W velling, e	ay Vd,av lwelling is not and co Jun ctor from 1 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7Tm / 3600 112.88 boxes (46) 16.93 within sa (47)	+ 36 a water us Sep 97.89 9 kWh/mor 114.23 1 to (61) 17.13 ame vesi	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 c, 1d) 157.8 23.67		(4)
Annual average annual average annual average annual average in the average in the average in the average in the average in the average average average in the average in the average average average in the average in t	9, N = 1 9, N = 1 19, N = 1 19e hot was all average is litres per per per per per per per per per per	tter usage hot water person per Mar day for ear 101.88 147.06 147.06 includin and no tale hot water eclared lem Table storage	Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ng any so nk in dw er (this in oss facto 2b , kWh/ye	es per da 5% if the d vater use, h May Vd,m = fax 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e ocludes in or is knowear	ay Vd,av lwelling is not and co Jun 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110 nstantar	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7Tm / 3600 112.88 boxes (46) 16.93 within sa (47)	+ 36 a water us Sep 97.89 97.89 114.23 10 to (61) 17.13 ame vess ers) enter	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 c, 1d) 157.8 23.67		(4) (4) (4) (4) (4) (4) (4) (4)
Annual average annual average annual average annual average annual average in the following annual average in the following annual average ave	9, N = 1 9, N = 1 19, N = 1 19 hot was all average is litres per per per per per per per per per per	tter usage hot water person per day for eat 101.88 101.88 147.06 147.06 includin and no tall hot water eclared least storage eclared of the storage eclared	ge in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ag any so nk in dw er (this in oss facto 2b , kWh/ye cylinder l	es per da 5% if the d vater use, I May Vd,m = fax 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e includes in or is known ear oss factor	ay Vd,av lwelling is not and co Jun 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110 nstantar wn (kWh	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7m / 3600 112.88 boxes (46) 16.93 within sa (47) pmbi boil	+ 36 a water us Sep 97.89 97.89 114.23 10 to (61) 17.13 ame vess ers) enter	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67 0 0 0 0 0		(4) (4) (4) (4) (5)
if TFA £ 13.9 Annual average annual average annual average in the annual average in the average in the average in the average average average in the average	9, N = 1 9, N = 1 105, Salar	ter usaghot water person per day for ea 101.88 101.88 147.06 including at point 22.06 including at point water person per day for ea 101.88	ge in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ag any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl	es per da 5% if the d vater use, I May Vd,m = fax 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e includes in or is known ear oss factor	ay Vd,av lwelling is not and co Jun 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110 nstantar wn (kWh	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7m / 3600 112.88 boxes (46) 16.93 within sa (47) pmbi boil	+ 36 a water us Sep 97.89 97.89 114.23 10 to (61) 17.13 ame vess ers) enter	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67		(4) (4) (4) (4) (5)
if TFA £ 13.9 Annual average annual average in the annual average in the annual average in the average in the average in the average in the average content of the average average content of the average in the average	9, N = 1 9, N = 1 19, N = 1 19 hot was all average is litres per per per per per per per per per per	tter usage hot water person per Mar day for ear 101.88 147.06 147.06 including at point 22.06 including at point water eclared lear to the storage eclared of factor free sections.	ge in litre usage by a day (all w Apr ach month 97.89 culated mo 128.21 of use (no 19.23 ag any so nk in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl	es per da 5% if the d vater use, I May Vd,m = fax 93.89 onthly = 4. 123.02 o hot water 18.45 colar or W velling, e includes in or is known ear oss factor	ay Vd,av lwelling is not and co Jun 89.9 190 x Vd,r 106.15 storage), 15.92 /WHRS nter 110 nstantar wn (kWh	erage = designed and and and and and and and and and an	(25 x N) to achieve Aug (43) 93.89 7m / 3600 112.88 boxes (46) 16.93 within sa (47) pmbi boil	+ 36 a water us Sep 97.89 97.89 114.23 10 to (61) 17.13 ame vess ers) enter	Oct 101.88 Total = Su 133.12 Total = Su 19.97 Sel	9) Nov 105.88 m(44) ₁₁₂ = ables 1b, 1 145.31 m(45) ₁₁₂ = 21.8	Dec 109.87 = c, 1d) 157.8 = 23.67 0 0 0 0 0		(4 (4 (4 (4 (4 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5 (5

Energy lost from water storage, kWh/year Enter (50) or (54) in (55)	(47) x (51) x (52) x (53) =	0	(54) (55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		(00)
(56)m= 0 0 0 0 0 0 0	0 0 0	0 0	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] +	(50), else (57)m = (56)m where	(H11) is from Append	H xilt
(57)m= 0 0 0 0 0 0 0	0 0 0	0 0	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 3	` ,		
(modified by factor from Table H5 if there is solar water hea	, , , , , , , , , , , , , , , , , , ,] (50)
(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 × (4	'i	, ,	1
(61)m= 50.96 46.03 50.96 48.27 47.85 44.33 45.81	47.85 48.27 50.96	49.32 50.96	(61)
Total heat required for water heating calculated for each mont	- 	ì i i i i i i i i i i i i i i i i i i i	ı`´´
(62)m= 213.9 188.54 198.01 176.48 170.86 150.49 144.18		194.63 208.76	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quant		tion to water heating	
(add additional lines if FGHRS and/or WWHRS applies, see A	ppendix G)		(63)
		0 0	(03)
Output from water heater (64)m= 213.9 188.54 198.01 176.48 170.86 150.49 144.18	3 160.73 162.5 184.08	194.63 208.76	1
(64)m= 213.9 188.54 198.01 176.48 170.86 150.49 144.18	3 160.73 162.5 184.08 Output from water heate		2153.15 (64)
Heat going from water heating IVMh/month 9.35 (10.95 x (45)			
Heat gains from water heating, kWh/month 0.25 [0.85 × (45)] (65)m= 66.92 58.89 61.64 54.7 52.86 46.38 44.16		60.64 65.21	(65)
include (57)m in calculation of (65)m only if cylinder is in the			J ' '
	dwelling of flot water is i	TOTTI COMMITTALINEY I	leating
5. Internal gains (see Table 5 and 5a):			
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul			
	I Aug I San I Oct	Nov Dec	 1
	Aug Sep Oct	Nov Dec	(66)
(66)m= 138.29 138.29 138.29 138.29 138.29 138.29 138.29	138.29 138.29 138.29	Nov Dec 138.29 138.29	(66)
(66)m= 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5	138.29 138.29	J
(66)m= 138.29	also see Table 5 11.28 15.14 19.23	 	(66)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92	(67)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29	J
(66)m= 138.29 13	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58	(67) (68)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92	(67)
(66)m= 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 Lighting gains (calculated in Appendix L, equation L9 or L9a), (67)m= 23.28 20.68 16.81 12.73 9.52 8.03 8.68 Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 261.11 263.82 256.99 242.45 224.1 206.86 195.34 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 36.83 36.83 36.83 36.83 36.83 36.83 36.83 36.83 36.83	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83	(67) (68) (69)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83	(67) (68)
(66)m= 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 138.29 Lighting gains (calculated in Appendix L, equation L9 or L9a), (67)m= 23.28 20.68 16.81 12.73 9.52 8.03 8.68 Appliances gains (calculated in Appendix L, equation L13 or L (68)m= 261.11 263.82 256.99 242.45 224.1 206.86 195.34 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 36.83 36.83 36.83 36.83 36.83 36.83 36.83 36.83 36.83 36.83 36.83 26.83	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3	[(67) (68) (69) (70)
(66)m= 138.29	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3	(67) (68) (69)
(66)m= 138.29 138.3 138.3	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3	[(67) (68) (69) (70)
(66)m= 138.29 138.68 138.68 138.68 139.3 138.29 138.68	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3 -110.63 -110.63 84.23 87.64	(67) (68) (69) (70) (71)
(66)m= 138.29 138.68 86.8 86.8 86.8 86.8 138.68 138.68 86.8 138.68 195.34 106.86 195.34 195.34 195.34 195.34 1	also see Table 5 11.28	138.29 138.29 22.44 23.92 232.34 249.58 36.83 36.83 3 3 -110.63 -110.63 84.23 87.64	(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	6.41	x	11.28	x	0.55	x	0.7	=	19.3	(75)
Northeast 0.9x 0.77	X	4.65	x	11.28	х	0.55	x	0.7	=	14	(75)
Northeast 0.9x 0.77	X	6.41	х	22.97	х	0.55	x	0.7	=	39.28	(75)
Northeast 0.9x 0.77	X	4.65	x	22.97	x	0.55	x	0.7] =	28.49	(75)
Northeast 0.9x 0.77	X	6.41	x	41.38	х	0.55	x	0.7	=	70.77	(75)
Northeast 0.9x 0.77	X	4.65	x	41.38	х	0.55	x	0.7	=	51.34	(75)
Northeast 0.9x 0.77	X	6.41	x	67.96	х	0.55	x	0.7	=	116.22	(75)
Northeast 0.9x 0.77	X	4.65	x	67.96	x	0.55	x	0.7	=	84.31	(75)
Northeast 0.9x 0.77	X	6.41	x	91.35	x	0.55	x	0.7	=	156.22	(75)
Northeast 0.9x 0.77	X	4.65	x	91.35	x	0.55	x	0.7	=	113.33	(75)
Northeast _{0.9x} 0.77	X	6.41	x	97.38	x	0.55	x	0.7	=	166.55	(75)
Northeast _{0.9x} 0.77	X	4.65	x	97.38	x	0.55	x	0.7	=	120.82	(75)
Northeast _{0.9x} 0.77	X	6.41	x	91.1	x	0.55	x	0.7	=	155.8	(75)
Northeast _{0.9x} 0.77	X	4.65	x	91.1	x	0.55	x	0.7	=	113.02	(75)
Northeast _{0.9x} 0.77	X	6.41	x	72.63	x	0.55	x	0.7	=	124.21	(75)
Northeast 0.9x 0.77	X	4.65	X	72.63	X	0.55	X	0.7		90.1	(75)
Northeast 0.9x 0.77	X	6.41	х	50.42	x	0.55	x	0.7		86.23	(75)
Northeast 0.9x 0.77	X	4.65	x	50.42	×	0.55	x	0.7	=	62.55	(75)
Northeast 0.9x 0.77	X	6.41	х	28.07	x	0.55	x	0.7	=	48	(75)
Northeast 0.9x 0.77	X	4.65	x	28.07	×	0.55	x	0.7	=	34.82	(75)
Northeast 0.9x 0.77	X	6.41	х	14.2	х	0.55	x	0.7	=	24.28	(75)
Northeast 0.9x 0.77	X	4.65	x	14.2	x	0.55	x	0.7	=	17.61	(75)
Northeast 0.9x 0.77	X	6.41	x	9.21	X	0.55	X	0.7	=	15.76	(75)
Northeast _{0.9x} 0.77	X	4.65	X	9.21	X	0.55	X	0.7	=	11.43	(75)
Southeast 0.9x 0.77	X	8.51	X	36.79	X	0.55	X	0.7	=	83.54	(77)
Southeast 0.9x 0.77	X	9.45	x	36.79	X	0.55	X	0.7	=	92.77	(77)
Southeast 0.9x 0.77	X	2.3	x	36.79	X	0.55	X	0.7	=	22.58	(77)
Southeast 0.9x 0.77	X	8.51	X	62.67	X	0.55	X	0.7	=	142.3	(77)
Southeast 0.9x 0.77	X	9.45	x	62.67	x	0.55	X	0.7	=	158.02	(77)
Southeast 0.9x 0.77	X	2.3	x	62.67	X	0.55	X	0.7	=	38.46	(77)
Southeast 0.9x 0.77	X	8.51	x	85.75	X	0.55	X	0.7	=	194.7	(77)
Southeast 0.9x 0.77	X	9.45	x	85.75	x	0.55	X	0.7	=	216.21	(77)
Southeast 0.9x 0.77	X	2.3	X	85.75	X	0.55	X	0.7	=	52.62	(77)
Southeast 0.9x 0.77	X	8.51	X	106.25	X	0.55	X	0.7	=	241.25	(77)
Southeast 0.9x 0.77	X	9.45	x	106.25	x	0.55	x	0.7	=	267.89	(77)
Southeast 0.9x 0.77	X	2.3	x	106.25	x	0.55	x	0.7	=	65.2	(77)
Southeast 0.9x 0.77	X	8.51	x	119.01	x	0.55	x	0.7	=	270.21	(77)
Southeast 0.9x 0.77	X	9.45	x	119.01	x	0.55	x	0.7	=	300.06	(77)
Southeast 0.9x 0.77	X	2.3	X	119.01	X	0.55	X	0.7	=	73.03	(77)

Southeast 0.9x	0.77	1	0.54	۱ .,	440.45	1 ,	0.55	l "	0.7	1 =	000.00	7(77)
Southeast 0.9x	0.77] X	8.51	X	118.15] X] .,	0.55	X	0.7] 1	268.26	(77)
Southeast 0.9x	0.77	X	9.45	X I	118.15] X]	0.55	X	0.7] = 1 _	297.89	(77)
Southeast 0.9x	0.77] X	2.3	l X	118.15] X] .,	0.55	X	0.7] = 1 _	72.5	(77)
Southeast 0.9x	0.77] X	8.51	X	113.91] X	0.55	X	0.7] = 1	258.63	(77)
<u> </u>	0.77	X	9.45	X	113.91	X	0.55	X	0.7] = 1	287.2	(77)
Southeast 0.9x	0.77	X	2.3	X	113.91	X	0.55	X	0.7] = 1	69.9	(77)
Southeast 0.9x	0.77	X	8.51	X	104.39	X	0.55	X	0.7] = 1	237.02	(77)
Southeast 0.9x	0.77	X	9.45	X	104.39	X	0.55	X	0.7] = 1	263.2	(77)
Southeast 0.9x	0.77	X	2.3	X	104.39	X	0.55	X	0.7] = 1	64.06	(77)
Southeast 0.9x	0.77	X	8.51	X	92.85	X	0.55	X	0.7] = 1	210.82	(77)
Southeast 0.9x	0.77	X	9.45	X	92.85	X	0.55	X	0.7] =	234.11	(77)
Southeast 0.9x	0.77	X	2.3	X	92.85	X	0.55	X	0.7] =	56.98	(77)
Southeast 0.9x	0.77	X	8.51	X	69.27	X	0.55	X	0.7] =	157.27	(77)
Southeast 0.9x	0.77	X	9.45	Х	69.27	X	0.55	X	0.7	=	174.64	(77)
Southeast 0.9x	0.77	X	2.3	X	69.27	X	0.55	X	0.7	=	42.51	(77)
Southeast 0.9x	0.77	X	8.51	X	44.07	X	0.55	X	0.7] =	100.06	(77)
Southeast 0.9x	0.77	X	9.45	X	44.07	X	0.55	X	0.7	=	111.12	(77)
Southeast 0.9x	0.77	X	2.3	Х	44.07	Х	0.55	X	0.7	=	27.04	(77)
Southeast 0.9x	0.77	X	8.51	Х	31.49	X	0.55	X	0.7	=	71.49	(77)
Southeast _{0.9x}	0.77	X	9.45	х	31.49	×	0.55	X	0.7	=	79.39	(77)
Southeast _{0.9x}	0.77	X	2.3	X	31.49	X	0.55	X	0.7	=	19.32	(77)
Southwest _{0.9x}	0.77	X	2.3	Х	36.79		0.55	X	0.7	=	22.58	(79)
Southwest _{0.9x}	0.77	X	2.3	Х	62.67		0.55	X	0.7	=	38.46	(79)
Southwest _{0.9x}	0.77	X	2.3	X	85.75]	0.55	X	0.7	=	52.62	(79)
Southwest _{0.9x}	0.77	X	2.3	X	106.25]	0.55	X	0.7	=	65.2	(79)
Southwest _{0.9x}	0.77	X	2.3	X	119.01]	0.55	X	0.7	=	73.03	(79)
Southwest _{0.9x}	0.77	X	2.3	X	118.15]	0.55	X	0.7	=	72.5	(79)
Southwest _{0.9x}	0.77	X	2.3	X	113.91	_	0.55	X	0.7	=	69.9	(79)
Southwest _{0.9x}	0.77	X	2.3	X	104.39	_	0.55	X	0.7	=	64.06	(79)
Southwest _{0.9x}	0.77	X	2.3	X	92.85	ļ	0.55	X	0.7	=	56.98	(79)
Southwest _{0.9x}	0.77	X	2.3	X	69.27		0.55	X	0.7	=	42.51	(79)
Southwest _{0.9x}	0.77	X	2.3	X	44.07	_	0.55	X	0.7	=	27.04	(79)
Southwest _{0.9x}	0.77	X	2.3	X	31.49	_	0.55	X	0.7	=	19.32	(79)
Northwest _{0.9x}	0.77	X	2.3	X	11.28	X	0.55	X	0.7	=	6.92	(81)
Northwest _{0.9x}	0.77	X	2.3	X	22.97	X	0.55	X	0.7	=	14.09	(81)
Northwest _{0.9x}	0.77	X	2.3	x	41.38	X	0.55	X	0.7	=	25.39	(81)
Northwest _{0.9x}	0.77	X	2.3	x	67.96	X	0.55	X	0.7] =	41.7	(81)
Northwest 0.9x	0.77	x	2.3	x	91.35	x	0.55	x	0.7	=	56.05	(81)
Northwest _{0.9x}	0.77	X	2.3	x	97.38	X	0.55	X	0.7	=	59.76	(81)
Northwest _{0.9x}	0.77	X	2.3	x	91.1	X	0.55	X	0.7	=	55.9	(81)
Northwest _{0.9x}	0.77	X	2.3	X	72.63	X	0.55	X	0.7	=	44.57	(81)

Northwe	est _{0.9x}	0.77	X	2.3	3	x	50.42	x		0.55	x	0.7	=	30.94	(81)
Northwe	est _{0.9x}	0.77	X	2.3	3	x	28.07	x		0.55	x	0.7	=	17.22	(81)
Northwe	est _{0.9x}	0.77	X	2.3	3	x	14.2	x		0.55	x	0.7	=	8.71	(81)
Northwe	est _{0.9x}	0.77	X	2.3	3	x	9.21	x		0.55	_ x _	0.7		5.65	(81)
	_					_		-							
Solar g	ains in	watts, ca	alculated	for eacl	h month			(83)m =	= Su	ım(74)m	(82)m				
(83)m=	261.68	459.1	663.65	881.77	1041.94	1	3.29 1010.36	887.2	22	738.61	516.98	315.87	222.37		(83)
Total g	ains – ir	nternal a	nd solai	(84)m =	(73)m	+ (83	3)m , watts	•					•	•	
(84)m=	703.5	898.72	1087.78	1280.41	1414.1	1405	5.08 1341.22	1225.	.14	1090.21	894.3	722.37	651.01		(84)
7. Me	an inter	nal temp	erature	(heating	season)									
		•		`		<i>'</i>	ea from Tal	ole 9,	Th1	I (°C)				21	(85)
•		_	• .			_	e Table 9a)			` ,					
	Jan	Feb	Mar	Apr	May	Ò	ın Jul	Au	ıa T	Sep	Oct	Nov	Dec]	
(86)m=	1	0.99	0.95	0.85	0.67	0.4	-	0.39	-	0.64	0.92	0.99	1		(86)
L	intorno	tompor	oturo in	livina or	. T1 /f	سا	otopo 2 to -	l 7 in Ta	مامد	. 00)				I	
(87)m=	19.95	20.19	20.49	20.8	20.95	20.	steps 3 to 7	21	-	20.97	20.73	20.27	19.91	1	(87)
` ′ [l					_		20.73	20.21	19.91		(01)
· r				1		r -	lling from Ta			`				1	(0.0)
(88)m=	20.03	20.03	20.03	20.05	20.05	20.	07 20.07	20.0	7	20.06	20.05	20.04	20.04		(88)
Util <mark>isa</mark>	<mark>itio</mark> n fac	tor for g	ains for	rest of d	welling,	h2,m	(see Table	9a)							
(89)m=	1	0.98	0.94	0.82	0.61	0.4	1 0.27	0.31	1	0.57	0.89	0.99	1		(89)
Mean	interna	temper	ature in	the rest	of dwelli	ing T	2 (follow ste	eps 3 t	to 7	in Table	e 9 <mark>c</mark>)				
(90)m=	18.63	18.98	19.41	19.84	20.01	20.	06 20.07	20.0	7	20.04	19.76	19.12	18.58		(90)
			7					•		f	LA = Livin	g area ÷ (4	4) =	0.26	(91)
Mean	interna	temper	ature (fo	r the wh	ole dwe	llina)	= fLA × T1	+ (1 -	_ fl /	Δ) x T2					
(92)m=	18.97	19.29	19.69	20.09	20.25	20		20.3	\neg	20.28	20.01	19.41	18.92]	(92)
` ′ [nent to the	ne mear	internal	temper	ature	from Table	4e. w	vhe		priate			J	
(93)m=	18.82	19.14	19.54	19.94	20.1	20.		20.1	-	20.13	19.86	19.26	18.77]	(93)
8. Spa	ace hea	ting requ	uirement												
Set Ti	to the r	nean int	ernal tei	mperatui	e obtair	ned a	t step 11 of	Table	9b	, so that	t Ti,m=(76)m an	d re-cald	culate	
the uti	ilisation	factor fo	or gains	using Ta	ble 9a									1	
	Jan	Feb	Mar	Apr	May	Jı	ın Jul	Au	ıg	Sep	Oct	Nov	Dec		
г		tor for g	1	î .			-	1	_	ı		Г	1	1	(0.1)
(94)m=	0.99	0.98	0.93	0.81	0.62	0.4	11 0.28	0.32	2	0.57	0.89	0.98	1		(94)
г				4)m x (84			00 070 70	T	<u>. T</u>	204.40	704.40	700.00	L 0.17 0.4	1	(05)
(95)m=	698.51	878.22		1037.72		581		393.	3	624.43	791.49	709.29	647.81		(95)
г		_		perature				164	,	111	10.6	7.1	1 4 2	1	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	14		16.4		14.1	10.6	7.1	4.2		(96)
r	1597.53			1185.61	899.71	Lm , 583	W =[(39)m .99 373.96	X [(93 393.7	_	638.85	991.19	1311.1	1582	l	(97)
` ' L						<u> </u>	nonth = 0.02		_				1302	J	(01)
(98)m=	668.87	459.03	305.9	106.48	21.85	VVII/II		24 X [(<u>31)</u>	0 0	148.58	433.3	695.03]	
(00)111-	000.01	.55.55		1 .30.40		Щ			Otal			r) = Sum(9	<u> </u>	2839.05	(98)
0				1380 / 3) /			'	otal	poi yeai (ixvviii yedi	, – Guiii(9	√J15,912 ¯		=
Space	neating	y require	ement in	kWh/m²	year									27.56	(99)

9a. Energy requirements – Indiv	idual heating s	/stems i	ncluding	ı micro-C	HP)					
Space heating:	radar reating 3)		orading	-Imoro-C	7 II)					
Fraction of space heat from sec	condary/supple	mentary	system						0	(201)
Fraction of space heat from ma	ain system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from m	nain system 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating	ng system 1								90.4	(206)
Efficiency of secondary/suppler	mentary heating	g system	າ, %						0	(208)
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space heating requirement (ca					_				1	
	106.48 21.85	0	0	0	0	148.58	433.3	695.03		
(211) m = {[(98)m x (204)] } x 10		•				404.00	470.04	700.04	Ī	(211)
739.9 507.78 338.39	117.79 24.17	0	0	0 Tota	0 I (kWh/yea	164.36	479.31	768.84	0440.54	(244)
Space heating fuel (secondary)	\ k\Mh/month			Tota	i (KVVIII yea	ar) = Ourii(2	- 1 / _{15,1012}	2	3140.54	(211)
Space heating fuel (secondary) = $\{[(98)m \times (201)]\} \times 100 \div (208)$										
(215)m = 0 0 0	0 0	0	0	0	0	0	0	0		
				Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating										
Output from water heater (calcul	lated above)	150.49	144.18	160.73	162.5	184.08	194.63	208.76		
Efficiency of water heater	170.46	150.49	144.10	100.73	102.5	104.00	194.03	200.70	80.3	(216)
(217)m= 87.73 87.21 86.14	83.82 81.33	80.3	80.3	80.3	80.3	84.52	87.01	87.85	00.3	(217)
Fuel for water heating, kWh/mor										
(219) m = (64) m x $100 \div (217)$ m	n							T		
(219)m= 243.83 216.19 229.87	210.54 210.09	187.41	179.55	200.16	202.37 I = Sum(2	217.8	223.69	237.64	0550.44	7(240)
Annual totals				Tota	1 - Sum(2		Wh/yeaı	<u>,</u>	2559.11	(219)
Space heating fuel used, main s	system 1					K.	wii/yeai		kWh/yea 3140.54	ar T
Water heating fuel used	•								2559.11	=
Electricity for pumps, fans and e	electric keep-hot	t								
mechanical ventilation - balanc	·		nout fron	n outside	۵			247.72		(230a)
central heating pump:	ca, extract or p	OSILIVE II	iput iroi	n oatolat	•			30		(230c)
Total electricity for the above, k	Mh/vear			sum	of (230a).	(230a) =		30	277 72	(231)
•	/vii/yeai			oum	01 (2004).	(2009)			277.72	
Electricity for lighting									411.09	(232)
Electricity generated by PVs									-271.71	(233)
12a. CO2 emissions – Individua	al heating syste	ms inclu	uding mi	cro-CHP						
			ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emission kg CO2/y	
Space heating (main system 1)		(211	1) x			0.2	16	=	678.36	(261)
Space heating (secondary)		(215	5) x			0.5	19	=	0	(263)
Water heating		(219	9) x			0.2		=	552.77	(264)
Č							-			`` ′

Space and water heating	(261) + (262) + (263) + (264) =		1231.12	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	144.14	(267)
Electricity for lighting	(232) x	0.519 =	213.36	(268)
Energy saving/generation technologies				
Item 1		0.519	-141.02	(269)
Total CO2, kg/year	sum of (2	265)(271) =	1447.6	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4	4) =	14.05	(273)
El rating (section 14)			87	(274)

User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.4.16 Property Address: Flat 04 Address: 1. Overall dwelling dimensions Area(m²) Av. Height(m) Volume(m³) **Basement** 59.89 (1a) x 2.7 (2a) =161.7 (3a) Ground floor (1b) x (2b) (3b) 46.65 3.27 152.55 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)106.54 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 314.25 2. Ventilation rate: main secondary other total m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c)0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 1 (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21)0.15 Infiltration rate modified for monthly wind speed Sep Jan Feb Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7

4.9

4.4

5

3.8

4.3

3.8

3.7

4

4.3

4.5

4.7

(22)m=

5.1

Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infiltr	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m		-		-	
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18]	
Calculate effe		•	rate for t	he appli	cable ca	se	!		!	!		, 	1,00
If mechanic			andiv N. (2	2h) = (22c) v Emu (a	auation (NEN otho	nuina (22h	s) = (22a)			0.5	(23a)
If balanced with)) = (23a)			0.5	(23b)
a) If balance		•	•	_		,		•	2b)m + (23b) × [1 – (23c)	73.9 ÷ 1001	(23c)
(24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31]	(24a)
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (ľ	MV) (24t)m = (2	2b)m + (2	23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h				•	•					-	-	_	
if (22b)r	n < 0.5 ×	(23b), t	hen (24)	c) = (23b); other	vise (24	c) = (22h	o) m + 0	.5 × (23b)		1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural if (22b)r	ventilation n = 1, the				•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(25)
3. Heat losse	es and he	eat loss r	paramete	er:									
3. Heat losse ELEMENT	Gros	SS	oaramete Openin m	gs	Net Ar		U-valı W/m2		A X U	()	k-value		A X k kJ/K
	Gros area	SS	Openin	gs	Net Ar A ,r 8.51	m²	U-vali W/m2 /[1/(1.2)+	2K	A X U (W/I	()	k-value kJ/m²·		A X k kJ/K
ELEMENT	Gros area e 1	SS	Openin	gs	A ,r	m² x1	W/m2	2K 0.04] =	(W/I	<) 			kJ/K
ELEMENT Windows Type	Gros area e 1	SS	Openin	gs	A ,r	m² x1 x1	W/m2 /[1/(1.2)+	0.04] = 0.04] =	9.74	<) 			kJ/K (27)
ELEMENT Windows Type Windows Type	Gros área e 1 e 2 e 3	SS	Openin	gs	A ,r 8.51 2.3	m ² x1 x1 x1	W/m2 /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] =	9.74 2.63	<) 			kJ/K (27) (27)
Windows Type Windows Type Windows Type	Gros área e 1 e 2 e 3	SS	Openin	gs	A ,r 8.51 2.3 8.51	x1 x1 x1 x1 x1	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] =	9.74 2.63 9.74	<) 			kJ/K (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	Gros área e 1 e 2 e 3	ss (m²)	Openin	gs	A ,r 8.51 2.3 8.51 5.35	x1 x1 x1 x1 x1	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 9.74 6.13	<) 			kJ/K (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Floor	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs ²	A ,r 8.51 2.3 8.51 5.35 59.89	x1 x1 x1 x2 x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] =	9.74 2.63 9.74 6.13 5.989	<)			kJ/K (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Floor Walls Type1	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs ²	A ,r 8.51 2.3 8.51 5.35 59.89	x1 x1 x1 x2 x x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 	0.04] = 0.04] = 0.04] = 0.04] = = = =	9.74 2.63 9.74 6.13 5.989 1.86	<)			kJ/K (27) (27) (27) (27) (28)
Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2	Gros area e 1 e 2 e 3 e 4	22 16 15	Openin m	gs ²	A ,r 8.51 2.3 8.51 5.35 59.89 11.62	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16	0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	9.74 2.63 9.74 6.13 5.989 1.86	<)			kJ/K (27) (27) (27) (27) (28) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3	22 26 35 88	0 24.6 0	gs ²	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 10.29	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = =	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98	<)			kJ/K (27) (27) (27) (27) (28) (29) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3 15.9	55 (m²) 66 85 88	0 24.6 0	gs ²	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 10.29 62.35	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.16	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98 1.92	<)			kJ/K (27) (27) (27) (27) (28) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Total area of e	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3 15.9 16.4 elelements	55 (m²) 26 25 28 28 28 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	Openin m 0 24.6 0 0 0 effective wi	gs ² 7	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 62.35 15.98 16.48 201.2	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.16 0.12	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98 1.92 1.98		kJ/m²·	K	(27) (27) (27) (27) (28) (29) (29) (29) (30)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Total area of e	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3 15.9 16.4 elements	22	Openin m 0 24.6 0 0 ceffective winternal wall	gs ² 7	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 62.35 15.98 16.48 201.2	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.1 0.16 0.16 0.16 0.12	0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = = = = = = = =	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98 1.92 1.98		kJ/m²·	K	(27) (27) (27) (27) (28) (29) (29) (29) (30) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Total area of e * for windows and ** include the area	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3 15.9 16.4 elements d roof windows, W/K =	52 66 68 88 98 98 98 98 98 98 98 98 9	Openin m 0 24.6 0 0 ceffective winternal wall	gs ² 7	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 62.35 15.98 16.48 201.2	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04]	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98 1.92 1.98	as given in	kJ/m²·	K	(27) (27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Walls Type3 Roof Type1 Roof Type2 Total area of e * for windows and ** include the are Fabric heat los	Gros area e 1 e 2 e 3 e 4 11.6 34.9 62.3 15.9 16.4 elements d roof windd as on both ss, W/K = Cm = S(55 (m²) 66 (m²) 76 (m²) 77 (m²) 78 (m²) 78 (m²) 78 (m²) 78 (m²) 78 (m²) 79 (m²)	Openin m 24.6 0 0 effective winternal walk U)	gs 2 7 Indow U-vals and part	A ,r 8.51 2.3 8.51 5.35 59.89 11.62 62.35 15.98 16.48 201.2 alue calculatitions	x1 x1 x1 x1 x2 x x x x x x x x x x x x x	W/m2 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = 0.04] = = 0.04] =	9.74 2.63 9.74 6.13 5.989 1.86 1.65 9.98 1.92 1.98	as given in (2) + (32a)	kJ/m²·	h 3.2	(27) (27) (27) (27) (28) (29) (29) (29) (30) (30) (31)

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.

	al bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix k	<						7.67	(36)
		0 0	are not kn	own (36) =	0.15 x (3	1)								_
Total fa	abric he	at loss							(33) +	(36) =			59.28	(37)
Ventila	ation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)	· · · · · · · · · · · · · · · · · · ·		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	33.34	32.95	32.56	30.62	30.23	28.28	28.28	27.9	29.06	30.23	31.01	31.78		(38)
Heat tr	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	92.62	92.23	91.84	89.9	89.51	87.56	87.56	87.17	88.34	89.51	90.28	91.06		
Heat lo	oss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) _{1.} (4)	12 /12=	89.8	(39)
(40)m=	0.87	0.87	0.86	0.84	0.84	0.82	0.82	0.82	0.83	0.84	0.85	0.85		
								!	,	Average =	Sum(40) _{1.}	12 /12=	0.84	(40)
Numbe	er of day	s in mor	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ener	gy requi	irement:								kWh/ye	ear:	
Λ			. I											
		ipancy, l		[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0)013 x (ΓFA -13.		79		(42)
	A £ 13.9		6 /	L. Oxip	(0.000	(7	/_/]						
								(25 x N)).52		(43)
				usage by a day (all w			-	to achieve	a water us	se target o	1			
			_					Aug	Con	Oct	Nov	Dec		
Hot water	Jan er usage ii	Feb	Mar	Apr	May	Jun	Jul	I AHO				i Deci		
		n litres ber	day for ea	ch month	Vd.m = fa	ctor from T	able 1c x		Sep	Oct	NOV			
(44)m=				ach month				(43)						
(44)m=	110.57	106.55	day for ea	98.51	<i>Vd,m = fa</i> 94.49	otor from 7	90.47		98.51	102.53	106.55	110.57	1206 23	7(44)
	110.57	106.55	102.53	98.51	94.49	90.47	90.47	(43)	98.51	102.53 Fotal = Su	106.55 m(44) ₁₁₂ =	110.57	1206.23	(44)
	110.57	106.55	102.53	98.51	94.49	90.47	90.47	94.49	98.51	102.53 Fotal = Su	106.55 m(44) ₁₁₂ =	110.57	1206.23	(44)
Energy	110.57	106.55	102.53 used - cal	98.51	94.49 onthly = 4.	90.47 190 x Vd,n	90.47 m x nm x D	94.49 OTm / 3600	98.51 9 kWh/mon	102.53 Total = Su tth (see Ta 133.96	106.55 m(44) ₁₁₂ = ables 1b, 1	110.57 : c, 1d)	1206.23	(44)
Energy (45)m=	110.57 content of	106.55 hot water 143.41	102.53 used - cal	98.51 culated mo	94.49 onthly = 4.	90.47 190 x Vd,n	90.47 n x nm x E 98.99	94.49 OTm / 3600	98.51 98.51 98.Wh/mort	102.53 Total = Su tth (see Ta 133.96	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23	110.57 : c, 1d)		
Energy (45)m= If instan (46)m=	110.57 content of 163.97 taneous w	106.55 hot water 143.41 vater heatin 21.51	102.53 used - cal	98.51 culated mo	94.49 onthly = 4.	90.47 190 x Vd,n	90.47 n x nm x E 98.99	94.49 97m / 3600 113.59	98.51 98.51 98.Wh/mort	102.53 Total = Su tth (see Ta 133.96	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23	110.57 : c, 1d)		
Energy (45)m= If instant (46)m= Water	content of 163.97 taneous w 24.6 storage	106.55 hot water 143.41 vater heatin 21.51 loss:	102.53 used - cal 147.99 ng at point 22.2	98.51 culated model 129.02 of use (not 19.35)	94.49 onthly = 4. 123.8 hot water 18.57	90.47 190 x Vd,n 106.83 - storage), 16.02	90.47 n x nm x D 98.99 enter 0 in 14.85	(43) 94.49 07m / 3600 113.59 boxes (46) 17.04	98.51 9 kWh/mon 114.95 9 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ =	110.57 : c, 1d) 158.8		(45)
Energy (45)m= If instant (46)m= Water Storage	content of 163.97 taneous w 24.6 storage	106.55 hot water 143.41 vater heatin 21.51 loss: e (litres)	102.53 used - cal 147.99 ng at point 22.2 includir	98.51 culated model 129.02 for use (not 19.35) ng any so	94.49 onthly = 4. 123.8 hot water 18.57 olar or W	90.47 190 x Vd,n 106.83 storage), 16.02	90.47 n x nm x E 98.99 enter 0 in 14.85 storage	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa	98.51 9 kWh/mon 114.95 9 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ =	110.57 : c, 1d) 158.8		(45)
Energy (45)m= If instant (46)m= Water Storag If comm	110.57 content of 163.97 taneous w 24.6 storage ye volum munity h	hot water 143.41 21.51 loss: e (litres)	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta	98.51 culated model 129.02 for use (not 19.35) and any south in dw.	94.49 onthly = 4. 123.8 hot water 18.57 olar or Welling, e	90.47 190 x Vd,n 106.83 storage), 16.02 /WHRS	90.47 98.99 enter 0 in 14.85 storage	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47)	98.51 9 kWh/mon 114.95 1 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8		(45)
Energy (45)m= If instan (46)m= Water Storag If comi	taneous w 24.6 storage ye volum munity h	hot water 143.41 21.51 loss: e (litres) eating a o stored	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta	98.51 culated model 129.02 for use (not 19.35) and any south in dw.	94.49 onthly = 4. 123.8 hot water 18.57 olar or Welling, e	90.47 190 x Vd,n 106.83 storage), 16.02 /WHRS	90.47 98.99 enter 0 in 14.85 storage	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa	98.51 9 kWh/mon 114.95 1 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8		(45)
Energy (45)m= If instant (46)m= Water Storag If comit Otherv Water	taneous w 24.6 storage working if no storage	hot water 143.41 21.51 loss: e (litres) eating as stored loss:	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate	98.51 culated model 129.02 for use (not 19.35) ag any sounk in dwer (this in	94.49 onthly = 4. 123.8 o hot water 18.57 olar or W relling, e cludes i	90.47 190 x Vd,n 106.83 storage), 16.02 /WHRS = nter 110 nstantan	90.47 98.99 enter 0 in 14.85 storage litres in neous co	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47)	98.51 9 kWh/mon 114.95 1 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82		(45) (46) (47)
Energy (45)m= If instan (46)m= Water Storag If cominothery Water a) If m	taneous w 24.6 storage we volum munity h vise if no storage nanufact	hot water 143.41 21.51 loss: lee (litres) leeating as o stored loss: lurer's de	102.53 used - cal 147.99 ng at point 22.2 includir and no tal hot water	98.51 culated model 129.02 for use (not 19.35) and any south in dwarf (this in the coss factors)	94.49 onthly = 4. 123.8 o hot water 18.57 olar or W relling, e cludes i	90.47 190 x Vd,n 106.83 storage), 16.02 /WHRS = nter 110 nstantan	90.47 98.99 enter 0 in 14.85 storage litres in neous co	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47)	98.51 9 kWh/mon 114.95 1 to (61) 17.24	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82		(45) (46) (47) (48)
Energy (45)m= If instant (46)m= Water Storag If commodities Otherw Water a) If m Tempe	taneous w 24.6 storage ye volum munity h vise if no storage nanufact erature fi	hot water 143.41 21.51 loss: e (litres) eating a o stored loss: urer's de	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate eclared I m Table	98.51 culated model 129.02 for use (not 19.35) and any south in dwarf (this in the cost factor 2b	94.49 onthly = 4. 123.8 hot water 18.57 olar or Water relling, excludes in the column of the c	90.47 190 x Vd,n 106.83 storage), 16.02 /WHRS = nter 110 nstantan	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47) ombi boile	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82		(45) (46) (47) (48) (49)
Energy (45)m= If instan (46)m= Water Storag If cominothery Water a) If m Temper Energy	taneous w 24.6 storage ye volum munity h vise if no storage nanufact erature fi	hot water 143.41 21.51 loss: e (litres) eating a control of stored loss: urer's defactor from water	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot water eclared I m Table	98.51 culated model 129.02 for use (not 19.35) and any south in dweer (this in oss factors 2b k, kWh/ye	94.49 onthly = 4. 123.8 hot water 18.57 olar or W relling, e cludes i or is knowear	90.47 190 x Vd,n 106.83 s storage), 16.02 /WHRS : nter 110 nstantan	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47)	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82		(45) (46) (47) (48)
Energy (45)m= If instan (46)m= Water Storag If comi Otherv Water a) If m Tempe Energy b) If m	taneous w 24.6 storage we volum munity h vise if no storage nanufact erature fi	hot water 143.41 21.51 loss: e (litres) eating a o stored loss: urer's de actor fro m water urer's de	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate eclared I m Table storage	98.51 culated model 129.02 for use (not 19.35) and any south in dwarf (this in the cost factor 2b	94.49 onthly = 4. 123.8 hot water 18.57 olar or W relling, e cludes i or is knower ear oss factor	90.47 190 x Vd,n 106.83 16.02 /WHRS : nter 110 nstantan wn (kWh	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47) ombi boile	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82		(45) (46) (47) (48) (49)
Energy (45)m= If instan (46)m= Water Storag If cominothery Water a) If m Temper Energy b) If m Hot water	taneous w 24.6 storage ye volum munity h vise if no storage nanufact erature fi y lost fro nanufact ater stora munity h	hot water 143.41 21.51 loss: e (litres) eating a control of the stored loss: urer's defactor from water urer's defage loss leating s	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate eclared I m Table storage eclared of	98.51 culated model 129.02 for use (not 19.35) ag any sounk in dwer (this in oss factor 2b) cylinder I com Table	94.49 onthly = 4. 123.8 hot water 18.57 olar or W relling, e cludes i or is knower ear oss factor	90.47 190 x Vd,n 106.83 16.02 /WHRS : nter 110 nstantan wn (kWh	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47) ombi boile	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82 0		(45) (46) (47) (48) (49) (50)
Energy (45)m= If instant (46)m= Water Storag If comin Otherv Water a) If m Tempe Energy b) If m Hot wa If comin Volume	taneous w 24.6 storage we volume munity h vise if no storage nanufact erature fi y lost fro nanufact ater stora munity h e factor	hot water 143.41 21.51 loss: e (litres) eating a control stored loss: urer's defactor from water urer's defage loss eating s from Tai	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate eclared I m Table storage eclared of factor fr ee section	98.51 culated model 129.02 for use (not 19.35) and any so the ser (this in 19.35) coss factor 2b cylinder I from Table on 4.3	94.49 onthly = 4. 123.8 hot water 18.57 olar or W relling, e cludes i or is knower ear oss factor	90.47 190 x Vd,n 106.83 16.02 /WHRS : nter 110 nstantan wn (kWh	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47) ombi boile	98.51 98.51 114.95 10 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82 0		(45) (46) (47) (48) (49) (50)
Energy (45)m= If instant (46)m= Water Storag If comit Otherv Water a) If m Tempe Energy b) If m Hot wa If comit Volume	taneous w 24.6 storage we volume munity h vise if no storage nanufact erature fi y lost fro nanufact ater stora munity h e factor	hot water 143.41 21.51 loss: e (litres) eating a control of the stored loss: urer's defactor from water urer's defage loss leating s	102.53 used - cal 147.99 ng at point 22.2 includir nd no ta hot wate eclared I m Table storage eclared of factor fr ee section	98.51 culated model 129.02 for use (not 19.35) and any so the ser (this in 19.35) coss factor 2b cylinder I from Table on 4.3	94.49 onthly = 4. 123.8 hot water 18.57 olar or W relling, e cludes i or is knower ear oss factor	90.47 190 x Vd,n 106.83 16.02 /WHRS : nter 110 nstantan wn (kWh	90.47 98.99 enter 0 in 14.85 storage litres in neous con/day):	(43) 94.49 97m / 3600 113.59 boxes (46) 17.04 within sa (47) ombi boile	98.51 98.51 114.95 1 to (61) 17.24 ame vess	102.53 Fotal = Su tth (see Ta 133.96 Fotal = Su 20.09 sel	106.55 m(44) ₁₁₂ = ables 1b, 1 146.23 m(45) ₁₁₂ = 21.93	110.57 c, 1d) 158.8 23.82 0		(45) (46) (47) (48) (49) (50) (51)

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)	
Enter (50) or (54) in (55)		0	(55)	
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$			
(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 Append	lix H	
(57)m= 0 0 0 0 0 0	0 0 0	0 0	(57)	
Primary circuit loss (annual) from Table 3		0	(58)	
Primary circuit loss calculated for each month (59)m = (58) ÷	365 × (41)m			
(modified by factor from Table H5 if there is solar water hea	ating and a cylinder therm	ostat)		
(59)m= 0 0 0 0 0 0	0 0 0	0 0	(59)	
Combi loss calculated for each month (61)m = (60) ÷ 365 × (4	l1)m			
(61)m= 50.96 46.03 50.96 48.58 48.15 44.61 46.1	48.15 48.58 50.96	49.32 50.96	(61)	
Total heat required for water heating calculated for each mon	th (62)m = 0.85 × (45)m +	(46)m + (57)m +	(59)m + (61)m	
(62)m= 214.93 189.44 198.95 177.6 171.95 151.44 145.0	9 161.74 163.53 184.92	195.55 209.76	(62)	
Solar DHW input calculated using Appendix G or Appendix H (negative quar	tity) (enter '0' if no solar contribu	ition to water heating)		
(add additional lines if FGHRS and/or WWHRS applies, see A	Appendix G)		_	
(63)m= 0 0 0 0 0 0	0 0 0	0 0	(63)	
Output from water heater				
(64)m= 214.93 189.44 198.95 177.6 171.95 151.44 145.0	9 161.74 163.53 184.92	195.55 209.76		
	Output from water heate	er (annual) ₁₁₂	2164.91 (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	1]	
(65)m= 67.26 59.19 61.95 55.04 53.2 46.67 44.44	49.81 50.37 57.28	CO OF CE E4	1 (65)	
	49.61 30.57 37.28	00.95 05.54	(65)	
include (57)m in calculation of (65)m only if cylinder is in the			J '	
include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):			J '	
5. Internal gains (see Table 5 and 5a):			J '	
			J '	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	e dwelling or hot water is to Aug Sep Oct	from community h	J '	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.62 139.62 139.62 139.62 139.62 139.62	Aug Sep Oct 139.62 139.62	rom community h	neating	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul	Aug Sep Oct 139.62 139.62	rom community h	neating	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62	Nov Dec 139.62	neating (66)	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5	Nov Dec 139.62	neating (66)	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4	Nov Dec 139.62 139.62	(66)	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.62 139.62 139.62 139.62 139.62 139.62 Lighting gains (calculated in Appendix L, equation L9 or L9a) (67)m= 23.76 21.1 17.16 12.99 9.71 8.2 8.86 Appliances gains (calculated in Appendix L, equation L13 or I	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5	Nov Dec 139.62 139.62	(66)	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.62 139.62 139.62 139.62 139.62 139.62 Lighting gains (calculated in Appendix L, equation L9 or L9a), (67)m= 23.76 21.1 17.16 12.99 9.71 8.2 8.86 Appliances gains (calculated in Appendix L, equation L13 or I (68)m= 266.49 269.25 262.28 247.45 228.72 211.12 199.3 Cooking gains (calculated in Appendix L, equation L15 or L15 (69)m= 36.96 36.96 36.96 36.96 36.96 36.96 36.96	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73	(66) (67) (68)	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.62 139.62 139.62 139.62 139.62 139.62 Lighting gains (calculated in Appendix L, equation L9 or L9a). (67)m= 23.76 21.1 17.16 12.99 9.71 8.2 8.86 Appliances gains (calculated in Appendix L, equation L13 or I (68)m= 266.49 269.25 262.28 247.45 228.72 211.12 199.3 Cooking gains (calculated in Appendix L, equation L15 or L15)	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73	(66) (67) (68)	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 5a), also see Table 5 5 36.96 36.96 36.96	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96	(66) (67) (68) (69)	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 6a), also see Table 5 6 36.96 36.96 36.96 3 3 3 3	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96	(66) (67) (68) (69)	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 6a), also see Table 5 6 36.96 36.96 36.96 3 3 3 3	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96 3	[] (66) (67) (68) (69) (70)	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 6a), also see Table 5 7 36.96 36.96 36.96 3 3 3 3	0		
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 6a), also see Table 5 7 36.96 36.96 36.96 3 3 3 3	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96 3 3 3 3 -111.7 -111.7	(66) (67) (68) (69) (70)	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul (66)m= 139.62 139.	Aug Sep Oct 2 139.62 139.62 139.62 also see Table 5 11.52 15.46 19.62 13a), also see Table 5 6 196.6 203.57 218.4 6a), also see Table 5 3 36.96 36.96 36.96 3 3 3 3 7 -111.7 -111.7 -111.7	Nov Dec 139.62 139.62 22.91 24.42 237.13 254.73 36.96 36.96 3 3 3 3 -111.7 -111.7 84.65 88.09 71)m + (72)m	(66) (67) (68) (69) (70) (71) (72)	

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

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	X	8.51	x	36.79	x	0.55	x	0.7	=	83.54	(77)
Southeast 0.9x	0.77	X	8.51	x	36.79	x	0.55	x	0.7	=	83.54	(77)
Southeast 0.9x	0.77	X	5.35	x	36.79	x	0.55	x	0.7	=	52.52	(77)
Southeast 0.9x	0.77	X	8.51	x	62.67	x	0.55	x	0.7] =	142.3	(77)
Southeast 0.9x	0.77	X	8.51	x	62.67	x	0.55	x	0.7	=	142.3	(77)
Southeast 0.9x	0.77	X	5.35	x	62.67	x	0.55	x	0.7	=	89.46	(77)
Southeast 0.9x	0.77	X	8.51	x	85.75	x	0.55	x	0.7	=	194.7	(77)
Southeast 0.9x	0.77	X	8.51	x	85.75	x	0.55	x	0.7	=	194.7	(77)
Southeast 0.9x	0.77	X	5.35	x	85.75	x	0.55	x	0.7	=	122.4	(77)
Southeast 0.9x	0.77	X	8.51	x	106.25	x	0.55	x	0.7	=	241.25	(77)
Southeast 0.9x	0.77	X	8.51	x	106.25	x	0.55	x	0.7	=	241.25	(77)
Southeast 0.9x	0.77	X	5.35	x	106.25	x	0.55	x	0.7	=	151.66	(77)
Southeast 0.9x	0.77	X	8.51	x	119.01	x	0.55	x	0.7	=	270.21	(77)
Southeast 0.9x	0.77	X	8.51	x	119.01	X	0.55	x	0.7	=	270.21	(77)
Southeast 0.9x	0.77	X	5.35	x	119.01	X	0.55	x	0.7	=	169.88	(77)
Southeast 0.9x	0.77	X	8.51	X	118.15	X	0.55	X	0.7] =	268.26	(77)
Southeast 0.9x	0.77	X	8.51	х	118.15	x	0.55	x	0.7		268.26	(77)
Southeast 0.9x	0.77	X	5.35	x	118.15	×	0.55	x	0.7	=	168.65	(77)
Southeast 0.9x	0.77	X	8.51	х	113.91	x	0.55	x	0.7	=	258.63	(77)
Southeast 0.9x	0. <mark>77</mark>	X	8.51	х	113.91	_x	0.55	x	0.7	=	258.63	(77)
Southeast 0.9x	0.77	X	5.35	х	113.91	х	0.55	x	0.7	=	162.59	(77)
Southeast 0.9x	0.77	X	8.51	х	104.39	X	0.55	x	0.7	=	237.02	(77)
Southeast 0.9x	0.77	X	8.51	X	104.39	X	0.55	X	0.7	=	237.02	(77)
Southeast 0.9x	0.77	X	5.35	X	104.39	X	0.55	X	0.7	=	149.01	(77)
Southeast 0.9x	0.77	X	8.51	X	92.85	X	0.55	X	0.7	=	210.82	(77)
Southeast 0.9x	0.77	X	8.51	x	92.85	x	0.55	x	0.7	=	210.82	(77)
Southeast 0.9x	0.77	X	5.35	x	92.85	x	0.55	X	0.7	=	132.54	(77)
Southeast 0.9x	0.77	X	8.51	x	69.27	x	0.55	X	0.7	=	157.27	(77)
Southeast 0.9x	0.77	X	8.51	X	69.27	X	0.55	X	0.7	=	157.27	(77)
Southeast 0.9x	0.77	X	5.35	x	69.27	x	0.55	X	0.7	=	98.87	(77)
Southeast 0.9x	0.77	X	8.51	x	44.07	x	0.55	X	0.7	=	100.06	(77)
Southeast 0.9x	0.77	X	8.51	x	44.07	x	0.55	x	0.7	=	100.06	(77)
Southeast 0.9x	0.77	X	5.35	x	44.07	x	0.55	X	0.7	=	62.91	(77)
Southeast 0.9x	0.77	X	8.51	x	31.49	x	0.55	X	0.7	=	71.49	(77)
Southeast 0.9x	0.77	X	8.51	x	31.49	X	0.55	X	0.7	=	71.49	(77)
Southeast 0.9x	0.77	X	5.35	x	31.49	x	0.55	X	0.7	=	44.95	(77)
Southwest _{0.9x}	0.77	X	2.3	x	36.79]	0.55	X	0.7	=	22.58	(79)
Southwest _{0.9x}		X	2.3	x	62.67]	0.55	x	0.7	=	38.46	(79)
Southwest _{0.9x}	0.77	X	2.3	X	85.75		0.55	X	0.7	=	52.62	(79)

_					_									_		<u>_</u>
Southwest _{0.9x}	0.77	X	2.3	3	x L	10	06.25			0.55	X	0.7		• <u>L</u>	65.2	(79)
Southwest _{0.9x}	0.77	X	2.3	3	х	1	19.01			0.55	X	0.7	:		73.03	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x [1	18.15			0.55	x	0.7			72.5	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x [1	13.91			0.55	x	0.7			69.9	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x [10	04.39			0.55	x	0.7			64.06	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x [9	2.85			0.55	x	0.7	:		56.98	(79)
Southwest _{0.9x}	0.77	X	2.3	3	x [6	9.27			0.55	x [0.7			42.51	(79)
Southwest _{0.9x}	0.77	x	2.3	3	x [4	4.07			0.55	x [0.7		-	27.04	(79)
Southwest _{0.9x}	0.77	x	2.3	3	x [3	1.49			0.55	x	0.7		-	19.32	(79)
				_									_			
Solar gains in v	watts, cald	culated	for each	n month				(83)m	= Su	ım(74)m .	(82)m					
(83)m= 242.18	412.52	564.43	699.36	783.34	77	7.67	749.76	687.	11	611.16	455.92	290.08	207.2	6		(83)
Total gains – ir	nternal an	d solar	(84)m =	: (73)m -	+ (8	3)m	, watts									
(84)m= 690.72	858.84	995.02	1104.13	1161.16	11	29.7	1085.6	1030	.05	968.02	838.83	702.65	642.3	8		(84)
7. Mean intern	nal tempe	rature (heating	season)											
Temperature	during he	ating pe	eriods ir	the livir	ng a	area f	from Tab	ole 9,	Th1	l (°C)					21	(85)
Utilisation fac	tor for gai	ns for li	ving are	a, h1,m	(se	е Та	ble 9a)			, ,				_		
Jan	Feb	Mar	Apr	May	Ė	Jun	Jul	Αι	ıg	Sep	Oct	Nov	De			
(86)m= 1	0.99	0.96	0.86	0.69	0	.49	0.35	0.3		0.62	0.91	0.99	1			(86)
Me <mark>an int</mark> ernal	temperat	ure in li	iving are	ea T1 (fo	ارمال	v ste	ns 3 to 7	in T	ahle	9c)						
(87)m= 20.2		20.65	20.87	20.97		21	21	21		20.99	20.84	20.48	20.17	,		(87)
` '					4	11:	form To		71							
Temperature (88)m= 20.19	20.2	20.2	20.22	20.22		211111g 0.23	20.23	20.2	_	20.23	20.22	20.21	20.21	\neg		(88)
										20.20	20.22	20.21	20.2			(55)
Utilisation fac			1			<u> </u>		–		0.55				_		(00)
(89)m= 1	0.98	0.94	0.83	0.64	0	.44	0.29	0.3	2	0.55	0.88	0.99	1			(89)
Mean internal	temperat	ure in t		of dwelli	ng	T2 (f	ollow ste	ps 3	to 7	in Tabl	e 9c)	•		_		
(90)m= 19.13	19.43	19.76	20.08	20.19	20	0.23	20.23	20.2	24	20.22	20.05	19.54	19.09)		(90)
										f	LA = Livir	ng area ÷ (4	4) =		0.25	(91)
Mean internal	temperat	ure (for	the wh	ole dwe	ling	g) = fl	_A × T1	+ (1 -	– fL	A) × T2						
(92)m= 19.39	19.67	19.98	20.27	20.39	20	0.42	20.42	20.4	13	20.41	20.25	19.77	19.36	5		(92)
Apply adjustm	nent to the	mean	internal	temper	atur	re fro	m Table	4e, v	whe	re appro	priate			_		
(93)m= 19.24	19.52	19.83	20.12	20.24	20	0.27	20.27	20.2	28	20.26	20.1	19.62	19.21			(93)
8. Space heat	ting requir	rement														
Set Ti to the r					ed	at ste	ep 11 of	Table	e 9b	, so tha	t Ti,m=(76)m an	d re-ca	alcula	ate	
the utilisation	1					1	l. d	۸.	1	0	0-4	Navi		П		
Jan Utilisation fac	Feb tor for gain	Mar	Apr	May		Jun	Jul	Αι	ıg [Sep	Oct	Nov	De			
(94)m= 0.99	0.98	0.94	0.82	0.64	0	.44	0.3	0.3	3	0.56	0.87	0.98	1	7		(94)
Useful gains,							0.0	0.0		0.00	0.01	0.00	<u> </u>			(- /
(95)m= 686.43		931.58	910.2	746.31	49	5.57	321.72	337.	85	538.93	731.87	690	639.6	9		(95)
Monthly avera	age exterr	nal temi	ı perature	from Ta	able	 e 8						<u> </u>	<u> </u>			
(96)m= 4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.4	4	14.1	10.6	7.1	4.2			(96)
Heat loss rate	for mean	interna	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93	 3)m-	 - (96)m]	-	I	_		
	1348.36 1			764.23		6.76	321.79	337.	' T	544.38	849.94	1130.77	1366.8	88		(97)
	<u>!</u>									!		!				

8)m= 519.08	341.37	217.97	71.09	13.34	0	0	0	0	87.84	317.35	541.03		
							Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2109.08	(98)
Space heating	g require	ement in	kWh/m²	/year							Ī	19.8	(99)
a. Energy req	uiremer	ıts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)			_		
Space heatin	_			, .							г		٦,,,,
raction of spa					mentary	-		(201) -			Ĺ	0	(20
raction of spa			-	• ,			(202) = 1 - (204) =	, ,	(202)] =		Ĺ	1	(20)
Fraction of tot		•	-				(204) - (20	02) ^ [1 -	(203)] =		Ĺ	1	(20
Efficiency of n Efficiency of s	•				a evetor	0/2					Ĺ	90.4	(20)
							A	0.5.5	0-4	Navi		0	
Jan J Space heating	Feb	Mar ement (c	Apr alculate	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
519.08	341.37	217.97	71.09	13.34	0	0	0	0	87.84	317.35	541.03		
 (98)]} = m(11	m x (20	4)] } x 1	00 ÷ (20)6)									(21
574.21	377.62	241.12	78.64	14.75	0	0	0	0	97.17	351.05	598.49		
							Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2333.06	(21
Space heating				month									
$\begin{cases} [(98)m \times (20)] \\ (15)m = 0 \end{cases}$	1)] } x 1	00 ÷ (20 0	8)	0	0	0	0	0	0	0	0		
	0	U	0	0	0	9				215) _{15,1012}		0	(21
at <mark>er he</mark> ating											L		┛`
utput from wa		ter (calc	ulated a	bove)									
	189.44	198.95	177.6	171.95	151.44	145.09	161.74	163.53	184.92	195.55	209.76		٠,,,
ficiency of wa			92.05	90.05	90.2	90.2	00.2	90.2	02.2	96.26	07.22	80.3	(21
17)m= 87.19 uel for water h	86.52	85.28	82.95	80.95	80.3	80.3	80.3	80.3	83.3	86.26	87.33		(21
(64)r = (64) r	-												
19)m= 246.51	218.96	233.28	214.11	212.41	188.6	180.69	201.43	203.65	222.01	226.69	240.19		_
							lota	I = Sum(2				2588.52	(21
nnual totals pace heating	fuel use	ed. main	svstem	1					K	Wh/year	· 	2333.06	r T
ater heating			-,								L T	2588.52	╡
•			olootrio	kaan ha							Ĺ	2000.02	
ectricity for p	•			·									
nechanical ve			cea, ext	ract or p	ositive ii	nput fron	n outside)			258.78		(23
entral heating	g pump:										30		(23
otal electricity	for the	above, k	(Wh/yea	r			sum	of (230a).	(230g) =			288.78	(23
ectricity for liq	ghting											419.57	(23
ectricity gene	erated by	v PVs									Ī	-271.71	

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	503.94 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216	559.12 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1063.06 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	149.88 (267)
Electricity for lighting	(232) x	0.519	217.76 (268)
Energy saving/generation technologies Item 1		0.519 =	-141.02 (269)
Total CO2, kg/year	sum	of (265)(271) =	1289.68 (272)
Dwelling CO2 Emission Rate	(272	?) ÷ (4) =	12.11 (273)
El rating (section 14)			89 (274)



			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20)12		Strom Softwa				Versio	on: 1.0.4.16	
		Р	roperty	Address	: Flat 05	5				
Address :										
1. Overall dwelling dimer	nsions:									
Basement				a(m²) 1.92	(1a) x		2.5	(2a) =	Volume(m 179.81	3) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	1e)+(1n	1) 7	1.92	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	179.81	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	у П + Г	other 0	7 = [total	×	40 =	m³ per hou	ur (6a)
Number of open flues	0 +	0	- - - - -	0]	0	x	20 =	0	(6b)
Number of intermittent fan					J L		=	10 =		╡`
	13				L	0		10 =	0	(7a)
Number of passive vents					Ļ	0			0	(7b)
Number of flueless gas fire	es				L	0	X	40 =	0	(7c)
					_		<u> </u>	Air ch	nanges per h	our —
Infiltration due to chimney						0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in the		аеа, ргосеес	10 (17), (otnerwise (continue n	10111 (9) 10	(16)		0	(9)
Additional infiltration	3 (2,						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timbe	r frame or	0.35 fo	r masoni	y const	ruction			0	(11)
if both types of wall are pre		esponding to	the great	er wall are	a (after					
deducting areas of opening If suspended wooden flo		aled) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, enter	•	,	(000	,,					0	(13)
Percentage of windows									0	(14
Window infiltration				0.25 - [0.2	x (14) ÷	100] =			0	(15
Infiltration rate				(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16)
Air permeability value, o	•		•	•	•	netre of e	envelope	area	3	(17)
If based on air permeabilit	-								0.15	(18)
Air permeability value applies		nas been don	e or a deg	gree air pe	rmeability	is being u	sed		_	— (40)
Number of sides sheltered Shelter factor	ı			(20) = 1 -	[0.075 x (19)] =			0	(19)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified fo	_	ed							0.10	(
	Mar Apr May		Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind spe		<u>′ </u>				1	•	•	J	
 	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
)m : 4	ı		ı		1	1	1	ı	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25 1)m ÷ 4 .23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(224)III 1.21 1.20 1	1.1 1.00	0.33	0.90	0.92	<u> </u>	1.00	1.14	1.10	J	

0.19	0.19	0.18	0.16	0.16	o.14	0.14	0.14	0.15	0.16	0.17	0.18	1	
Calculate effec			l ' '		1 -	· ·	0.14	0.10	0.10	0.17	0.10	l	
If mechanica	l ventila	ition:										0.5	(2
If exhaust air he	at pump	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	for in-use f	actor (fron	n Table 4h) =				73.9)5
a) If balance	d mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	covery (N	MV) (24b)m = (22	2b)m + (23b)		-	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(
c) If whole ho if (22b)m				•					5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural v									0.5]	•	•		
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)		•			
25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(;
3. Heat losses	and he	nat loce i	o aranzot	or:									
LEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·l		A X k kJ/K
/indows Type		(111)			17.75		/[1/(1.2)+		20.32		KO/III	`	(2
/indows Type					4.65	-	/[1/(1.2)+	<u> </u>	5.32	Ħ			
/indows Type					4.65	-	/[1/(1.2)+	\ \ \ \ \ \	5.32	Ħ			()
/alls Type1	68.6	·e	27.0		41.61		0.16	=	6.66	┞ ┌			
/alls Type2		=		<u>^</u>		=						ᆗ 늗	
• •	17.7		0		17.76	_	0.16	[2.84				(;
otal area of el for windows and			effective wi	ndow II w	86.42		r formula 1	/[/1/ volu	(0) (0,041 (a airan in	naraarank		(;
include the area						ateu using	j ioiiiiuia i	7[(17 0- vaiu	e)+0.04] a	as giveii iii	paragrapi	1 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				40.4	7 (
eat capacity (Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	11280	.49 (3
nermal mass	parame	ter (TMF	o = Cm ÷	TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250) (:
or design assessi				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
n be used instea						,							 ,
nermal bridge	`	,		•	•	1						12.4	1 (
details of therma otal fabric hea		are not kii	OWII (30) -	- U. 13 X (3	11)			(33) +	(36) =			52.8	88 (3
entilation hea		alculated	l monthly	/						(25)m x (5))	02.0	<u> </u>
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 19.08	18.85	18.63	17.52	17.3	16.18	16.18	15.96	16.63	17.3	17.74	18.19		(;
eat transfer c		<u> </u>			<u>I</u>	I	<u>I</u>		= (37) + (37)	<u> </u>	1	I	
cat transier C	CHILLIE	it, VV/T\						(55)111	- (31) + (1	1	1	
9)m= 71.96	71.74	71.51	70.4	70.18	69.07	69.07	68.84	69.51	70.18	70.62	71.07		

Heat Ic	ss para	meter (H	HLP), W/	m²K				(40)m						
(40)m=	1	1	0.99	0.98	0.98	0.96	0.96	0.96	0.97	0.98	0.98	0.99		
N I Is			- 41- / T - 1-1	l- 4-V					,	Average =	Sum(40) ₁ .	12 /12=	0.98	(40)
Numbe			nth (Tab		N.4	1	11	A	0	0-4	N.			
(44)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ıng enei	gy requi	rement:								kWh/yea	ar:	
if TF	ed occu A > 13.9 A £ 13.9	9, N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		29		(42)
Reduce	the annua	l average		usage by	5% if the d	welling is	designed t	(25 x N) to achieve		se target o		5.63		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	97.5	93.95	90.41	86.86	83.31	79.77	79.77	83.31	86.86	90.41	93.95	97.5		
C		h at water			and by A	100 1/1		T / 0000			m(44) ₁₁₂ =		1063.6	(44)
											ables 1b, 1			
(45)m=	144.58	126.45	130.49	113.76	109.16	94.2	87.29	100.16	101.36	118.12	128.94	140.02	1204 54	(45)
lf inst <mark>an</mark> i	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar = Su	m(45) ₁₁₂ =		1394.54	(45)
(46)m=	2 1.69	18.97	19.57	17.06	16.37	14.13	13.09	15.02	15.2	17.72	19.34	21		(46)
Water	storage	loss:												
		,						within sa	ame ves	sel		0		(47)
	•	•	nd no ta		•			` '	\1-	(0) : (47)			
	storage		not wate	er (uns ir	iciudes ii	nstantar	ieous co	mbi boil	ers) erite	er U III (47)			
	_		eclared l	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 o	-										
			factor fr ee section		e z (kvvi	n/litre/da	ly)					0		(51)
	e factor	•		JII 4.0								0		(52)
Tempe	erature fa	actor fro	m Table	2b							-	0		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or (54) in (5	55)									0		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendix	Н	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	inual) fro	m Table	3							0		(58)
	-	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor f	om Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
				<u> </u>		· ` `		T 40.04	1007	T 40.00	1,0,00	1	(61)	
(61)m= 49.68	43.24	46.07	42.84	42.46	39.34	40.65	42.46		46.07	46.33	49.68]	(61)	
							`		` 	ì 	`	(59)m + (61)m	(00)	
(62)m= 194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.62		164.19	175.27	189.71		(62)	
Solar DHW input									r contribut	tion to wate	er heating)			
(add additiona						·			Ι ,	1 0		1	(62)	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)	
Output from w			450.0	454.00	400.50	107.04	1 40 00	1 44440	1 404 40	1,75,07	100 74	1		
(64)m= 194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.62		164.19	175.27	189.71	1026 10	(64)	
Output from water heater (annual) ₁₁₂ 1926.19 [Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$														
_						 		-	 			!]]	(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 gair						l		T _		1	_	1		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	<u> </u>	Oct	Nov	Dec		(00)	
(66)m= 114.6	114.6	114.6	114.6	114.6	114.6	114.6	114.6	_	114.6	114.6	114.6		(66)	
Lighting gains	_		_									1		
(67)m= 17.99	15.97	12.99	9.84	7.35	6.21	6.71	8.72	11.7	14.86	17.34	18.49		(67)	
App <mark>liance</mark> s ga		ulat <mark>ed ir</mark>	Append		uation L		3a), al	so see Ta	_			,		
(68)m= 201.75	203.84	198.56	187.33	173.16	159.83	150.93	148.84	154.11	165.34	179.52	192.84		(68)	
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also	see Table	5		•			
(69)m= 34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46		(69)	
Pumps and fa	ns gains	(Table 5	a)					_						
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)	
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)					_				
(71)m= -91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68		(71)	
Water heating	gains (T	able 5)						_				_		
(72)m= 81.31	78.66	73.8	67.41	63.05	57.16	52.67	59.03	61.68	68.27	75.63	79.27		(72)	
Total internal	gains =				(66)m + (67)m	n + (68)n	n + (69)m + ((70)m + (7	71)m + (72))m -	_		
(73)m= 361.42	358.85	345.73	324.96	303.94	283.58	270.68	276.96	287.87	308.85	332.87	350.98		(73)	
6. Solar gains	s:													
Solar gains are		•				·	itions to	convert to th	ne applical		tion.			
Orientation: A	Access F Fable 6d	actor	Area m²		Flu	ix ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)		
_							, –	Table ob	_ '				-	
Northeast _{0.9x}	0.77	X	4.6	35	X	1.28	x	0.55		0.7	=	14	(75)	
Northeast _{0.9x}	0.77	X	4.6	35	X 2	22.97	×	0.55	× _	0.7	=	28.49	(75)	
Northeast _{0.9x}	0.77	X	4.6	S5	X 2	11.38	×	0.55	x	0.7	=	51.34	(75)	
Northeast _{0.9x}	0.77	X	4.6	S5	× (67.96	x _	0.55	x	0.7	=	84.31	(75)	
Northeast _{0.9x}	0.77	X	4.6	65	x (91.35	X	0.55	x	0.7	=	113.33	(75)	

Northeast 0.9x 0.77	٦.,	1.05	1	07.00	1 .,	0.55	– "г			100.00	7(75)
Northwest] X]	4.65] X]	97.38] X]	0.55		0.7	_ = -	120.82	(75)
Northwest	X	4.65] X]	91.1] X]	0.55	×	0.7	_ =	113.02	(75)
Northood	」 × ¬	4.65	J X	72.63	J X	0.55	×	0.7	=	90.1	(75)
Northeast 0.9x 0.77	_ X	4.65	J X I	50.42] X]	0.55	_	0.7	=	62.55	(75)
Northeast 0.9x 0.77	X	4.65	X	28.07	X	0.55	_ ×	0.7	_ =	34.82	(75)
Northeast 0.9x 0.77	X	4.65	X	14.2	X	0.55	×	0.7	=	17.61	(75)
Northeast 0.9x 0.77	X	4.65	X	9.21	X	0.55	x [0.7	=	11.43	(75)
Southeast 0.9x 0.77	X	17.75	X	36.79	X	0.55	X	0.7	=	174.25	(77)
Southeast 0.9x 0.77	X	17.75	X	62.67	X	0.55	X	0.7	=	296.81	(77)
Southeast 0.9x 0.77	X	17.75	X	85.75	X	0.55	X	0.7	=	406.11	(77)
Southeast 0.9x 0.77	X	17.75	X	106.25	X	0.55	X	0.7	=	503.19	(77)
Southeast 0.9x 0.77	X	17.75	X	119.01	X	0.55	X	0.7	=	563.61	(77)
Southeast 0.9x 0.77	x	17.75	X	118.15	X	0.55	x [0.7	=	559.53	(77)
Southeast 0.9x 0.77	x	17.75	x	113.91	X	0.55	x	0.7	=	539.45	(77)
Southeast 0.9x 0.77	x	17.75	x	104.39	X	0.55	×	0.7	=	494.37	(77)
Southeast 0.9x 0.77	x	17.75	x	92.85	x	0.55	x [0.7	=	439.73	(77)
Southeast 0.9x 0.77	x	17.75	x	69.27	X	0.55	_ x [0.7	=	328.04	(77)
Southeast 0.9x 0.77	x	17.75	X	44.07	Х	0.55	х	0.7	=	208.71	(77)
Southeast 0.9x 0.77	x	17.75	x	31.49	X	0.55	x	0.7		149.12	(77)
Southwest _{0.9x} 0.77	X	4.65	X	36.79	i /	0.55	x	0.7		45.65	(79)
Southwest _{0.9x} 0.77	x	4.65	X	62.67	i /	0.55	x	0.7	=	77.76	(79)
Southwest _{0.9x} 0.77	i x	4.65	X	85.75	i	0.55	- x	0.7	= =	106.39	(79)
Southwest _{0.9x} 0.77	i x	4.65	X	106.25	i	0.55		0.7	= =	131.82	(79)
Southwest _{0.9x} 0.77] x	4.65	X	119.01]]	0.55	×	0.7	_	147.65	(79)
Southwest _{0.9x} 0.77] x	4.65] x	118.15]]	0.55	x	0.7	= -	146.58	(79)
Southwest _{0.9x} 0.77] x	4.65] x	113.91]]	0.55		0.7	= -	141.32	(79)
Southwest _{0.9x} 0.77] ^] x	4.65] ^] x	104.39]]	0.55	^ L x [0.7	= =	129.51	(79)
Southwest _{0.9x} 0.77] ^] x	4.65]	92.85]]	0.55	^ L x [0.7	= =	115.2	(79)
0	」^] ×		1]]		^ L x [= -		(79)
01	╡	4.65] X] ,	69.27] 1	0.55	≓ ¦	0.7	- -	85.94	= ' '
0 11 1] X]	4.65] X]	44.07] 1	0.55	×	0.7	_	54.68	= (79)
Southwest _{0.9x} 0.77	X	4.65	X	31.49	J	0.55	X	0.7	=	39.07	(79)
Oalan maina in wetter and av		fa., a a a la a	4 1_		(00)	0(74)	(00)				
Solar gains in watts, calculus (83)m= 233.89 403.06 563	3.83	719.31 824.5		26.93 793.79	713	.99 617.48	(82)m 448.79	281	199.62		(83)
Total gains – internal and		!			1 , , ,	.00 011.10	110.70	1 20.	100.02		()
		1044.27 1128.5	`	110.51 1064.48	990	.95 905.35	757.64	613.87	550.6		(84)
` '		<u> </u>			1 333	100 000.00		1 0.0.0.	000.0		
7. Mean internal tempera				for Tal	- I - O	Th4 (90)					7(05)
Temperature during heat	•		_		ole 9	, In1 (°C)				21	(85)
Utilisation factor for gains			Ť				0 = 1	N1	Des		
 	/lar	Apr Ma	_	Jun Jul	 	ug Sep	Oct	Nov	Dec		(96)
(86)m= 0.99 0.97 0	.9	0.75 0.57		0.4 0.29	0.3	32 0.52	0.84	0.97	0.99		(86)
Mean internal temperatur			`	i	1			1		1	
(87)m= 20.18 20.44 20	.71	20.91 20.98	3	21 21	2	1 20.99	20.87	20.48	20.13		(87)

i emperatilire di irii				ali 112	C	1-1- A T	LO (00)									
·	g heating p	1	i		1	20.12		20.4	20.4	20.00		(88)				
(88)m= 20.08 20.		20.1	20.1	20.12	20.12		20.11	20.1	20.1	20.09		(00)				
Utilisation factor fo	-			- ` ` 		- 		0.70	0.00			(00)				
(89)m= 0.99 0.9	6 0.88	0.71	0.52	0.34	0.23	0.26	0.46	0.79	0.96	0.99		(89)				
Mean internal tem		1	1	` ` `	1		i									
(90)m= 19.01 19.	19.74	20.01	20.09	20.12	20.12	20.12	20.11	19.97	19.46	18.94		(90)				
fLA = Living area ÷ (4) =												(91)				
Mean internal tem																
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.5 19.82 20.15 20.39 20.46 20.48 20.49 20.49 20.48 20.35 19.88 19.44												(92)				
Apply adjustment	o the mea	n interna	temper	ature fro	m Table	4e, whe	ere appro	opriate								
(93)m= 19.35 19.	37 20	20.24	20.31	20.33	20.34	20.34	20.33	20.2	19.73	19.29		(93)				
8. Space heating	equiremen	t														
Set Ti to the mean the utilisation fact	d re-calc	ulate														
Jan F	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Utilisation factor for	r gains, hn	n:														
(94)m= 0.98 0.9	5 0.87	0.72	0.53	0.36	0.24	0.27	0.47	8.0	0.96	0.99		(94)				
Useful gains, hm(m , W = (9	4)m x (8	4)m													
(95)m= 585.88 724	39 794.74	749.92	596.57	395.41	257.94	270.92	429.63	604.09	589.28	544.47		(95)				
Monthly average	xternal ten	perature	from T	able 8												
(96)m= 4.3 4.	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			_		-			_								
(97)m= 1082.64 1059		798.15	604.46	396.04	257.99	271.02		673.49	892.27	1072.32		(97)				
Space heating red	i									-						
(98)m= 369.59 225	15 126.77	34.72	5.87	0	0	0	0	51.64	218.16	392.72						
						Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1424.61	(98)				
Space heating red	uirement ir	า kWh/m²	²/year		Space heating requirement in kWh/m²/year											
9a. Energy require	9a. Energy requirements – Individual heating systems including micro-CHP)															
												(99)				
Space heating:				,	<u> </u>		CHP)			l	19.81					
Fraction of space	heat from s	secondar	y/supple	,	system		Ź				0	(201)				
	heat from s	secondar	y/supple	,	system		Ź									
Fraction of space	neat from s	secondar nain syst	y/supple em(s)	,	system	(202) = 1	Ź	(203)] =			0	(201)				
Fraction of space Fraction of space	heat from s heat from r eating from	secondar main syst main sys	y/supple em(s) stem 1	,	system	(202) = 1	- (201) =	(203)] =			0	(201)				
Fraction of space Fraction of space Fraction of total h	neat from s heat from r eating from space hea	secondar main syst main sys ting syste	y/supple em(s) stem 1 em 1	ementary	system	(202) = 1	- (201) =	(203)] =			0 1 1	(201) (202) (204)				
Fraction of space Fraction of space Fraction of total had be a second space Efficiency of main	neat from s heat from r eating from space hea	secondar main syst main sys ting syste	y/supple em(s) stem 1 em 1	ementary	system	(202) = 1	- (201) =	(203)] =	Nov	Dec	0 1 1 90.4	(201) (202) (204) (206) (208)				
Fraction of space Fraction of space Fraction of total had be a second space Efficiency of main	heat from sheat from reating from space hear ndary/suppleb Mar	secondar main syst main sys ting syste lementar Apr	y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov	Dec	0 1 1 90.4	(201) (202) (204) (206) (208)				
Fraction of space Fraction of space Fraction of total had be a specific space Efficiency of main Efficiency of seco	neat from sheat from reating from space heardary/suppleb Maruirement (secondar main syst main sys ting syste lementar Apr	y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov 218.16	Dec 392.72	0 1 1 90.4	(201) (202) (204) (206) (208)				
Fraction of space Fraction of space Fraction of total h Efficiency of main Efficiency of seco Jan Fo	neat from sheat from reating from space heardary/suppleb Maruirement (and 15 126.77	main systemain systementar Apr calculate 34.72	y/supple em(s) stem 1 em 1 y heating May d above	g system Jun	system 1, % Jul	(202) = 1 · (204) = (2	- (201) = 02) × [1 - (Oct			0 1 1 90.4	(201) (202) (204) (206) (208)				
Fraction of space Fraction of space Fraction of total h Efficiency of main Efficiency of seco Jan Fo Space heating rec 369.59 225	heat from sheat from reating from space heardary/suppleb Maruirement (continuity) 126.77	main systemain systementar Apr calculate 34.72	y/supple em(s) stem 1 em 1 y heating May d above	g system Jun	system 1, % Jul	(202) = 1 · (204) = (2	- (201) = 02) × [1 - (Oct			0 1 1 90.4	(201) (202) (204) (206) (208) ear				
Fraction of space Fraction of space Fraction of total had be a special fraction of tot	heat from sheat from reating from space heardary/suppleb Maruirement (content from the first fro	main systemain systemain systementar Apr Calculate 34.72	y/supple em(s) stem 1 em 1 y heatin May d above 5.87	g system Jun 0	system 1, % Jul 0	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - (Oct 51.64 57.12	218.16	392.72	0 1 1 90.4	(201) (202) (204) (206) (208) ear				
Fraction of space Fraction of space Fraction of total had be a special fraction of tot	heat from sheat from reating from space hear hadary/suppleb Maruirement (doi:15 126.77) (204)] } x	main systemain systemain systementar Apr Calculate 34.72 100 ÷ (20 38.41	y/supple sem(s) stem 1 em 1 y heating May d above 5.87 06) 6.49	g system Jun 0	system 1, % Jul 0	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - 1	Oct 51.64 57.12	218.16	392.72	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear				
Fraction of space Fraction of space Fraction of total h Efficiency of main Efficiency of seco Jan Form Space heating recessions and second se	heat from sheat from reating from space hear dary/suppleb Maruirement (dary/suppleb 126.77 (204)] } x	main systemain systematrar Apr calculater 34.72 100 ÷ (20 38.41	y/supple sem(s) stem 1 em 1 y heating May d above 5.87 06) 6.49	g system Jun 0	system 1, % Jul 0	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - 1	Oct 51.64 57.12	218.16	392.72	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear				
Fraction of space Fraction of space Fraction of total h Efficiency of main Efficiency of seco Jan Form Space heating rece 369.59 225 (211)m = {[(98)m x 408.84 249]	heat from sheat from reating from space hear dary/suppleb Maruirement (dary/suppleb 126.77 (204)] } x	main systemain systematrar Apr calculater 34.72 100 ÷ (20 38.41	y/supple sem(s) stem 1 em 1 y heating May d above 5.87 06) 6.49	g system Jun 0	system 1, % Jul 0	(202) = 1 · (204) = (2 Aug 0 Tota	- (201) = 02) × [1 - 0] Sep 0 0 0 kl (kWh/yea	51.64 57.12 ar) =Sum(2	218.16 241.32 211) _{15,1012}	392.72 434.42 =	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear				
Fraction of space Fraction of space Fraction of total h Efficiency of main Efficiency of seco Jan Fraction of total h Efficiency of seco Jan Fraction of total h Efficiency of seco Jan Fraction of total h Efficiency of seco Jan Fraction of total h Efficiency of seco Jan Fraction of space [369.59 225] (211)m = {[(98)m x (201)] } Space heating fue = {[(98)m x (201)] }	heat from sheat from reating from space hear dary/suppleb Maruirement (continuity) 126.77 (204)] } x 1 (secondar x 100 ÷ (204) 204)	main systemain systemain systementar Apr Calculate 34.72 100 ÷ (20 38.41 ry), kWh/	y/supple tem(s) stem 1 em 1 y heating May d above 5.87 06) 6.49	g system Jun 0	system 1, % Jul 0	(202) = 1 · (204) = (2 Aug 0 Tota	- (201) = 02) × [1 - (201) = 02) × [1 - (201) = 0	51.64 57.12 ar) =Sum(2	218.16 241.32 211) _{15,1012}	392.72 434.42 =	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear				

Water heating							
Output from water heater (calculated above) 194.27 169.7 176.56 156.6 151.62 1	33.53 127.94	142.62 144.	19 164.19	175.27	189.71		
Efficiency of water heater	00.00 127.04	142.02	10 104.10	175.27	100.71	80.3	(216)
· · · · · · · · · · · · · · · · · · ·	80.3 80.3	80.3 80.	3 82.51	85.6	86.84	00.0	(217)
Fuel for water heating, kWh/month	!	<u> </u>				I	
$(219)m = (64)m \times 100 \div (217)m$				l	l	1	
(219)m= 224.21 197.87 209.61 191.06 188.03 1	66.29 159.32	177.61 179.	57 199.01 m(219a) _{1.12} =	204.75	218.45		¬
Amount totals	2315.77	(219)					
Annual totals Space heating fuel used, main system 1	kWh/yea 1575.9						
Water heating fuel used	2315.77	=					
Electricity for pumps, fans and electric keep-hot						2010.77	
	itiva immut fram	a autaida				1	(220-)
mechanical ventilation - balanced, extract or pos	itive iriput iron	outside			148.07	1	(230a)
central heating pump:					30		(230c)
Total electricity for the above, kWh/year		sum of (23	0a)(230g) =			178.07	(231)
Electricity for lighting						317.63	(232)
Electricity generated by PVs						-271.71	(233)
Electricity generated by PVs 12a. CO2 emissions – Individual heating system	s including mid	cro-CHP				-271.71	(233)
	Energy	cro-CHP		ion fac 2/kWh	tor	Emissions	
12a. CO2 emissions – Individual heating system	Energy kWh/year	cro-CHP	kg CO	2/kWh	tor	Emissions kg CO2/ye	s ar
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy kWh/year	cro-CHP	kg CO	2/kWh	=	Emissions kg CO2/ye	ar (261)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x	cro-CHP	kg CO	2/kWh 16	= =	Emissions kg CO2/ye	(261) (263)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x		kg CO 0.2 0.5 0.2	2/kWh 16	=	Emissions kg CO2/ye	ar (261)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x (219) x	+ (263) + (264) =	kg CO 0.2 0.5 0.2	2/kWh 16	= =	Emissions kg CO2/ye	(261) (263)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x		kg CO 0.2 0.5 0.2	2/kWh 16 19	= =	Emissions kg CO2/ye 340.39 0	(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) +		kg CO 0.2 0.5 0.2	2/kWh 16 19 16	= = =	Emissions kg CO2/ye 340.39 0 500.21	(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 Electricity for lighting Energy saving/generation technologies	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (231) x		0.2 0.5 0.5 0.5	2/kWh 16 19 16 19	= = = = =	Emissions kg CO2/ye 340.39 0 500.21 840.6 92.42 164.85	(261) (263) (264) (265) (267) (268)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies Item 1	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (231) x	+ (263) + (264) =	0.2 0.5 0.5 0.5 0.5	2/kWh 16 19 16 19 19	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/ye 340.39 0 500.21 840.6 92.42 164.85	(261) (263) (264) (265) (267) (268)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (231) x	+ (263) + (264) =	0.2 0.5 0.5 0.5	2/kWh 16 19 16 19 19	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/ye 340.39 0 500.21 840.6 92.42 164.85	(261) (263) (264) (265) (267) (268)

El rating (section 14)

(274)

			User D	etail <u>s:</u>						
Assessor Name: Software Name:	Stroma FSAP 2	012		Strom Softwa				Versio	on: 1.0.4.16	
		Р	roperty .	Address	: Flat 06	5				
Address :										
1. Overall dwelling dimer	nsions:									
Basement				a(m²) 65.1	(1a) x		2.5	(2a) =	Volume(m 162.74	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n	1) (35.1	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	162.74	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	у +	other 0	7 = [total 0	x	40 =	m³ per hou	ır — _(6a)
Number of open flues	0 +	0	」	0]	0	x:	20 =	0	` (6b)
Number of intermittent fan					J L		=	10 =		(7a)
Number of passive vents	13				L	0		10 =	0	╡゛
					Ļ	0		40 =	0	(7b)
Number of flueless gas fin	es				L	0	X '		0	(7c)
	fluor and force	(6a) (6b) (7	(a) 1 (7b) 1 (70) -			_		nanges per h	_
Infiltration due to chimney If a pressurisation test has be					continue f	0 irom (9) to		÷ (5) =	0	(8)
Number of storeys in the		idea, present	. 10 (17), (10111 (0) 10	(70)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2	25 for steel or timbe	er frame or	0.35 for	r masoni	y const	ruction			0	(11)
if both types of wall are pre deducting areas of opening		responding to	the great	er wall are	a (after					
If suspended wooden flo		ealed) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente	er 0.05, else enter (0							0	(13
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	` '	-			0	(15
Infiltration rate						12) + (13)			0	(16)
Air permeability value, o	• •		•	•	•	netre of e	envelope	area	3	(17)
If based on air permeabilit	-					. ! - -			0.15	(18)
Air permeability value applies Number of sides sheltered		nas been don	e or a deg	gree air pe	гтеаршту	r is being u	isea		0	(19)
Shelter factor	•			(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified fo	or monthly wind spe	ed								
Jan Feb I	Mar Apr Ma	y Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7	•		-		•	•	-	•	
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a) = - (22)m ÷ 1								•	
Wind Factor (22a)m = (22 $(22a)$ m = 1.27 1.25 1)m ÷ 4 .23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
(223)11 1.21 1.20 1	0 1.1 1.00	0.33	0.00	L 0.02	L	1 1.00	1 1.12	1.10	l	

lajustea iriiliti	ation rat	<u> </u>	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	1	Т		İ	
0.19 Calculate effe	0.19	0.18	0.16	0.16 he annli	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanica		_	rate for t	пс аррп	cabic ca	.50					ĺ	0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c)													
24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(24
b) If balance	d mech	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b)m = (22	2b)m + (23b)		•	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	•				.5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft	ļ	!	!		
if (22b)n				•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(2
B. Heat losse	s and he	eat loss i	paramet	er:								_	
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U		k-value		A X k kJ/K
in <mark>dows</mark> Type					17.75	<u> </u>	/[1/(1.2)+	_	20.32	$\stackrel{\prime}{\Box}$			(2
in <mark>dows</mark> Type					4.65		/[1/(1.2)+	<u> </u>	5.32	Ħ			(2
indows Type					4.65		/[1/(1.2)+	\ \ \ \ \ \	5.32	Ħ			(2
alls Type1	61.7	76	27.0	5	34.71		0.16		5.55	片 ,			(2
/alls Type2	26.6		0		26.68	_	0.16	╡┇	4.27	=		╡┝	(2
otal area of e					88.44		0.10		7.21				(3
or windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	as aiven in	paragraph	13.2	(3
include the area						a.oa aog	TOTTING T		,	uo giroii ii	pa.ag.ap	· •	
abric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				40.8	(3
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	11663.7	72 (3
nermal mass	parame	eter (TMF	⊃ = Cm ÷	- TFA) ir	n kJ/m²K	•		Indica	tive Value	: Medium	j	250	(3
r design assess n be used inste				construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
nermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						12.08	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	11)								
otal fabric he								(33) +	(36) =			52.88	(3
entilation hea		i -	· ·		ı		1		= 0.33 × (1	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 17.27	17.07	16.86	15.86	15.66	14.65	14.65	14.45	15.05	15.66	16.06	16.46		(3
eat transfer o	oefficie	nt, W/K						(39)m	= (37) + (38)m		•	
9)m= 70.15	69.95	69.74	68.74	68.54	67.53	67.53	67.33	67.93	68.54	68.94	69.34		
			_										(3

Column C	Heat loss para	ımeter (l	HLP). W	′m²K					(40)m	= (39)m ÷	· (4)					
Number of days in month (Table 1a) United 2 United 2 United 3 Unite		· `	- 		1.05	1.04	1.04	1.03	· · ·	·	· ·	1.07				
A Water heating energy requirement. SWhiyer.	. ,	l .			l .			ļ.	<u> </u>	L Average =	Sum(40) _{1.}	12 /12=	1.06	(40)		
### Assumed occupancy, N ITFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9) ITFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]) + 0.0013 x (TFA -13.9) ITFA £ 13.9, N = 1	Number of day	s in mo	nth (Tab	le 1a)												
### A. Water heating energy requirement: ### Assumed occupancy, N If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA > 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 ### Annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 128 litres per person per day (all water use, hot and cold) ### Annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 128 litres per person per day (all water use, hot and cold) ### Annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 128 litres per person per day (all water use, hot and cold) ### Annual average in litres per day for each morth Vd == factor from Table 15 x (45) ### Annual average in litres per day for each morth Vd == factor from Table 20	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Assumed occupancy, N If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA E 13.9, N = 1 If TFA E 13.9, N = 1	(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)		
Assumed occupancy, N If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA E 13.9, N = 1 If TFA E 13.9, N = 1																
if TFA ≥ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 126 titres per per appear and users usa, hot and cotol) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec																
Reduce the annual average hot water usage by 5% if the divelling is designed to achieve a water use target of not more that 126 litres per person per day (all water use, hot and cotd) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	if TFA > 13.9	if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1														
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	Reduce the annua	Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)														
44 m = 93.04 89.66 86.28 82.89 79.51 76.13 76.13 79.51 82.89 86.28 89.66 93.04	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Total = Sum(44) = 1015.03 (44)	Hot water usage i	n litres pe	r day for ea			ctor from	Table 1c x		•	•						
Community heating and no tank in dwelling, enter 110 litres in (47) Community heating and no tank in dwelling, enter 110 litres in (47) Community heating along to the distribution of the twater storage, loss: Community heating along to the twater (this includes instantaneous combi boilers) enter '0' in (47) Community heating along to the twater (this includes instantaneous combi boilers) enter '0' in (47) Community heating and no tank in dwelling, enter 110 litres in (47) Community heating and no tank in dwelling, enter 110 litres in (47) Community heating and no tank in dwelling, enter 110 litres in (47) Community heating and no tank in dwelling (48) Community heating and no tank in dwelling (48) Community heating and no tank in dwelling (48) Community heating and no tank in dwelling (49) Community heating and no tank in dwelling (49) Community heating eloss a color is known (kWh/day): Community heating eloss factor is known (kWh/day): Community heating eloss factor is known (kWh/day): Community heating eloss factor from Table 2b Community heating see section 4.3 Community heating see sect	(44)m= 93.04	89.66	86.28	82.89	79.51	76.13	76.13	79.51	82.89	86.28	89.66	93.04				
(45)n = 137.98 120.68 124.53 108.57 104.17 89.9 83.3 95.59 96.73 112.73 123.05 133.63 Total = Sum(45) _{1.32} =													1015.03	(44)		
Total = Sum(45):	Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	ables 1b, 1	c, 1d)				
## Instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) ## User storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel	(45)m= 137.98	120.68	124.53	108.57	104.17	89.9	83.3	95.59	96.73	112.73	123.05	133.63				
(46)m = 20.7	If in atomton acres w	votor booti	ing at paint	of was /ne	a hat wata	r ataraga)	antar O in	havea (46		Total = Su	m(45) ₁₁₂ =	_	1330.87	(45)		
Storage volume (litres) including any solar or WWHRS storage within same vessel	_													(40)		
Storage volume (litres) including any solar or WWHRS storage within same vessel 0			18.68	16.29	15.63	13.48	12.5	14.34	14.51	16.91	18.46	20.04		(46)		
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) × (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (56) If cylinder contains dedicated solar storage, (57)m = (56)m × ((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 0 0 0 0 (57) 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)	_) includir	ig anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) × (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) Water storage loss calculated for each month (56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (56) If cylinder contains dedicated solar storage, (57)m = (56)m × [(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 0 0 0 0 0 Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) + 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)			·									<u> </u>		()		
a) If manufacturer's declared loss factor is known (kWh/day): 0	-	_			_			` '	ers) ente	er '0' in (47)					
Temperature factor from Table 2b	Water storage	loss:														
Energy lost from water storage, kWh/year (48) x (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) (55) Water storage loss calculated for each month ((56)m = (55) x (41)m) (56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)		
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Volume factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Temperature f	actor fro	m Table	2b								0		(49)		
Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) 0 (55) Water storage loss calculated for each month ((56)m = $\frac{0}{2}$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Energy lost fro	m watei	r storage	, kWh/ye	ear			(48) x (49)) =			0		(50)		
If community heating see section 4.3 Volume factor from Table 2a	•			-												
Volume factor from Table 2a $0 \qquad (52)$ Temperature factor from Table 2b $0 \qquad (53)$ Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0 \qquad (54)$ Enter (50) or (54) in (55) $0 \qquad (55)$ Water storage loss calculated for each month $((56)m = (55) \times (41)m)$ $(56)m = 0 \qquad 0 \qquad 0 \qquad 0 \qquad 0 \qquad 0 \qquad 0 \qquad 0 \qquad 0 \qquad 0$		•			ie 2 (KVV	n/litre/da	ly)					0		(51)		
Temperature factor from Table 2b	•	•		JII 4.3										(52)		
Energy lost from water storage, kWh/year $ (47) \times (51) \times (52) \times (53) = 0 $ (54) Enter (50) or (54) in (55) $ 0 $ (55) $ 0 $ (55) $ 0 $ (56) $ 0 $ (56) $ 0 $ (56) $ 0 $ (56) $ 0 $ (56) $ 0 $ (56) $ 0 $ (57) $ 0 $ (57) $ 0 $ (57) $ 0 $ (57) $ 0 $ (58)				2b							-					
Enter (50) or (54) in (55) Water storage loss calculated for each month (56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	•				ear			(47) x (51) x (52) x (53) =						
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)m=	Water storage	loss cal	culated t	or each	month			((56)m = (55) × (41)	m				, ,		
If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m$ where $(H11)$ is from Appendix H (57)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			1			n					l 0	0		(56)		
(57)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				_	-		-		-	-	-	_	ix H	(00)		
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)					1		1		1					(57)		
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)		loss (s	anual\ fra	m Table	. 2		ı		ı	ı				(58)		
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	Timary directions (armaly from rable o													(00)		
	•				,	•	. ,	, ,		r thermo	stat)					
	` —		1			i			<u> </u>			0		(59)		

Combi loss calculated for each month (61) m = $(60) \div 365 \times (41)$ m														
		1		1		1	r		ı	1	1	1		
(61)m= 47.41		43.97	40.88	40.52	37.54	38.79	40.52	40.88	43.97	44.22	47.41	J	(61)	
Total heat red	`						(62)m :	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m		
(62)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.11	137.61	156.7	167.27	181.04		(62)	
Solar DHW inpu									r contribu	tion to wate	er heating)			
(add addition	al lines if	FGHRS			applies	, see Ap	pendix		•	1	1	1		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(63)	
Output from v	water hea	iter										1		
(64)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.11	137.61	156.7	167.27	181.04		7	
Output from water heater (annual) $_{112}$ 1838.24 [Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]														
Heat gains from	om water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	[]		
(65)m= 57.73	50.44	52.4	46.32	44.77	39.28	37.4	41.91	42.38	48.47	51.97	56.29		(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 gai	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= 106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.08		(66)	
Lighting gains	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5						
(67)m= 16.55	14.7	11.95	9.05	6.76	5.71	6.17	8.02	10.76	13.67	15.95	17.01		(67)	
Appliances g	ains (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			,		
(68)m= 185.6	`	182.67	172.34	159.3	147.04	138.85	136.92	141.78	152.11	165.15	177.41]	(68)	
Cooking gain	s (calcula	ated in A	ppendix	L. eguat	ion L15	or L15a), also s	ee Table	5		<u>!</u>	1		
(69)m= 33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.61]	(69)	
Pumps and fa	ans gains	(Table !	5a)			1	l .					1		
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	l	(70)	
Losses e.g. e			ļ	ļ				1 -		1 -		l	` ,	
(71)m= -84.86	 	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	1	(71)	
Water heating	_!	ļ	_ 01.00	0 1.00	0 1.00	01.00	01.00	0 1.00	1 01.00	01.00	01.00	I	()	
(72)m= 77.6	75.06	70.43	64.33	60.17	54.55	50.26	56.33	58.86	65.15	72.18	75.65	1	(72)	
		ļ.	04.55	00.17		<u> </u>		+ (69)m +	ļ.			l	(12)	
(73)m= 337.56	_	322.87	303.54	284.05	265.12	253.11	259.1	269.23	288.75	311.11	327.89	1	(73)	
(73)m= 337.56 6. Solar gair		322.07	303.54	204.00	200.12	255.11	259.1	209.23	200.75	311.11	327.09		(10)	
Solar gains are		using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	nle orientat	tion			
Orientation:		•	Area		Flu	•		g_	о арриоа	FF		Gains		
Onemation.	Table 6d		m²			ble 6a	•	э <u> </u>	Т	able 6c		(W)		
Northeast 0.9x	0.77	x	4.6	35	х	11.28	1 x [0.55	x [0.7		14	(75)	
Northeast 0.9x						22.97	」^ <u>└</u> ┃ x	0.55	_	0.7	= =	28.49](75)	
Northeast 0.9x					-		」^ <u> </u>		_ ^ L x [╡ -		(75) (75)	
Northeast 0.9x						41.38	╎├	0.55	╡╞	0.7	╣	51.34	_	
Northeast 0.9x		===		==	-	67.96]	0.55	×	0.7	=	84.31	(75)	
riornicasi U.9X	0.77	X	4.6	5	X (91.35	x	0.55	X	0.7	=	113.33	(75)	

Northea	st _{0.9x}	0.77	X	4.6	35	X	9	7.38	x		0.55	X	0.7	=	120.82	(75)
Northea	ıst _{0.9x}	0.77	X	4.6	35	x		91.1	×		0.55	×	0.7	=	113.02	(75)
Northea	ıst _{0.9x}	0.77	X	4.6	35	X	7	2.63	x		0.55	×	0.7	=	90.1	(75)
Northea	st _{0.9x}	0.77	X	4.6	35	X	5	0.42	x		0.55	x	0.7	=	62.55	(75)
Northea	ıst _{0.9x}	0.77	X	4.6	35	x	2	28.07	x		0.55	X	0.7	=	34.82	(75)
Northea	st _{0.9x}	0.77	X	4.6	35	x		14.2	X		0.55	x	0.7	=	17.61	(75)
Northea	st _{0.9x}	0.77	X	4.6	35	x	,	9.21	X		0.55	X	0.7	=	11.43	(75)
Southw	est _{0.9x}	0.77	X	4.6	35	x	3	86.79			0.55	X	0.7	=	45.65	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	x	6	32.67			0.55	X	0.7	=	77.76	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	8	35.75]		0.55	X	0.7	=	106.39	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	1	06.25			0.55	X	0.7	=	131.82	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	1	19.01			0.55	X	0.7	=	147.65	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	x	1	18.15]		0.55	X	0.7	=	146.58	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	1	13.91			0.55	X	0.7	=	141.32	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	1	04.39			0.55	X	0.7	=	129.51	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	x	9	2.85]		0.55	X	0.7	=	115.2	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	6	9.27			0.55	X	0.7	=	85.94	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	X	4	4.07			0.55	X	0.7	=	54.68	(79)
Southw	est _{0.9x}	0.77	X	4.6	35	х	3	31.49] ,		0.55	x	0.7	=	39.07	(79)
Northwe	est _{0.9x}	0.77	X	17.	75	x	1	1.28	x		0.55	X	0.7	=	53.43	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	х	2	22.97] x		0.55	x	0.7	=	108.77	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	Х	4	1.38	X		0.55	X	0.7	=	195.96	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	X	6	67.96	X		0.55	x	0.7	=	321.82	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	x	9	1.35	X		0.55	x	0.7	=	432.6	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	X	9	7.38	X		0.55	X	0.7	=	461.19	(81)
Northwe	L	0.77	X	17.	75	X		91.1	X		0.55	X	0.7	=	431.44	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	x	7	2.63	X		0.55	X	0.7	=	343.95	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	x	5	0.42	X		0.55	X	0.7	=	238.78	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	x	2	28.07	X		0.55	X	0.7	=	132.92	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	x		14.2	X		0.55	X	0.7	=	67.23	(81)
Northwe	est _{0.9x}	0.77	X	17.	75	X		9.21	X		0.55	X	0.7	=	43.64	(81)
ו		watts, ca		1		$\overline{}$		l	Ė	$\overline{}$	um(74)m .			I	1	(00)
(83)m=	113.08	215.01	353.69	537.95	693.57		28.59	685.78	563	3.56	416.53	253.68	139.52	94.13		(83)
Ī		nternal a							L 000		COF 70	F40.4	150.00	400.00	1	(84)
(84)m=	450.64	550.12	676.56	841.5	977.63		93.71	938.89	822	2.66	685.76	542.43	450.63	422.02]	(04)
		nal temp		•				_								_
-		_	•			_		from Tab	ole 9	, Th	1 (°C)				21	(85)
Utilisa		tor for g				Ť							1	l	1	
(00):	Jan	Feb	Mar	Apr	May	+	Jun	Jul	 	ug	Sep	Oct	_	Dec	1	(96)
(86)m=	1	0.99	0.96	0.84	0.63		0.43	0.32	0.3	აგ	0.65	0.93	0.99	1	J	(86)
ı						_		ps 3 to 7	1					Ι.	1	/a=:
(87)m=	19.94	20.15	20.47	20.81	20.97		21	21	2	1	20.97	20.7	20.25	19.91]	(87)

Tarana anatana akan	L C		6	ale 115 a	T	- I- I - O - T	LO (90)					
Temperature duri		.	1		1	1	· ` ´	20.04	20.02	20.02		(88)
` '		20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.03	20.03		(00)
Utilisation factor t	_ 	1		- ` `		- ´ 		·	1			
(89)m= 0.99 0.	0.95	0.8	0.57	0.37	0.25	0.3	0.58	0.91	0.99	1		(89)
Mean internal ter	perature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m= 18.62 18	92 19.37	19.84	20.01	20.05	20.05	20.05	20.03	19.71	19.07	18.58		(90)
							f	fLA = Livin	ig area ÷ (4	4) =	0.42	(91)
Mean internal ter	perature (f	or the wh	nole dwe	lling) = f	LA × T1	+ (1 – fL	_A) × T2					
(92)m= 19.18 19	 	20.25	20.41	20.45	20.45	20.45	20.43	20.13	19.57	19.14		(92)
Apply adjustment	to the mea	n interna	l temper	ature fro	m Table	4e, whe	ere appro	priate	•			
(93)m= 19.03 19	29 19.69	20.1	20.26	20.3	20.3	20.3	20.28	19.98	19.42	18.99		(93)
8. Space heating	requiremen	nt										
Set Ti to the mea		•		ned at st	ep 11 of	Table 9	b, so tha	it Ti,m=(76)m an	d re-calc	ulate	
Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor	or gains, hr	n:		•	•	•	•		•			
(94)m= 0.99 0.	0.94	0.8	0.58	0.39	0.27	0.32	0.59	0.91	0.98	0.99		(94)
Us <mark>eful gains, hm</mark>	Sm , W = (9	94)m x (8	4)m									
(95)m= 447.49 539	.79 635.78	676.28	571.43	383.6	249.91	262.48	407.75	491.23	443.48	419.86		(95)
Monthly average	ex <mark>terna</mark> l ter	nperature	e from T	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)
He <mark>at los</mark> s rate for		_	_	_		1		_				
(97)m= 1033.17 100			586.96	384.93	250.05	262.83	419.5	642.57	849.41	1025.56		(97)
Space heating re	1			Wh/mon	th = 0.02	24 x [(97)m – (95					
(98)m= 435.75 313	.51 211.2	67.49	11.56	0	0	0	0	112.6	292.27	450.64		_
						Tota	al per year	(kWh/year	r) = Sum(9	8)15,912 =	1895.02	(98)
Space heating re	quirement in	n kWh/m	²/year								29.11	(99)
9a. Energy require	ments – Inc	dividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heating:												_
Fraction of space				ementary	•					ļ	0	(201)
Fraction of space	heat from r	main syst	tem(s)			(202) = 1	- (201) =				1	(202)
Fraction of total h	eating from	main sy	stem 1			(204) = (2	(02) × [1 –	(203)] =			1	(204)
Efficiency of mair	space hea	ting syste	em 1								90.4	(206)
Efficiency of seco	ndary/supp	lementar	y heatin	g systen	ո, %						0	(208)
Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	— ear
<u> </u>		<u> </u>		L				<u> </u>			,	
Space heating re	faireilleilt (oaioaiato										
Space heating re	` 	67.49	11.56	0	0	0	0	112.6	292.27	450.64		
435.75 313	.51 211.2	67.49	11.56	i	0	0	0	112.6	292.27	450.64		(211)
· — —	.51 211.2 (204)] } x	67.49 100 ÷ (20	11.56	i	0	0	0	112.6 124.55	292.27 323.31	450.64 498.5		(211)
435.75 313 (211)m = {[(98)m)	.51 211.2 (204)] } x	67.49 100 ÷ (20	11.56	0	I	0		124.55	323.31	498.5	2096.26	(211)
$ \begin{array}{c c} 435.75 & 313 \\ (211)m = \{[(98)m) \\ 482.02 & 346 \end{array} $.51 211.2 (204)] } x .81 233.63	67.49 100 ÷ (20 74.66	11.56 06) 12.79	0	I	0	0	124.55	323.31	498.5	2096.26	_
435.75 313 (211)m = {[(98)m)	.51 211.2 (204)] } x .81 233.63	67.49 100 ÷ (20 74.66 ry), kWh	11.56 06) 12.79	0	I	0	0	124.55	323.31	498.5	2096.26	_
435.75 313 (211)m = {[(98)m x) 482.02 346 Space heating fu = {[(98)m x (201)]	.51 211.2 (204)] } x .81 233.63	67.49 100 ÷ (20 74.66 ry), kWh	11.56 06) 12.79	0	I	0	0	124.55	323.31	498.5	2096.26	_
435.75 313 (211)m = {[(98)m x 482.02 346] Space heating fu = {[(98)m x (201)]	.51 211.2 (204)] } x .81 233.63 el (seconda x 100 ÷ (20	67.49 100 ÷ (20 74.66 ry), kWh/	11.56 06) 12.79 /month	0	0	0 Total	0 al (kWh/yea	124.55 ar) =Sum(2	323.31 211) _{15,1012}	498.5	2096.26	_

Water heating								
Output from water heater (calculated above) 185.4 161.95 168.5 149.45 144.69 1	27.44 122.09	136.11	137.61	156.7	167.27	181.04]	
Efficiency of water heater						10.101	80.3	(216)
	80.3 80.3	80.3	80.3	84.23	86.44	87.25		(217)
Fuel for water heating, kWh/month			!			<u> </u>		
$(219)m = (64)m \times 100 \div (217)m$	450 7 450 05	100 5	474 07	100.00	400.5	007.40	1	
(219)m= 212.78 186.82 196.79 179.64 178.7 1	158.7 152.05	169.5	171.37 = Sum(21	186.02	193.5	207.49	2402.20	7(240)
Annual totals		Total	- Oum(2)		Wh/yeaı	<u>,</u>	2193.38 kWh/yea	(219)
Space heating fuel used, main system 1				N.	wii/yeai		2096.26	<u>'</u>
Water heating fuel used							2193.38	╡
Electricity for pumps, fans and electric keep-hot								
mechanical ventilation - balanced, extract or pos	itive input fron	n outside				134.02		(230a)
central heating pump:						30		(230c)
Total electricity for the above, kWh/year		sum c	of (230a).	(230g) =			164.02	(231)
Electricity for lighting							292.21	(232)
Electricity generated by PVs							-271.71	(233)
Electricity generated by PVs 12a. CO2 emissions – Individual heating system	s including mid	cro-CHP					-271.71	(233)
	s including mid Energy kWh/year	cro-CHP		Emiss kg CO	ion fac 2/kWh	tor	-271.71 Emissions kg CO2/ye	
	Energy	cro-CHP			2/kWh	tor =	Emissions	
12a. CO2 emissions – Individual heating system	Energy kWh/year	cro-CHP		kg CO	2/kWh		Emissions kg CO2/ye	s ar
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy kWh/year	cro-CHP		kg CO:	2/kWh	=	Emissions kg CO2/ye	ar (261)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x		64) =	0.2 0.5	2/kWh	= =	Emissions kg CO2/ye	(261) (263)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x		64) =	0.2 0.5	2/kWh	= =	Emissions kg CO2/ye 452.79 0	(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)		64) =	0.2 0.5 0.2	2/kWh 16 19 16	= = =	Emissions kg CO2/ye 452.79 0 473.77 926.56	(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		64) =	0.2 0.5 0.5	2/kWh 16 19 16	= = = =	Emissions kg CO2/ye 452.79 0 473.77 926.56 85.13	(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 saving/generation technologies	Energy kWh/year (211) x (215) x (219) x (261) + (262) - (231) x			0.2 0.5 0.5 0.5	2/kWh 16 19 16 19	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/ye 452.79 0 473.77 926.56 85.13	(261) (263) (264) (265) (267) (268)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies Item 1	Energy kWh/year (211) x (215) x (219) x (261) + (262) - (231) x			0.2 0.5 0.5 0.5 0.5 0.5 0.5 0.6	2/kWh 16 19 16 19	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/ye 452.79 0 473.77 926.56 85.13 151.66	(261) (263) (264) (265) (267) (268)

El rating (section 14)

(274)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Strom Softwa				Versio	n: 1.0.4.16	
		Pi	roperty	Address	: Flat 07	,				
Address :										
1. Overall dwelling dimer	nsions:									
Basement				a(m²) ′1.92	(1a) x		2.5	(2a) =	Volume(m 179.81	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n	1) 7	1.92	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	179.81	(5)
2. Ventilation rate:										
Number of chimneys	main s heating	secondar heating	у 	other 0	7 = [total	x	40 =	m³ per hou	ır — _(6a)
Number of open flues	0 +	0	- - - - -	0	」	0	x	20 =	0	(6b)
Number of intermittent fan				0	J			10 =		╡`
	5				Ļ	0			0	(7a)
Number of passive vents					Ĺ	0		10 =	0	(7b)
Number of flueless gas fire	es				L	0	X	40 =	0	(7c)
								Air ch	anges per h	our
Infiltration due to chimney	s. flues and fans = ((6a)+(6b)+(7	a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has be					continue f			(0)		(0)
Number of storeys in the	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening		sponding to	ine great	ei wali ale	a (anei					
If suspended wooden flo	oor, enter 0.2 (unsea	aled) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente									0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	` '	-	. (45)		0	(15)
Infiltration rate	.EO averaged in a	ibia maatua				12) + (13)		0.00	0	(16)
Air permeability value, of the based on air permeability	•		•	•	•	ietre oi e	envelope	area	3	(17)
Air permeability value applies	-					is beina u	sed		0.15	(18)
Number of sides sheltered			•	,	,	Ü			0	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified fo	r monthly wind spee	ed								
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5	1.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
	1 1.00	1 5.55	3.00		<u> </u>	1			I	

0.19	0.19	0.18	0.16	0.16	o.14	0.14	0.14	0.15	0.16	0.17	0.18	1	
Calculate effec			l ' '		I -	· ·	0.14	0.10	0.10	0.17	0.10	l	
If mechanica	l ventila	ition:										0.5	(2
If exhaust air he	at pump	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	for in-use f	actor (fron	n Table 4h) =				73.9)5
a) If balance	d mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	covery (N	MV) (24b)m = (22	2b)m + (23b)		-	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(
c) If whole ho if (22b)m				•					5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural v									0.5]	•	•		
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)		•			
25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(;
3. Heat losses	and he	nat loce i	o aran zo t	or:									
LEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·l		A X k kJ/K
/indows Type		(111)			17.75		/[1/(1.2)+		20.32		KO/III	`	(2
/indows Type					4.65	-	/[1/(1.2)+	<u> </u>	5.32	Ħ			
/indows Type					4.65	-	/[1/(1.2)+	\ \ \ \ \ \	5.32	Ħ			()
/alls Type1	68.6	·e	27.0		41.61		0.16	=	6.66	┞ ┌			
/alls Type2		=		<u>^</u>		=						ᆗ 늗	
• •	17.7		0		17.76	_	0.16	[2.84				(;
otal area of el for windows and			effective wi	ndow II w	86.42		r formula 1	/[/1/ volu	(0) (0,041 (a airan in	naraarank		(;
include the area						ateu using	j ioiiiiuia i	7[(17 0- vaiu	e)+0.04] a	as giveii iii	paragrapi	1 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				40.4	7 (
eat capacity (Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	11280	.49 (3
nermal mass	parame	ter (TMF	o = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250) (:
or design assessi				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
n be used instea						,							 ,
nermal bridge	•	,		•	•	1						12.4	(1
details of therma otal fabric hea		are not kii	OWII (30) -	- U. 13 X (3	11)			(33) +	(36) =			52.8	88 (3
entilation hea		alculated	l monthly	/						(25)m x (5))	02.0	<u> </u>
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 19.08	18.85	18.63	17.52	17.3	16.18	16.18	15.96	16.63	17.3	17.74	18.19		(;
eat transfer c		<u> </u>			I .	I	<u>I</u>		= (37) + (37)	<u> </u>	1	I	
cat transier C	CHILLIE	it, VV/T\						(55)111	- (31) + (1	1	1	
9)m= 71.96	71.74	71.51	70.4	70.18	69.07	69.07	68.84	69.51	70.18	70.62	71.07		

Heat Ic	ss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1	1	0.99	0.98	0.98	0.96	0.96	0.96	0.97	0.98	0.98	0.99		
ما مصد دا		:	-41- /T-1-1	la 4a\					/	Average =	Sum(40) ₁ .	12 /12=	0.98	(40)
Numbe	 		nth (Tab		Mov	lun	ll	۸۰۰۰	Con	Oct	Nov	Doo		
(41)m=	Jan 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31		(41)
(+1)111	<u> </u>		01	00	01	- 00	<u> </u>	01	00	01		<u> </u>		(,
4 \//	tor boot	ing onc	gy requi	romont:								kWh/yea	or:	
4. VVC	ilei neal	ing ener	gy requi	rement.								KVVII/yea	al.	
if TF	ed occu A > 13.9 A £ 13.9	9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (1	ΓFA -13.		29		(42)
Reduce	the annua	l average	ater usag hot water person per	usage by	5% if the d	welling is	designed t			se target o		5.63		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	ı litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	97.5	93.95	90.41	86.86	83.31	79.77	79.77	83.31	86.86	90.41	93.95	97.5		
Energy	content of	hot water	used - cal	culated ma	onthly $= 4$	190 v Vd r	n v nm v F	Tm / 3600			m(44) ₁₁₂ =		1063.6	(44)
45)m=	144.58	126.45	130.49	113.76	109.16	94.2	87.29	100.16	101.36	118.12	128.94	140.02		
+3)111=	144.30	120.43	150.49	113.70	109.10	34.2	07.23	100.10			m(45) ₁₁₂ =	<u> </u>	1394.54	(45
f inst <mark>an</mark> i	taneous w	ater he <mark>ati</mark> i	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)			(10)112			`
46)m=	21.69	18.97	19.57	17.06	16.37	14.13	13.09	15.02	15.2	17.72	19.34	21		(46
	storage		includin	a any co	olar or M	/\/\LDC	etorago	within co	amo voce	col				(47
		,	nd no ta						airie ves	SCI		0		(47
	•	•	hot wate		•			` '	ers) ente	er '0' in (47)			
	storage													
•			eclared l		or is kno	wn (kWł	n/day):					0		(48
•			m Table									0		(49
			storage eclared o	-		or is not		(48) x (49)) =			0		(50
			factor fr	-								0		(51
	•	•	ee section	on 4.3										
	e factor			2h							-	0		(52
			m Table					(47) v (E1)	. v. (EQ) v. (I	E2) -		0		(53
•	(50) or (storage	, KVVII/ye	aı			(47) x (51)) X (32) X (55) –	_	0		(54 (55
	. , .	, ,	culated f	or each	month			((56)m = (55) × (41)r	m		<u> </u>		(
56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56
												m Appendix	Н	•
57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57
Primar	v circuit	loss (ar	ınual) fro	m Table	3							0		(58
	-	•	culated t			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor f	om Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59

													
Combi loss ca				` ´ 	<u> </u>	· ` `		1 40 04	10.07	T 40.00	T 40.00	1	(61)
(61)m= 49.68	43.24	46.07	42.84	42.46	39.34	40.65	42.46	<u>l</u>	46.07	46.33	49.68]	(61)
						1	`		` ´ 	ì 	`	(59)m + (61)m	(00)
(62)m= 194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.6		164.19	175.27	189.71		(62)
Solar DHW input									r contribu	tion to wate	er heating)		
(add additiona						 	. 			1 0	1 0	1	(62)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w			1500	154.00	400.50	1,07,04	1400	0 1 444 40	1 404 40	1,75,07	1,00 74	1	
(64)m= 194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.6		164.19	175.27	189.71	1926.19	(64)
lla at mains for		la a a Cara	1.1.4.0- /	11- 0 0	F / [0 0F	(45)		utput from w](04)
Heat gains fro						 			 		- 	!]]	(65)
(65)m= 60.49	52.86	54.91	48.54	46.91	41.15	39.19	43.92		50.79	54.46	58.98]	(03)
include (57)					ylinder i	s in the o	dwellin	g or hot w	ater is t	rom com	imunity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):									
Metabolic gair					I .			1 -		1	-	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug		Oct	Nov	Dec		(00)
(66)m= 114.6	114.6	114.6	114.6	114.6	114.6	114.6	114.6	_	114.6	114.6	114.6		(66)
Lighting gains	_		_					_				1	
(67)m= 17.99	15.97	12.99	9.84	7.35	6.21	6.71	8.72		14.86	17.34	18.49		(67)
App <mark>liance</mark> s ga		ulated ir	Append		uation L		3a), al	so see Ta	_			,	
(68)m= 201.75	203.84	198.56	187.33	173.16	159.83	150.93	148.8	4 154.11	165.34	179.52	192.84		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5				
(69)m= 34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46	34.46		(69)
Pumps and fa	ns gains	(Table 5	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)							,	
(71)m= -91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.68	-91.6	91.68	-91.68	-91.68	-91.68		(71)
Water heating	gains (T	able 5)										_	
(72)m= 81.31	78.66	73.8	67.41	63.05	57.16	52.67	59.03	61.68	68.27	75.63	79.27		(72)
Total internal	gains =	1			(66)m + (67)m	1 + (68)r	n + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 361.42	358.85	345.73	324.96	303.94	283.58	270.68	276.9	6 287.87	308.85	332.87	350.98		(73)
6. Solar gains													
Solar gains are		•					itions to	convert to th	e applical		tion.		
Orientation: A	Access F Fable 6d	actor	Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
_							, –	Table ob	, -, -				-
Northeast _{0.9x}	0.77	X	4.6	35	х	11.28	X	0.55	x	0.7	=	14	(75)
Northeast _{0.9x}	0.77	X	4.6	35	X 2	22.97	X	0.55	×	0.7	=	28.49	(75)
Northeast _{0.9x}	0.77	X	4.6	35	X 2	11.38	×	0.55	×	0.7	=	51.34	(75)
Northeast _{0.9x}	0.77	X	4.6	35	x (67.96	x	0.55	x	0.7	=	84.31	(75)
Northeast _{0.9x}	0.77	X	4.6	35	x (91.35	X	0.55	X	0.7	=	113.33	(75)

Northeast 0.9x 0.77	٦.,	1.05	1	07.00	1 .,	0.55	— "г			100.00	7(75)
Northwest] X]	4.65] X]	97.38] X]	0.55		0.7	_ = -	120.82	(75)
Neglected	X	4.65] X]	91.1] X]	0.55	X	0.7	_ =	113.02	(75)
Northood	」 × ¬	4.65	J X	72.63	J X	0.55	_	0.7	=	90.1	(75)
Northeast 0.9x 0.77	X	4.65	J X I	50.42	X	0.55	×	0.7	=	62.55	(75)
Northeast 0.9x 0.77	X	4.65	X	28.07	X	0.55	× [0.7	_ =	34.82	(75)
Northeast 0.9x 0.77	X	4.65	X	14.2	X	0.55	×	0.7	=	17.61	(75)
Northeast 0.9x 0.77	X	4.65	X	9.21	X	0.55	x [0.7	=	11.43	(75)
Southeast 0.9x 0.77	X	17.75	X	36.79	X	0.55	×	0.7	=	174.25	(77)
Southeast 0.9x 0.77	X	17.75	X	62.67	X	0.55	x [0.7	=	296.81	(77)
Southeast 0.9x 0.77	X	17.75	X	85.75	X	0.55	x	0.7	=	406.11	(77)
Southeast 0.9x 0.77	X	17.75	X	106.25	X	0.55	x	0.7	=	503.19	(77)
Southeast 0.9x 0.77	X	17.75	X	119.01	X	0.55	x [0.7	=	563.61	(77)
Southeast 0.9x 0.77	x	17.75	X	118.15	X	0.55	x [0.7	=	559.53	(77)
Southeast 0.9x 0.77	x	17.75	x	113.91	X	0.55	×	0.7	=	539.45	(77)
Southeast 0.9x 0.77	x	17.75	x	104.39	X	0.55	×	0.7	=	494.37	(77)
Southeast 0.9x 0.77	x	17.75	x	92.85	x	0.55		0.7	=	439.73	(77)
Southeast 0.9x 0.77	x	17.75	x	69.27	X	0.55	x [0.7	=	328.04	(77)
Southeast 0.9x 0.77	x	17.75	X	44.07	Х	0.55	х	0.7	=	208.71	(77)
Southeast 0.9x 0.77	X	17.75	x	31.49	X	0.55	×	0.7		149.12	(77)
Southwest _{0.9x} 0.77	X	4.65	X	36.79	i /	0.55	×	0.7		45.65	(79)
Southwest _{0.9x} 0.77	x	4.65	X	62.67	i /	0.55	×	0.7	=	77.76	(79)
Southwest _{0.9x} 0.77	i x	4.65	X	85.75	i	0.55	×	0.7	= =	106.39	(79)
Southwest _{0.9x} 0.77	i x	4.65	X	106.25	i	0.55	×	0.7	= =	131.82	(79)
Southwest _{0.9x} 0.77] x	4.65	X	119.01]]	0.55	×	0.7	_	147.65	(79)
Southwest _{0.9x} 0.77] x	4.65] x	118.15]]	0.55	x	0.7	= -	146.58	(79)
Southwest _{0.9x} 0.77]	4.65]	113.91]]	0.55	^ L x [0.7	= =	141.32	(79)
Southwest _{0.9x} 0.77] ^] x	4.65] ^] x	104.39]]	0.55	^ L x [0.7	= =	129.51	(79)
Southwest _{0.9x} 0.77] ^] x	4.65]	92.85]]	0.55	^ L x [0.7	= =	115.2	(79)
0	」^] ×		1]]		_ ^ L 		= -		(79)
01	╡	4.65] X] ,	69.27] 1	0.55	≓ ¦	0.7	- -	85.94	= ` ` `
0 11 1] X]	4.65] X]	44.07] 1	0.55		0.7	_	54.68	= (79)
Southwest _{0.9x} 0.77	X	4.65	X	31.49	J	0.55	X	0.7	=	39.07	(79)
Oalan maina in wetter and av		fa., a a a la a	4 1_		(00)	0(74)	(00)				
Solar gains in watts, calculus (83)m= 233.89 403.06 563	3.83	719.31 824.5		26.93 793.79	713	.99 617.48	(82)m 448.79	281	199.62		(83)
Total gains – internal and		!			1 , , ,	.00 011.10	110.10	1 20.	100.02		()
		1044.27 1128.5	`	110.51 1064.48	990	.95 905.35	757.64	613.87	550.6		(84)
` '					1 333			1 0.0.0.	000.0		
7. Mean internal tempera				f T-I	- I - O	Th4 (90)					7(05)
Temperature during heat	•		_		ole 9	, In1 (°C)				21	(85)
Utilisation factor for gains			Ť				0-4	T N			
 	/lar	Apr Ma	_	Jun Jul	 	ug Sep	Oct	Nov	Dec		(96)
(86)m= 0.99 0.97 0	.9	0.75 0.57		0.4 0.29	0.3	32 0.52	0.84	0.97	0.99		(86)
Mean internal temperatur			`	i	1			1		1	
(87)m= 20.18 20.44 20	.71	20.91 20.98	3	21 21	2	1 20.99	20.87	20.48	20.13		(87)

Tamananah wa di wina	h4:	!! . !.	4 -6	م دال د دام	. f T.	O T	LO (90)					
Temperature during		i	i		20.12	20.12		1 20.4	1 20.4	20.00		(88)
(88)m= 20.08 20.09	20.09	20.1	20.1	20.12	<u> </u>		20.11	20.1	20.1	20.09		(88)
Utilisation factor for	-	1		- ` ` 		- 	,				ı	
(89)m= 0.99 0.96	0.88	0.71	0.52	0.34	0.23	0.26	0.46	0.79	0.96	0.99		(89)
Mean internal temper	erature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)				
(90)m= 19.01 19.38	19.74	20.01	20.09	20.12	20.12	20.12	20.11	19.97	19.46	18.94		(90)
							f	fLA = Livin	ig area ÷ (4	4) =	0.42	(91)
Mean internal tempe	erature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m= 19.5 19.82	20.15	20.39	20.46	20.48	20.49	20.49	20.48	20.35	19.88	19.44		(92)
Apply adjustment to	the mear	n interna	l temper	ature fro	m Table	4e, whe	ere appr	opriate				
(93)m= 19.35 19.67	20	20.24	20.31	20.33	20.34	20.34	20.33	20.2	19.73	19.29		(93)
8. Space heating re	quiremen	t		•		•		•	•			
Set Ti to the mean i the utilisation factor		•		ned at st	ep 11 of	Table 9	b, so tha	at Ti,m=(76)m an	d re-calc	culate	
Jan Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for		<u> </u>	ay	1 04.1		1 7109			1.101			
(94)m= 0.98 0.95	0.87	0.72	0.53	0.36	0.24	0.27	0.47	0.8	0.96	0.99		(94)
Useful gains, hmGn	, W = (9	4)m x (8	4)m									
(95)m= 585.88 724.39	794.74	749.92	596.57	395.41	257.94	270.92	429.63	604.09	589.28	544.47		(95)
Monthly average ex	ternal tem	perature	e from T	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 m	ean interr	al temp	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m= 1082.64 1059.4	3 965.14	798.15	604.46	396.04	257.99	271.02	432.79	673.49	892.27	1072.32		(97)
Space heating requ	rement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 369.59 225.15	126.77	34.72	5.87	0	0	0	0	51.64	218.16	392.72		
						Tota	ıl per year	(kWh/yea	r) = Sum(9	8)15,912 =	1424.61	(98)
Space heating requ	rement in	ı kWh/m²	²/year								19.81	(99)
9a. Energy requirement	ents – Ind	lividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heating:										ı		_
Fraction of space he	at from s	econdar	y/supple	ementary	system						0	(201)
Fraction of space he	at from n	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of total hea	ting from	main sy	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main s	oace heat	ting syste	em 1								90.4	(206)
Efficiency of second	ary/suppl	ementar	y heatin	g systen	ո, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	 ear
			.				•		•	•	l	
Space heating requ	rement (d	calculate	d above)								
Space heating requ		34.72	d above	0	0	0	0	51.64	218.16	392.72		
·	126.77	34.72	5.87	`	0	0	0	51.64	218.16	392.72		(211)
369.59 225.15	126.77 (204)] } x 1	34.72	5.87	`	0	0	0	51.64	218.16	392.72 434.42		(211)
$369.59 225.15$ $(211)m = \{[(98)m \times (2010)] \}$	126.77 (204)] } x 1	34.72 100 ÷ (20	5.87	0	l .	0	0	57.12	1	434.42	1575.9	(211)
$369.59 225.15$ $(211)m = \{[(98)m \times (2010)] \}$	126.77 204)] } x 1 5 140.24	34.72 100 ÷ (20 38.41	5.87 06) 6.49	0	l .	0	0	57.12	241.32	434.42	1575.9	_
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	126.77 (204)] } x 1 (5 140.24 (secondar)	34.72 100 ÷ (20 38.41 Ty), kWh/	5.87 06) 6.49	0	l .	0	0	57.12	241.32	434.42	1575.9	_
369.59	126.77 (204)] } x 1 (5 140.24 (secondar)	34.72 100 ÷ (20 38.41 Ty), kWh/	5.87 06) 6.49	0	l .	0 Total	0 ol (kWh/yea	57.12 ar) =Sum(2	241.32	434.42	1575.9	(211)
369.59 225.15 (211)m = {[(98)m x (2 408.84 249.05] Space heating fuel (= {[(98)m x (201)]} x	204)] } x 1 5 140.24 (secondar 100 ÷ (20	34.72 100 ÷ (20 38.41 ry), kWh/	5.87 (6) 6.49 (month	0	0	0 Total	0 ol (kWh/yea	57.12 ar) =Sum(2	241.32	434.42	1575.9	_

Water heating							
Output from water heater (calculated above) 194.27 169.7 176.56 156.6 151.62 1	33.53 127.94	142.62 144	1.19 164.19	175.27	189.71		
Efficiency of water heater	00.00 127.04	142.02	104.13	170.27	100.71	80.3	(216)
· · · · · · · · · · · · · · · · · · ·	80.3 80.3	80.3 80).3 82.51	85.6	86.84	00.0	(217)
Fuel for water heating, kWh/month	!	<u> </u>				I	
$(219)m = (64)m \times 100 \div (217)m$				1		1	
(219)m= 224.21 197.87 209.61 191.06 188.03 1	66.29 159.32		9.57 199.01 um(219a) _{1 12} =	204.75	218.45		–
Amount totals		10tai – 3t				2315.77	(219)
Annual totals Space heating fuel used, main system 1			r	Wh/yea	ſ	kWh/yea 1575.9	<u></u>
Water heating fuel used						2315.77	╡
Electricity for pumps, fans and electric keep-hot						2010.77	_
	itiva innvit fram	a autoida				1	(220-)
mechanical ventilation - balanced, extract or pos	itive iriput iron	outside			148.07	1	(230a)
central heating pump:					30		(230c) —
Total electricity for the above, kWh/year		sum of (2	30a)(230g)	=		178.07	(231)
Electricity for lighting						317.63	(232)
Electricity generated by PVs						-271.71	(233)
Electricity generated by PVs 12a. CO2 emissions – Individual heating system	s including mid	cro-CHP				-271.71	(233)
	Energy	cro-CHP		sion fac	etor	Emissions	
12a. CO2 emissions – Individual heating system	Energy kWh/year	cro-CHP	kg CC	2/kWh	etor	Emissions kg CO2/ye	s ar
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy kWh/year	cro-CHP	kg CC	216	=	Emissions kg CO2/ye	ar (261)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x	cro-CHP	kg CC	216 519	=	Emissions kg CO2/ye	(261) (263)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x		kg CC	216	=	Emissions kg CO2/ye	ar (261)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x (219) x	+ (263) + (264)	kg CC	216 519	=	Emissions kg CO2/ye	(261) (263)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x		kg CC	216 519	=	Emissions kg CO2/ye 340.39 0	(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) +		kg CC 0.3	22/kWh 216 519 216	= = = =	Emissions kg CO2/ye 340.39 0 500.21	(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		kg CC 0.3 0.4 0.5 0.5	22/kWh 216 519 216 519	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/ye 340.39 0 500.21 840.6 92.42 164.85	(261) (263) (264) (265) (267) (268)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies Item 1	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (231) x	+ (263) + (264)	kg CC 0.8 0.8 0.8 0.8 0.8	22/kWh 216 519 216 519 519	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/ye 340.39 0 500.21 840.6 92.42 164.85	(261) (263) (264) (265) (267) (268)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (231) x	+ (263) + (264) s	kg CC 0.3 0.4 0.5 0.5	22/kWh 216 519 216 519 519	= = = = = = = = = = = = = = = = = = = =	Emissions kg CO2/ye 340.39 0 500.21 840.6 92.42 164.85	(261) (263) (264) (265) (267) (268)

El rating (section 14)

(274)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Strom Softwa				Versio	on: 1.0.4.16	
		Pi	roperty .	Address	: Flat 08	3				
Address :										
1. Overall dwelling dimer	nsions:									
Basement				a(m²) 65.1	(1a) x		2.5	(2a) =	Volume(m 162.74	3) (3a)
Total floor area TFA = (1a	ı)+(1b)+(1c)+(1d)+(1	e)+(1n	1) (65.1	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	162.74	(5)
2. Ventilation rate:										
Number of chimneys	main s heating + [secondar heating	у + [other 0	7 = [total 0	x	40 =	m³ per hou	ır ─(6a)
Number of open flues	0 +	0	」	0]	0	x	20 =	0	(6b)
Number of intermittent far					J L			10 =		(7a)
Number of passive vents	10				L	0		10 =	0	=
					Ļ	0		40 =	0	(7b)
Number of flueless gas fir	es				L	0	X 1		nanges per h	(7c)
Infiltration due to chimney	n fluor and fans = ((6a)+(6b)+(7	a)+(7h)+(70) =	_					
If a pressurisation test has be					continue f	0 from (9) to		÷ (5) =	0	(8)
Number of storeys in th									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2					•	ruction			0	(11)
if both types of wall are pre deducting areas of opening		esponding to	the great	er wall are	a (after					
If suspended wooden fl		aled) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ento	er 0.05, else enter 0								0	(13
Percentage of windows	and doors draught	stripped							0	(14
Window infiltration				0.25 - [0.2	` '	-			0	(15
Infiltration rate				(8) + (10)					0	(16)
Air permeability value, o	•		•	•	•	netre of e	envelope	area	3	(17)
If based on air permeabilit Air permeability value applies	-					rio boina u	ucod		0.15	(18)
Number of sides sheltered		as been don	e or a deg	gree air pe	тпеаышу	is being u	13 C U		0	(19)
Shelter factor				(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporati	ng shelter factor			(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified for	or monthly wind spee	ed						,		
Jan Feb I	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	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 = (22	')m ÷ 4								-	
Wind Factor (22a)m = (22 $(22a)$ m = 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
,, 1.20 1	1.00	J 0.00	3.00	1 3.52	<u> </u>	1	1,2	Lo	l	

0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
alculate effec		•	rate for t	he appli	cable ca	se	l	l		ı	!	ı 	
If mechanica			l: N (0	(O.O.	/		15.) (1	. (00)	\ (00 \			0.5	(2:
If exhaust air he		0		, ,	, ,	. ,	,, .	•) = (23a)			0.5	(2:
If balanced with		-	-	_								73.95	(2:
a) If balance						- ` ` 	- ^ `	``	 		```	÷ 100]	
4a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(24
b) If balance						- 	<u> </u>	``	 			1	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (00)	,			
if (22b)n		r` ´	· ` `	<u> </u>	r i		ŕ	<u> </u>	· ` `			l	(2)
1c)m= 0	0	0		0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n				•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)		•	•		
5)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(2
Heat lease	and be	o logo i	o o ro n o o t	or:									_
. Heat losse					Net Ar	200	U-valı	10	AXU		k volu		ΑΧk
LEMENT	Gros area		Openin m		A, r		W/m2		(W/I	<)	k-value kJ/m²·l		kJ/K
in <mark>dows</mark> Type	1				17.75	₅ x1.	/[1/(1.2)+	0.04] =	20.32				(2
indows Type	2				4.65	x1.	/[1/(1.2)+	0.04] =	5.32	Ħ			(2
indows Type	3				4.65	×1.	/[1/(1.2)+	0.04] =	5.32	Ħ			(2
alls Type1	61.7	76	27.0	5	34.71		0.16		5.55	片 ,			(2
alls Type2		_	0			=		╣┇		륵 ¦		╡	(2
oof	26.6			_	26.68	=	0.16	-	4.27	륵 ¦		╡╞	
	64.7		0		64.78	_	0.12	= [7.77				(3
otal area of e					153.2			/r/4/11 1	\ 0.047		,		(3
or windows and include the area						ated using	i formula 1	/[(1/U-valu	ie)+0.04] a	is given in	paragrapr	1 3.2	
abric heat los				,			(26)(30)) + (32) =				48.57	(3
eat capacity		,	,					((28)	.(30) + (32	2) + (32a).	(32e) =	12246.7	
nermal mass		` ,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K	,		Indica	tive Value:	Medium		250	(3
r design assess	•	•		,			ecisely the	e indicative	values of	TMP in T	able 1f	200	(`
n be used instea	ad of a de	tailed calc	ulation.										
ermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix I	K						12.25	(3
letails of therma		are not kn	own (36) =	= 0.15 x (3	11)			(00)	(00)				
otal fabric he								• •	(36) =			60.82	(3
entilation hea		i e			Ι.				= 0.33 × (i	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		10
	17.07	16.86	15.86	15.66	14.65	14.65	14.45	15.05	15.66	16.06	16.46		(3
)m= 17.27			•										
eat transfer o	oefficie	nt, W/K						(39)m	= (37) + (3	38)m		•	

Heat loss para	ımeter (l	HP) W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.2	1.2	1.19	1.18	1.17	1.16	1.16	1.16	1.17	1.17	1.18	1.19		
	<u> </u>			<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	L Average =	Sum(40) ₁ .	12 /12=	1.18	(40)
Number of day	/s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•		•		•	•	•	•	•			
4. Water heat	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)] + 0.0	0013 x (⁻	TFA -13.		12		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.59		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pe	r day for ea			ctor from	Table 1c x		<u>'</u>	ļ.	!			
(44)m= 93.04	89.66	86.28	82.89	79.51	76.13	76.13	79.51	82.89	86.28	89.66	93.04		
									Total = Su	m(44) ₁₁₂ =		1015.03	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	ables 1b, 1	c, 1d)		
(45)m= 137.98	120.68	124.53	108.57	104.17	89.9	83.3	95.59	96.73	112.73	123.05	133.63		
W. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a. i. a.									Total = Su	m(45) ₁₁₂ =	<u> </u>	1330.87	(45)
If instantaneous w	_		ot use (no										
(46)m= 20.7 Water storage	18.1	18.68	16.29	15.63	13.48	12.5	14.34	14.51	16.91	18.46	20.04		(46)
Storage volum		includir	na any sa	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h								arrie ves	001		0		(47)
Otherwise if no	_			_			` '	ers) ente	er '0' in <i>(</i>	47)			
Water storage			. (o. o, o		, ,			
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
b) If manufact			-										
Hot water stora	•			le 2 (kW	h/litre/da	ay)					0		(51)
If community he Volume factor	_		on 4.3								. 1		(50)
Temperature factor			2h							-	0		(52) (53)
Energy lost fro				oor			(47) v (51)) v (52) v (53) -				. ,
Enter (50) or (•	, KVVII/y	zai			(47) X (31)) x (52) x (55) =		0		(54) (55)
Water storage	. , .	,	or each	month			((56)m = ((55) × (41)	m		0		(00)
										Ι .			(50)
(56)m= 0 If cylinder contains	0 a dadicata	0 d solar etc	0	0 = (56)m	0	0	0) also (5)	7)m = (56)	0 m whore (0	0 m Annond	iv Ll	(56)
				· · ·		1							
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by		rom Tab			i			<u> </u>		stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

				(0.1)	(00)	0= (44)							
Combi loss cal					<u> </u>	- ` ` `		2 1 40 00	1007	14400	17.44	[(61)
(61)m= 47.41	41.27	43.97	40.88	40.52	37.54	38.79	40.5	<u> </u>	43.97	44.22	47.41		(61)
Total heat requ							`		` 	ì 	`	(59)m + (61)m	(22)
(62)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.1		156.7	167.27	181.04		(62)
Solar DHW input o									r contribut	tion to wate	er heating)		
(add additional					- 	 	<u> </u>		Ι ,	1 0		1	(62)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa						1 ,00 00				T		1	
(64)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.1		156.7	167.27	181.04	4020.24	(64)
			134/1/		- /	(45)		output from w				1838.24](04)
Heat gains from	r]	(CE)
(65)m= 57.73	50.44	52.4	46.32	44.77	39.28	37.4	41.9	L	48.47	51.97	56.29		(65)
include (57)r			. ,		ylinder i	s in the o	dwellir	ng or hot w	ater is f	rom com	munity h	eating	
5. Internal ga	ins (see	Table 5	and 5a):									
Metabolic gain				Ι	ı		ı	-	ī		1	Ī	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au		Oct	Nov	Dec		(2.2)
(66)m= 106.08	106.08	106.08	106.08	106.08	106.08	106.08	106.0	_	106.08	106.08	106.08		(66)
Lighting gains	_		_		_								
(67)m= 16.55	14.7	11.95	9.05	6.76	5.71	6.17	8.02		13.67	15.95	17.01		(67)
App <mark>liance</mark> s gai	ns (ca <mark>lcı</mark>	<mark>ulat</mark> ed ir	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble 5				
(68)m= 185.6	187.52	182.67	172.34	159.3	147.04	138.85	136.9	141.78	152.11	165.15	177.41		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a	, also	see Table	5				
(69)m= 33.61	33.61	33.61	33.61	33.61	33.61	33.61	33.6	33.61	33.61	33.61	33.61		(69)
Pumps and far	ns gains	(Table 5	āa)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)	_		_		_			
(71)m= -84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.86	-84.8	6 -84.86	-84.86	-84.86	-84.86		(71)
Water heating	gains (T	able 5)											
(72)m= 77.6	75.06	70.43	64.33	60.17	54.55	50.26	56.3	3 58.86	65.15	72.18	75.65		(72)
Total internal	gains =				(66)m + (67)m	+ (68)	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 337.56	335.11	322.87	303.54	284.05	265.12	253.11	259.	1 269.23	288.75	311.11	327.89		(73)
6. Solar gains	:												
Solar gains are c		•					tions to	convert to the	ne applical		tion.		
Orientation: A	ccess Fable 6d	actor	Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
	able ou					DIE Ga	. –	Table ob	_ '	able oc		(()	,
Northeast _{0.9x}	0.77	X	4.6	35	X	11.28	×	0.55	x	0.7	=	14	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	x 2	22.97	x	0.55	x	0.7	=	28.49	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	X	11.38	x	0.55	x	0.7	=	51.34	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	x 6	67.96	x	0.55	x	0.7	=	84.31	(75)
Northeast _{0.9x}	0.77	X	4.6	S5	x (91.35	X	0.55	x	0.7	=	113.33	(75)

Northeast 0.9s															
Northeast 0.0x	Northeast _{0.9x}	0.77	X	4.	65	X	9	7.38	x	0.55	X	0.7	=	120.82	(75)
Northeast 0.sx	Northeast _{0.9x}	0.77	×	4.	65	X		91.1	x	0.55	x	0.7	=	113.02	(75)
Northeast 0.50	Northeast _{0.9x}	0.77	X	4.	65	X	7	2.63	x	0.55	X	0.7	=	90.1	(75)
Northeast 0, 9x	Northeast _{0.9x}	0.77	X	4.	65	X	5	50.42	x	0.55	X	0.7	=	62.55	(75)
Northwest 0 9x	Northeast _{0.9x}	0.77	X	4.	65	X	2	28.07	x	0.55	X	0.7	=	34.82	(75)
Southwesto 9x	Northeast _{0.9x}	0.77	X	4.	65	X		14.2	x	0.55	X	0.7	=	17.61	(75)
Southwesto 9s	Northeast _{0.9x}	0.77	X	4.	65	X	,	9.21	x	0.55	X	0.7	=	11.43	(75)
Southwesto.gs, 0.77 x 4.65 x 106.25 0.55 x 0.7 = 106.39 (79) Southwesto.gs, 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 (79) Southwesto.gs, 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 (79) Southwesto.gs, 0.77 x 4.65 x 118.15 0.55 x 0.7 = 147.65 (79) Southwesto.gs, 0.77 x 4.65 x 113.91 0.55 x 0.7 = 146.56 (79) Southwesto.gs, 0.77 x 4.65 x 113.91 0.55 x 0.7 = 146.56 (79) Southwesto.gs, 0.77 x 4.65 x 113.91 0.55 x 0.7 = 146.56 (79) Southwesto.gs, 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 (79) Southwesto.gs, 0.77 x 4.65 x 104.39 0.55 x 0.7 = 141.32 (79) Southwesto.gs, 0.77 x 4.65 x 92.85 0.55 x 0.7 = 185.94 (79) Southwesto.gs, 0.77 x 4.65 x 6.92 0.55 x 0.7 = 152.51 (79) Southwesto.gs, 0.77 x 4.65 x 6.92 0.55 x 0.7 = 152.51 (79) Southwesto.gs, 0.77 x 4.65 x 6.92 0.55 x 0.7 = 152.51 (79) Southwesto.gs, 0.77 x 4.65 x 6.92 0.55 x 0.7 = 152.51 (79) Southwesto.gs, 0.77 x 4.65 x 13.49 0.55 x 0.7 = 152.51 (79) Northwesto.gs, 0.77 x 17.75 x 11.28 y 0.55 x 0.7 = 152.51 (79) Northwesto.gs, 0.77 x 17.75 x 11.28 y 0.55 x 0.7 = 156.77 (79) Northwesto.gs, 0.77 x 17.75 x 11.28 y 0.55 x 0.7 = 33.43 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 11.28 y 0.55 x 0.7 = 165.99 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 13.32 x 0.55 x 0.7 = 165.99 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 x 0.55 x 0.7 = 132.82 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 x 0.55 x 0.7 = 343.95 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 x 0.55 x 0.7 = 343.95 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 x 0.55 x 0.7 = 343.95 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 x 0.55 x 0.7 = 343.95 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 x 0.55 x 0.7 = 343.95 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 x 0.55 x 0.7 = 343.95 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 (81) Northwesto.gs, 0.77 x 17.75 x 17.75 x 19.35 (81) Northwesto.gs, 0.77 x 17.75 x 19.35 (81) 8.87 = 13.87 (81) 8.87 = 13.88 (81) 8.87 = 13.88 (81) 8.87 = 13.88 (81) 8.87 = 13.88 (81) 8.87 = 13.88 (81) 8.87 = 13.88 (81) 8.87 = 13.88 (81) 8.87 = 13.88 (81) 8.87 = 13.88	Southwest _{0.9x}	0.77	X	4.	65	X	3	86.79]	0.55	X	0.7	=	45.65	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	X	4.	65	X	6	32.67]	0.55	X	0.7	=	77.76	(79)
Southwesto 9x	Southwest _{0.9x}	0.77	X	4.	65	X	8	35.75]	0.55	X	0.7	=	106.39	(79)
Southwesto 9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 (79) Southwesto 9x 0.77 x 4.65 x 118.19 0.55 x 0.7 = 141.32 (79) Southwesto 9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 (79) Southwesto 9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwesto 9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwesto 9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto 9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto 9x 0.77 x 4.65 x 112.8 x 0.55 x 0.7 = 85.94 (79) Southwesto 9x 0.77 x 1.75 x 112.8 x 0.55 x 0.7 = 39.07 (79) Northwest 0.9x 0.77 x 1.75 x 112.8 x 0.55 x 0.7 = 108.77 (81) Northwest 0.9x 0.77 x 17.75 x 12.297 x 0.55 x 0.7 = 195.96 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 12.297 x 0.55 x 0.7 = 195.96 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 17.75 x 0.55 x 0.7 = 195.96 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 321.82 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 321.82 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 432.6 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 432.6 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 431.44 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 431.44 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.35 x 0.55 x 0.7 = 431.44 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 334.395 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 131.99 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 131.99 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x 17.75 x 0.9 1.1 x 0.55 x 0.7 = 132.99 (81) Northwest 0.9x 0.77 x	Southwest _{0.9x}	0.77	X	4.	65	X	1	06.25]	0.55	X	0.7	=	131.82	(79)
Southwesto 9x	Southwest _{0.9x}	0.77	X	4.	65	X	1	19.01]	0.55	X	0.7	=	147.65	(79)
Southwesto, 9x	Southwest _{0.9x}	0.77	X	4.	65	X	1	18.15]	0.55	X	0.7	=	146.58	(79)
Southwesto.gx	Southwest _{0.9x}	0.77	X	4.	65	X	1	13.91]	0.55	X	0.7	=	141.32	(79)
Southwesto 9x	Southwest _{0.9x}	0.77	×	4.	65	X	1	04.39]	0.55	X	0.7	=	129.51	(79)
Southwesto 9x 0.77	Southwest _{0.9x}	0.77	×	4.	65	X	9	2.85]	0.55	X	0.7	=	115.2	(79)
Southwest0.9x 0.77	Southwest _{0.9x}	0.77	×	4.	65	X	6	9.27]	0.55	X	0.7	=	85.94	(79)
Northwest 0.9x	Sout <mark>hwest_{0.9x}</mark>	0.77	×	4.	65	X	4	4.07		0.55	X	0.7	=	54.68	(79)
Northwest 0, 9x	Southwest _{0.9x}	0.77	×	4.0	65	Х	3	31.49] ,	0.55	X	0.7	_	39.07	(79)
Northwest 0, 9x	Northwest _{0.9x}	0.77	×	17	.75	X	1	1.28	×	0.55	X	0.7	=	53.43	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	17	.75	Х	2	22.97	x	0.55	x	0.7	=	108.77	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	×	17	.75	Х	4	1.38	х	0.55	x	0.7	=	195.96	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	×	17	.75	Х	6	67.96	×	0.55	x	0.7	=	321.82	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	17	.75	Х	9	1.35	x	0.55	X	0.7	=	432.6	(81)
Northwest 0.9x	Northwest 0.9x	0.77	×	17	.75	X	9	7.38	x	0.55	X	0.7	=	461.19	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	17	.75	X	,	91.1	x	0.55	X	0.7	=	431.44	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	17	.75	X	7	2.63	x	0.55	X	0.7	=	343.95	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	×	17	.75	X	5	0.42	x	0.55	X	0.7	=	238.78	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	17	.75	X	2	28.07	x	0.55	X	0.7	=	132.92	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 113.08	Northwest 0.9x	0.77	×	17	.75	X		14.2	x	0.55	X	0.7	=	67.23	(81)
(83) m= 113.08 215.01 353.69 537.95 693.57 728.59 685.78 563.56 416.53 253.68 139.52 94.13 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 450.64 550.12 676.56 841.5 977.63 993.71 938.89 822.66 685.76 542.43 450.63 422.02 (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 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Northwest _{0.9x}	0.77	×	17	.75	X	9	9.21	x	0.55	x	0.7	=	43.64	(81)
(83)m= 113.08 215.01 353.69 537.95 693.57 728.59 685.78 563.56 416.53 253.68 139.52 94.13 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 450.64 550.12 676.56 841.5 977.63 993.71 938.89 822.66 685.76 542.43 450.63 422.02 (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 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	_								-						
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 450.64 550.12 676.56 841.5 977.63 993.71 938.89 822.66 685.76 542.43 450.63 422.02 (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 0.99 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Solar gains in	watts, ca	alculate	d for eac	h mont	_			(83)m	n = Sum(74)m	(82)m	_		•	
(84)m= 450.64 550.12 676.56 841.5 977.63 993.71 938.89 822.66 685.76 542.43 450.63 422.02 (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 0.99 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	` '			<u> </u>	ļ				563	.56 416.53	253.6	8 139.52	94.13		(83)
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 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)				`	`	- `								7	
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 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	(84)m= 450.64	550.12	676.56	841.5	977.63	9	93.71	938.89	822	.66 685.76	542.4	3 450.63	422.02		(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 temp	erature	(heating	g seaso	n)									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature	during h	eating	periods i	n the liv	ing	area	from Tab	ole 9	, Th1 (°C)				21	(85)
(86)m= 1 0.99 0.97 0.87 0.68 0.48 0.35 0.42 0.7 0.95 0.99 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Utilisation fac	tor for g	ains for	living ar	ea, h1,r	n (s	ee Ta	ble 9a)							_
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Jan	Feb	Mar	Apr	May	<u>' </u>	Jun	Jul	Α	ug Sep	Oct	Nov	Dec]	
	(86)m= 1	0.99	0.97	0.87	0.68		0.48	0.35	0.4	12 0.7	0.95	0.99	1		(86)
(87)m= 19.78 19.99 20.32 20.72 20.93 20.99 21 21 20.94 20.6 20.11 19.74 (87)	Mean interna	I temper	ature in	living ar	ea T1 (follo	w ste	ps 3 to 7	in T	able 9c)					
	(87)m= 19.78	19.99	20.32	20.72	20.93	2	20.99	21	_ 2	1 20.94	20.6	20.11	19.74		(87)
														=	

Tanana anakuma alumba ali a			: -1 11:	. f T.	hi o T	LO (90)					
Temperature during he		-	19.95	19.95	19.96	`	10.04	10.04	10.02		(88)
(88)m= 19.92 19.92	19.93 19	19.94	19.95	19.95	19.96	19.95	19.94	19.94	19.93		(88)
Utilisation factor for ga	-		h2,m (se	1	9a)						
(89)m= 0.99 0.99	0.95 0.	83 0.62	0.4	0.27	0.32	0.62	0.92	0.99	1		(89)
Mean internal tempera	ture in the	rest of dwell	ling T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)				
(90)m= 18.31 18.61	19.09 19	19.88	19.95	19.95	19.95	19.91	19.49	18.8	18.26		(90)
						1	fLA = Livin	g area ÷ (4	1) =	0.42	(91)
Mean internal tempera	ture (for th	e whole dwe	elling) = f	LA × T1	+ (1 – fL	A) × T2					
(92)m= 18.93 19.19		.09 20.33	20.39	20.39	20.39	20.34	19.96	19.35	18.89		(92)
Apply adjustment to th	e mean int	ernal tempe	rature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 18.78 19.04	19.46 19	.94 20.18	20.24	20.24	20.24	20.19	19.81	19.2	18.74		(93)
8. Space heating requi	rement	,		•							
Set Ti to the mean inte the utilisation factor for	•		ned at st	ep 11 of	Table 9l	b, so tha	it Ti,m=(76)m an	d re-calc	ulate	
Jan Feb		Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for ga		 	1		19						
(94)m= 0.99 0.98	-	83 0.63	0.42	0.29	0.35	0.64	0.92	0.99	0.99		(94)
Useful gains, hmGm,	W = (94)m	x (84)m				<u> </u>					
(95)m= 447.53 540.59	641.27 70	1.74 616.8	421.96	274.63	288.37	438.95	498.87	443.97	419.84		(95)
Monthly average exter	nal temper	ature from T	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	n internal to	emperature,	Lm , W :	=[(39)m	x [(93)m	– (96)m]				
(97)m= 1130.52 1101.34	1006.95 84	6.68 648.22	425.51	275.05	289.38	462.4	704.19	930.38	1123.5		(97)
Space heating require	ment fo <mark>r ea</mark>	ch month, k	Wh/mon	th = 0.02	24 x [(97	m - (95))m] x (4	1)m			
	i	4.36 23.37	0	0	0	0	152.75	350.21	523.52		_
	i	-	_		0	0	<u> </u>	350.21 -) = Sum(9		2311.26	(98)
	272.07 10-	4.36 23.37	_		0	0	<u> </u>			2311.26	(98) (99)
(98)m= 508.15 376.83	272.07 104 ment in kW	4.36 23.37 /h/m²/year	0	0	0 Tota	0 Il per year	<u> </u>				=
(98)m= 508.15 376.83 Space heating requirement Space heating:	ment in kW	4.36 23.37 h/m²/year ual heating s	0 systems i	0 ncluding	0 Total	0 Il per year	<u> </u>			35.5	(99)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat	ment in kW s – Individu	4.36 23.37 h/m²/year ual heating s	0 systems i	ncluding v system	0 Total	0 ol per year	<u> </u>				(99)
(98)m= 508.15 376.83 Space heating requirement Space heating:	ment in kW s – Individu	4.36 23.37 h/m²/year ual heating s	0 systems i	ncluding v system	0 Total	0 ol per year	<u> </u>			35.5	(99)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat	ment in kW s – Individu	4.36 23.37 h/m²/year ual heating s ndary/supple system(s)	0 systems i	ncluding v system	0 Total	0 Il per year CHP) - (201) =	(kWh/year			35.5	(99)
Space heating required 9a. Energy requirement Space heating: Fraction of space heat Fraction of space heat	ment in kW s – Individu from secon from main g from main	23.37 h/m²/year ual heating s ndary/supple system(s) n system 1	0 systems i	ncluding v system	0 Tota micro-C	0 Il per year CHP) - (201) =	(kWh/year			0 1	(99) (201) (202)
Space heating requirement Space heating: Fraction of space heat Fraction of total heatin	ment in kW s – Individu from secon from main g from main ce heating	23.37 2h/m²/year Lal heating solution andary/supple system(s) n system 1 system 1	o systems i ementary	ncluding v system	0 Tota micro-C	0 Il per year CHP) - (201) =	(kWh/year			0 1 1	(99) (201) (202) (204)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space	ment in kW s – Individu from secon from main g from main ce heating	23.37 2h/m²/year Lal heating solution andary/supple system(s) n system 1 system 1	o systems i ementary	ncluding v system	0 Tota micro-C	0 Il per year CHP) - (201) =	(kWh/year			0 1 1 90.4	(99) (201) (202) (204) (206) (208)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary	ment in kW s – Individu from secon from main g from main ce heating y/suppleme	23.37 ch/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating Apr May	systems in a system of the sys	ncluding v system	0 Tota micro-C (202) = 1 - (204) = (2	0 Il per year CHP) - (201) = 02) × [1 -	(kWh/year	r) = Sum(9	8) _{15,912} =	0 1 1 90.4	(99) (201) (202) (204) (206) (208)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer	ment in kW s – Individu from secon from main g from main ce heating sy/supplement Mar A ment (calculation)	23.37 ch/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating Apr May	systems in a system of the sys	ncluding v system	0 Tota micro-C (202) = 1 - (204) = (2	0 Il per year CHP) - (201) = 02) × [1 -	(kWh/year	r) = Sum(9	8) _{15,912} =	0 1 1 90.4	(99) (201) (202) (204) (206) (208)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer	ment in kW s – Individu from secon from main g from main ce heating y/suppleme Mar Mar Ament (calcu 272.07 10	23.37 h/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating Apr May ulated above 4.36 23.37	ementary g system Jun	ncluding v system n, %	0 Tota micro-C (202) = 1 - (204) = (2	0 Il per year CHP) - (201) = 02) × [1 -	(kWh/year	Nov	8) _{15,912} =	0 1 1 90.4	(99) (201) (202) (204) (206) (208)
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer 508.15 376.83 (211)m = {[(98)m x (204)]	ment in kW s – Individu from secon from main g from main ge heating y/supplement Mar Mar Ment (calcu 272.07 100	23.37 h/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating Apr May ulated above 4.36 23.37	ementary g system Jun	ncluding v system n, %	0 Tota micro-C (202) = 1 - (204) = (2	0 Il per year CHP) - (201) = 02) × [1 -	(kWh/year	Nov	8) _{15,912} =	0 1 1 90.4	(99) (201) (202) (204) (206) (208) ear
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer 508.15 376.83 (211)m = {[(98)m x (204)]	ment in kW s – Individu from secon from main g from main ge heating y/supplement Mar Mar Ment (calcu 272.07 100	23.37 ch/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating Apr May ulated above 4.36 23.37 ÷ (206)	ementary Jun O	ncluding v system n, % Jul	0 Tota micro-C (202) = 1 - (204) = (2 Aug 0	0 Il per year CHP) - (201) = 02) × [1 - Sep 0	(kWh/year (203)] = Oct 152.75	Nov 350.21	Dec 523.52	0 1 1 90.4	(99) (201) (202) (204) (206) (208) ear
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer 508.15 376.83 (211)m = {[(98)m x (204)]	ment in kW s – Individu from secon from main g from main ge heating y/suppleme Mar Mar Ment (calcu 272.07 10 300.96 11	th/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating May ulated above 4.36 23.37 ÷ (206) 5.44 25.85	ementary Jun O	ncluding v system n, % Jul	0 Tota micro-C (202) = 1 - (204) = (2 Aug 0	0 Il per year CHP) - (201) = 02) × [1 - Sep 0	(kWh/year (203)] = Oct 152.75	Nov 350.21	Dec 523.52	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer 508.15 376.83 (211)m = {[(98)m x (204) 562.11 416.84]	ment in kW s – Individu from secon from main g from main ge heating y/suppleme Mar A ment (calcu 272.07 100 300.96 111	th/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating May ulated above 4.36 23.37 ÷ (206) 5.44 25.85	ementary Jun O	ncluding v system n, % Jul	0 Tota micro-C (202) = 1 - (204) = (2 Aug 0	0 Il per year CHP) - (201) = 02) × [1 - Sep 0	(kWh/year (203)] = Oct 152.75	Nov 350.21	Dec 523.52	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space heating required 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Jan Feb Space heating required 508.15 376.83 (211)m = {[(98)m x (204) 562.11 416.84]	ment in kW s – Individu from secon from main g from main ge heating y/suppleme Mar A ment (calcu 272.07 10 300.96 11 condary), k 00 ÷ (208)	th/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating May ulated above 4.36 23.37 ÷ (206) 5.44 25.85	ementary Jun O	ncluding v system n, % Jul	0 Tota micro-C (202) = 1 - (204) = (2 Aug 0 Tota	0 Il per year CHP) - (201) = 02) × [1 - Sep 0 Il (kWh/yea	(kWh/year (203)] = Oct 152.75 168.98 ar) =Sum(2	Nov 350.21 387.4 211) _{15,1012}	Dec 523.52 579.12 =	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space heating requirer 9a. Energy requirement Space heating: Fraction of space heat Fraction of total heatin Efficiency of main space Efficiency of secondary Jan Feb Space heating requirer 508.15 376.83 (211)m = {[(98)m x (204)	ment in kW s – Individu from secon from main g from main ge heating y/suppleme Mar A ment (calcu 272.07 10 300.96 11 condary), k 00 ÷ (208)	th/m²/year ual heating sendary/supple system(s) n system 1 system 1 entary heating May lated above 4.36 23.37 ÷ (206) 5.44 25.85	systems in a system of the systems of the systems of the system of the s	ncluding v system n, % Jul 0	0 Tota micro-C (202) = 1 - (204) = (2 Aug 0 Tota	0 Il per year CHP) - (201) = 02) × [1 - Sep 0 Il (kWh/yea	(kWh/year (203)] = Oct 152.75 168.98 ar) =Sum(2	Nov 350.21 387.4 211) _{15,1012}	Dec 523.52 579.12 =	0 1 1 90.4 0 kWh/ye	(201) (202) (204) (206) (208) ear

Water heating								
Output from water heater (calculated above) 185.4	27.44 122.09	136.11	137.61	156.7	167.27	181.04	1	
Efficiency of water heater	27.44 122.09	130.11	137.01	150.7	107.27	101.04	80.3	(216)
	80.3 80.3	80.3	80.3	84.99	86.87	87.57	00.0	(217)
Fuel for water heating, kWh/month						3		
$(219)m = (64)m \times 100 \div (217)m$						1	I	
(219)m= 211.98 185.92 195.36 177.56 177.39 1	58.7 152.05	169.5	171.37	184.38	192.56	206.74		_
Annual totals		TOla	I = Sum(2 ⁻		Mb 6 - a a - 1		2183.5	(219)
Annual totals Space heating fuel used, main system 1				K	Wh/year	r 	kWh/year 2556.7	기
Water heating fuel used							2183.5	╡
Electricity for pumps, fans and electric keep-hot						ļ		
mechanical ventilation - balanced, extract or pos	itivo input fron	n outoida	,			124.02		(230a
·	ilive iriput iron	ii outside	;			134.02		
central heating pump:						30		(230d
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			164.02	(231)
Electricity for lighting							292.21	(232)
Electricity generated by PVs							-271.71	(233)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						
	Energy			Emiss	ion fac	tor	Emissions	;
	kWh/year			kg CO	2/kWh		kg CO2/ye	ar
Spa <mark>ce he</mark> ating (main system 1)	(211) x			0.2	16	=	552.25	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	471.64	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1023.88	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	85.13	(267)
Electricity for lighting	(232) x			0.5	19	=	151.66	(268)
Energy saving/generation technologies						!		
Item 1				0.5	19	=	-141.02	(269)
Total CO2, kg/year			sum o	f (265)(2	271) =		1119.65	(272)
Total CO2, kg/year Dwelling CO2 Emission Rate				f (265)(2 ÷ (4) =	271) =		1119.65 17.2	(272)

El rating (section 14)

(274)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Strom Softwa				Versic	on: 1.0.4.16	
		Pi	roperty .	Address	: Flat 09)				
Address :										
1. Overall dwelling dimer	nsions:			4 0						
Basement				a(m²) 38.5	(1a) x		2.5	(2a) =	Volume(m 221.25	3) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n) [38.5	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	221.25	(5)
2. Ventilation rate:		_								
Number of chimneys		secondar heating	у] + [other 0] - [total 0	x -	40 =	m³ per hou	ır ─ _(6a)
Number of open flues	0 +	0	- - - - -	0]	0	x	20 =	0	(6b)
Number of intermittent fan					J L 	0	x	10 =	0	(7a)
Number of passive vents	-				L	0	x	10 =	0	(7b)
Number of flueless gas fire	ac				L	_	x	40 =	-	
Number of fideless gas in					L	0			nanges per h	(7c)
Infiltration due to chimney	s, flues and fans = (6a)+(6b)+(7	a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has be		ded, proceed	d to (17), d	otherwise o	continue f	rom (9) to	(16)			
Number of storeys in the	e dw <mark>elling</mark> (ns)								0	(9)
Additional infiltration Structural infiltration: 0.2	25 for stool or timber	frame or	0.25 for	maaan	av oonet	ruotion	[(9)	-1]x0.1 =	0	(10)
if both types of wall are pre deducting areas of opening	esent, use the value corre				•	ruction			0	(11]
If suspended wooden flo		aled) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	stripped							0	(14)
Window infiltration				0.25 - [0.2	` '	-			0	(15
Infiltration rate						12) + (13)			0	(16)
Air permeability value, o	•		•	•	•	netre of e	envelope	area	3	(17)
If based on air permeabilit	-					to hoton			0.15	(18)
Air permeability value applies Number of sides sheltered		as been don	e or a deg	gree air pe	гтеаршту	r is being u	isea		0	(19)
Shelter factor	•			(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified fo	r monthly wind spee	ed								
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7								=	
	1.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4	'		•	-	•		-	•	
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
							-		ı	

1.19	Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
If mechanical ventilation: If exhaust air heat jump using Appendix N, (230) = (23a) × Fmv (equation (NS)), otherwise (23b) = (23a) =	,	1	· `				i ´	<u>` </u>	` 	0.16	0.17	0.18	1	
If ordinated air heat pump using Appendix N. (23b) = (23a) × Fmv (equation (NS)). otherwise (23b) = (23a) (3a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] (24a)m = (23			_	rate for t	he appli	cable ca	se					!		
If balanced with heat recovery efficiency in % allowing for in use factor (from Table 4h) = 73.95 23. a) if the balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) × 100] 22a)m = 0.32 0.32 0.31 0.3 0.29 0.27 0.27 0.27 0.28 0.29 0.3 0.31 b) if balanced mechanical ventilation with the trecovery (MVV) (24b)m = (22b)m + (23b) × [1 - (23c) × 100] 22b)m = 0 0 0 0 0 0 0 0 0 0													0.5	(23a
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] 24amm 032) = (23a)			0.5	(23b
28a)m	If balanced with	n heat reco	overy: effic	ency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				73.95	(230
b) if balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) 24b;mi	· -		1					- 	í `	- 		- ` ` `) ÷ 100]	
24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	` '					l		l .		L		0.31		(24a
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=						i		<u> </u>	· ·	<u> </u>	1	ı	1	
If (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)	,			,						0	0	0		(24b
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) 224d)m = 0	,				•	•				.5 × (23b	o)	_	_	
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] 24dym = 0	(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25 m										0.5]				
25)	(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings A, m² Nindows Type 1 17.75 17.75 17.75 17.75 17.71(1.2) + 0.04] = 20.32 (27. Nindows Type 2 Nindows Type 3 Nindows Type 4 11.88 17.11(1.2) + 0.04] = 5.32 (27. Nindows Type 4 11.88 17.11(1.2) + 0.04] = 5.32 (27. Nindows Type 4 11.88 17.11(1.2) + 0.04] = 13.6 (27. Feloor 16.167 18.167 19.18 19.18 11.	Effective air	change	rate - er	ter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
Nindows Type 1	(25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(25)
Nindows Type 1	3. Heat losse	s and he	eat loss r	paramete	er:								_	
Vindows Type 2	ELEMENT	Gros	ss	Openin	gs		/				K)			
Vindows Type 3	Win <mark>dows</mark> Type	1				17.75	₅ x1	/[1/(1.2)+	0.04] =	20.32				(27)
Vindows Type 4	Win <mark>dows</mark> Type	2				4.65	x1	/[1/(1.2)+	0.04] =	5.32	Ħ			(27)
Total area of elements, m2 204.64 31 38.93 37.4 x 0.16 = 5.98 3.78 38.93 37.4 x 0.16 = 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.78 3.89 3.78	Windows Type	3				4.65	x1	/[1/(1.2)+	0.04] =	5.32	Ħ			(27)
Total area of elements, m2 204.64 31 38.93 37.4 x 0.16 = 5.98 3.78 38.93 37.4 x 0.16 = 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.89 3.78 3.78 3.89 3.78	Windows Type	e 4				11.88	x1	/[1/(1.2)+	0.04] =	13.6	Ħ			(27)
Valls Type1	Floor						_	0.1	─ i		<u> </u>			
Nalls Type2	Walls Type1	76.3	33	38.93	3		=	0.16	-		=		7 F	
Roof 88.5 0 88.5 x 0.12 = 10.62 (30) (30) (31) (70 total area of elements, m² 204.64 (31) (70 total area of windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 (31) (32) (32) (33) (32) (33) (32) (33) (33) (32) (33) (33) (33) (34) (32) (32) (33) (34) (32) (33) (34) (32) (33) (34)									= :		<u> </u>		-	
Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total area of elements, m ² Total fabric heat loss, W/K = S (A x U) Thermal mass parameter (TMP = Cm + TFA) in kJ/m ² K Thermal mass parameter (TMP = Cm + TFA) in kJ/m ² K Total fabric heat loss (L x Y) calculated using Appendix K Total fabric heat loss Total fabric heat loss Total fabric heat loss Total fabric heat loss calculated monthly Total fabric heat loss calculated monthly Total fabric heat loss calculated monthly Total fabric heat loss calculated monthly Total fabric heat loss Total fabric heat loss calculated monthly Total fabric heat loss calculated will have been deally as given in paragraph 3.2 T	Roof				=		=		=		북 ¦		-	====
Internal pridges		L					_	0.12		10.02				
# include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) Heat capacity Cm = S(A x k) ((28)(30) + (32) = (26)(32) + (32a)(32e) = (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K Indicative Value: Medium 250 (35) Total fabric heat loss (33) + (36) = (35) (34) (35) (36) (37) (38) (38) (39) (39) (39) (30) (31) (32) (32) (32) (33) (34) (35) (35) (35) (36) (37) (38) (38) (39) (39) (30) (31) (30) (31) (32) (32) (33) (34) (35) (35) (35) (36) (37) (38) (38) (38) (39) (39) (30) (31) (32) (31) (32) (32) (33) (34) (35) (35) (36) (37) (38) (38) (38) (39) (39) (30)				ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	ue)+0.041 a	as aiven in	paragrapl	1 3.2	(01)
Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 13606.43 (34) (Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f trans be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (33) + (36) = (33) + (36) = (37) Total fabric heat loss (33) + (36) = (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = (23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m = 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78										, , .	J	7		
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K Indicative values of TMP in Table 1f than be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K Indicative values of TMP in Table 1f than be used instead of a detailed calculation. Indicative values of TMP in Table 1f than be used instead of a detailed calculation. Indicative values of TMP in Table 1f than be used instead of a detailed calculation. Indicative values: Medium Indicative values: Indicative values of TMP in Table 1f Indicative values: Indicative values of TMP in Table 1f Indicative values: Indicative values of TMP in Table 1f Indicative values: Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values of TMP in Table 1f Indicative values	Fabric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				66.58	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f san be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K f details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38)m = 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m = 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78	Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	13606.4	(34)
Thermal bridges: S (L x Y) calculated using Appendix K f details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss /entilation heat loss calculated monthly Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38)m= 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78		•	`		,								250	(35)
f details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 82.4 (37) 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= 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78	=				construct	ion are no	t known pr	recisely the	e indicative	e values of	TMP in T	able 1f		
Total fabric heat loss (33) + (36) = 82.4 (37) Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	_	•	,		• .	•	<						15.82	(36)
/entilation heat loss calculated monthly			are not kn	own (36) =	= 0.15 x (3	1)			(33) ±	(36) =			00.1	(27)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38)m= 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78			alculated	monthly	,				` ,		(25)m v (5)	82.4	(37)
38)m= 23.47 23.2 22.93 21.56 21.28 19.91 19.91 19.64 20.46 21.28 21.83 22.38 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78						lun	lul	Διια	``			<u>, </u>	1	
Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78			_			-		Ť		†	 	+	1	(38)
39)m= 105.88 105.6 105.33 103.96 103.69 102.32 102.32 102.04 102.86 103.69 104.23 104.78	` '			0		L	L	I	<u> </u>		<u> </u>	1	J	(-3)
0 (0) (0)				103.06	103.60	102 32	102 32	102.04				104 79	1	
Stroma FSAP 2012 Version: 1.0.4.16 (SAP 9.92) - http://www.stroma.com Average = Sum(39) ₁₁₂ /12= 103.\(\text{\text{Page 2}} \) of \$\frac{39}{2}\$	` ′					<u> </u>	<u> </u>	102.04		<u> </u>	L		103.80	32 2 (39)

Heat loss para	ımeter (l	HP) W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.2	1.19	1.19	1.17	1.17	1.16	1.16	1.15	1.16	1.17	1.18	1.18		
	ļ	!		<u> </u>			<u> </u>	<u> </u>	L Average =	Sum(40) ₁	12 /12=	1.17	(40)
Number of day	/s in mo	nth (Tab	le 1a)								<u>'</u>		_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	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)] + 0.0	0013 x (⁻	TFA -13.		.6		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.06		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 105.67	101.82	97.98	94.14	90.3	86.45	86.45	90.3	94.14	97.98	101.82	105.67		
		•								m(44) ₁₁₂ =		1152.72	(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 (<mark>see Ta</mark>	ables 1b, 1	c, 1d)		
(45)m= 156.7	137.05	141.42	123.3	118.31	102.09	94.6	108.56	109.85	1 <mark>2</mark> 8.02	139.75	151.76		
If ins <mark>tantane</mark> ous w	vator hosti	ng at paint	of was Inc	hot water	r otorogo)	antar () in	hayaa (46		Total = Su	m(45) ₁₁₂ =	_	1511.4	(45)
_	_												(40)
(46)m= 23.5 Water storage	20.56	21.21	18.49	17.75	15.31	14.19	16.28	16.48	19.2	20.96	22.76	ı	(46)
Storage volum		includir	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h											<u> </u>		()
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage	loss:												
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufact			-										(54)
Hot water storal If community h	_			ie z (KVV	ii/iitie/ua	iy <i>)</i>					0	i	(51)
Volume factor	•		JII 4.0								0		(52)
Temperature f	actor fro	m Table	2b							-	0		(53)
Energy lost fro	m wate	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or ((54) in (55)									0		(55)
Water storage	loss cal	culated t	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	<u>I</u> s dedicate	l d solar sto	L rage, (57)	<u>I</u> m = (56)m	x [(50) – (<u>l</u> H11)] ÷ (5	1 0), else (5	<u>I</u> 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 (ar	nual) fro	m Table	 e 3							0		(58)
Primary circuit	•	,			59)m = ((58) ÷ 36	65 × (41))m					
(modified by					•	. ,	, ,		r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Cambi lasa salaulatas	l for ooah	ma a matha d	(C1)	(CO) + 2	GE w (44	\						
Combi loss calculated (61)m= 50.96 46.03	49.93	46.42	(61)m = 46.01	(60) ÷ 3	65 × (41)m 46.01	46.42	49.93	49.32	50.96	1	(61)
` '										<u> </u>	(50) (04)	(01)
Total heat required fo	_	169.72	164.32	144.72	138.66	(62)m		(45)m + 177.95	(46)m + 189.06	(57)m + 202.71	(59)m + (61)m l	(62)
` '	1	<u> </u>	<u> </u>		1				1	l .		(02)
Solar DHW input calculated (add additional lines in								r contribu	tion to wate	er neating)		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0	0	0	0	0 0	0	T 0	0	0	0	1	(63)
(11)				Ů	<u> </u>	L °			1 –			(00)
Output from water hea (64)m= 207.66 183.08	_	169.72	164.32	144.72	138.66	154.5	7 156.28	177.95	189.06	202.71]	
(04)/11- 207.00 103.00	101.00	100.72	104.02	177.72	100.00	ļ	utput from wa		<u> </u>	l	2080.08	(64)
Heat gains from wate	r heating	k\/\/h/m/	onth 0.2	5 ′ [O 8 <i>F</i>	5 x (45)m](, ,
(65)m= 64.84 57.08	59.51	52.6	50.84	44.6	42.47	47.6	48.13	55.05	58.79	63.2]	(65)
include (57)m in ca		<u> </u>	L		1				<u> </u>	<u> </u>] socting	(00)
				yiiiiuei		uweiiii	g of flot w	alei is i	TOTTI COTTI	iiiiuiiity i	leating	
5. Internal gains (se):									
Metabolic gains (Tabl			Mov	lun	Jul	Ι Δ.,,	. I son	Oot	Nov	Doo	1	
Jan Feb (66)m= 130.23 130.23	Mar 130.23	Apr 130.23	May 130.23	Jun 130.23	130.23	Aug 130.23	· ·	Oct 130.23	Nov 130.23	Dec 130.23		(66)
` '							1	130.23	100.20	100.20		(00)
Lighting gains (calculation) (67)m= 21.07 18.71	15.22	11.52	L, equal	7.27	7.86	10.21		17.4	20.31	21.65	1	(67)
									20.31	21.00		(01)
Appliances gains (cal	_							_	1 240 20	005.07	1	(68)
(68)m= 236.29 238.74		219.41	202.81	187.2	176.77	174.3		193.65	210.26	225.87		(00)
Cooking gains (calcul			· ·	_	1				20.00	36.02	1	(60)
(69)m= 36.02 36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02	36.02		(69)
Pumps and fans gains	1	 			Ι.	<u> </u>	1 .	<u> </u>	Τ .	Ι ,	1	(70)
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. evaporati	· ·		, ``		T		. 1		T	T	1	(74)
(71)m= -104.19 -104.19		-104.19	-104.19	-104.19	-104.19	-104.1	9 -104.19	-104.19	-104.19	-104.19		(71)
Water heating gains (T	1	T	1	(- 0)
(72)m= 87.15 84.93	79.98	73.06	68.33	61.95	57.08	63.98		73.99	81.66	84.94		(72)
Total internal gains	_		l		, , ,	·	n + (69)m + (·	<u>, , , , , , , , , , , , , , , , , , , </u>	<u>, </u>	1	(70)
(73)m= 409.58 407.46	392.83	369.06	344.82	321.49	306.78	313.5	326.12	350.12	377.3	397.53		(73)
6. Solar gains:	l uniona nolo	r flux from	Table 6a	and asses	siated agus	tions to	convert to the	o annlica	ble erientei	tion		
Solar gains are calculated Orientation: Access	•	Area		and assoc Flu	·	ilions to		іе аррііса	FF	uori.	Gains	
Table 6		M ²			ble 6a		g_ Table 6b	Т	able 6c		(W)	
		1.6	25	,	11 20	1 , [0.55				. ,	(75)
Northeast 0.9x 0.77 Northeast 0.9x 0.77		4.6		_	11.28]	0.55		0.7	╡ -	14](75)](75)
Northead		4.6			22.97	t ⊨	0.55	≓ ¦		╡ -	28.49](75)](75)
Northand		4.6			41.38]	0.55	_	0.7	┥ [51.34	-
Nedless		4.6			67.96]	0.55	_	0.7	=	84.31	(75)
Northeast 0.9x 0.77	7 X	4.6	5	X	91.35	X	0.55	X	0.7	=	113.33	(75)

Northeast 0 s	Northeast _{0.9x}	0.77	1	4.05	1 .,	07.00	1 .,	0.55	١.,	0.7	1 _	400.00	7(75)
Northeast 0.9x	<u> </u>	0.77	X	4.65	X	97.38	X	0.55	X	0.7	= 	120.82	(75)
Northeast 0 st 0 st 0 st 0 st 0 st 0 st 0 st 0	<u> </u>] 1]]]]] 1		╡ .
Northeast 0.9%	<u> </u>]]]]]]] 1		╡ .
Northeast 0.9x	<u> </u>] 1]]]]] 1		╡ .
Northeast 0.9x	<u> </u>]]]]]]] 1		╡``
Southeast 0, 9x	<u> </u>] 1]]]]] 1		╡゛
Southeast 0.9x	<u> </u>] 1] 1] 1] 1		╡ .
Southeast 0.9% 0.77	<u> </u>] 1		X		X	0.55	X] 1		╡゛
Southeast 0.9% 0.77	<u> </u>] 1]]]]] 		╡゛
Southeast 0.9x 0.77 x 17.75 x 119.01 x 0.55 x 0.7 = 563.61 (77) Southeast 0.9x 0.77 x 17.75 x 118.01 x 0.55 x 0.7 = 569.53 (77) Southeast 0.9x 0.77 x 17.75 x 118.01 x 0.55 x 0.7 = 559.53 (77) Southeast 0.9x 0.77 x 17.75 x 118.01 x 0.55 x 0.7 = 539.45 (77) Southeast 0.9x 0.77 x 17.75 x 104.39 x 0.55 x 0.7 = 449.37 (77) Southeast 0.9x 0.77 x 17.75 x 92.85 x 0.55 x 0.7 = 449.37 (77) Southeast 0.9x 0.77 x 17.75 x 92.85 x 0.55 x 0.7 = 439.73 (77) Southeast 0.9x 0.77 x 17.75 x 92.85 x 0.55 x 0.7 = 208.11 (77) Southeast 0.9x 0.77 x 17.75 x 44.07 x 0.55 x 0.7 = 149.12 (77) Southeast 0.9x 0.77 x 4.65 x 36.79 x 0.55 x 0.7 = 149.12 (77) Southeast 0.9x 0.77 x 4.65 x 85.75 x 0.55 x 0.7 = 149.12 (77) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 149.12 (77) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 149.12 (77) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.15 x 0.55 x 0.7 = 141.32 (79) Southeast 0.9x 0.77 x 4.65 x 118.8 x 114.38 x 0.55 x 0.7 = 359.66 (81) Northwest 0.9x 0.77 x 11.88 x 112.8 x 0.55 x 0.7 = 359.66 (81) Northwest 0.9x 0.77 x 11.88 x 112.8 x 0.55 x 0.7 = 359.66 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 288.53 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 288.53 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 288.76 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 288.76 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 288.76 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 288.76 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 288.76 (81)	<u> </u>		X		X		X		X] 1		╡゛
Southeast 0 9x	<u> </u>	0.77	X	17.75	X	106.25	X	0.55	X] 1	503.19	╡``
Southeast 0.9x	<u> </u>	0.77	X	17.75	X	119.01	X	0.55	X	0.7	=	563.61	<u> </u> (77)
Southeast 0.9x	<u> </u>	0.77	X	17.75	X	118.15	X	0.55	X	0.7	=	559.53	╡゛
Southeast 0,9x	<u>L</u>	0.77	X	17.75	X	113.91	X	0.55	X	0.7	=	539.45	(77)
Southeast 0.9x	<u> </u>	0.77	X	17.75	X	104.39	X	0.55	X	0.7	=	494.37	(77)
Southeast 0.9x	<u> </u>	0.77	X	17.75	X	92.85	X	0.55	X	0.7	=	439.73	(77)
Southeast 0.9x 0.77	<u> </u>	0.77	X	17.75	X	69.27	X	0.55	X	0.7	=	328.04	(77)
Southwesto, 9x 0.77	<u> </u>	0.77	X	17.75	Х	44.07	Х	0.55	X	0.7	=	208.71	(77)
Southwest0.9x		0.77	X	17.75	X	31.49	×	0.55	X	0.7	=	149.12	(77)
Southwesto 9x 0.77		0.77	X	4.65	x	36.79		0.55	X	0.7	=	45.65	(79)
Southwesto.9x 0.77 x 4.65 x 106.25 0.55 x 0.7 = 131.82 (79) Southwesto.9x 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 (79) Southwesto.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 146.58 (79) Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwesto.9x 0.77		0.7 <mark>7</mark>	X	4.65	X	62.67		0.55	X	0.7	=	77.76	(79)
Southwesto.9x 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 (79) Southwesto.9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 (79) Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 129.51 (79) Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Northwesto.9x 0.77		0.77	X	4.65	Х	85.7 <mark>5</mark>		0.55	X	0.7	=	106.39	(79)
Southwesto.9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 (79) Southwesto.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 129.51 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 54.68 (79) Northwesto.9x 0.77 <t< td=""><td></td><td>0.77</td><td>X</td><td>4.65</td><td>Х</td><td>106.25</td><td></td><td>0.55</td><td>X</td><td>0.7</td><td>=</td><td>131.82</td><td>(79)</td></t<>		0.77	X	4.65	Х	106.25		0.55	X	0.7	=	131.82	(79)
Southwesto.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 (79) Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.65 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 54.68 (79) Northwesto.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 72.8 (81) Northwesto.9x 0.		0.77	X	4.65	X	119.01		0.55	X	0.7	=	147.65	(79)
Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 (79) Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 54.68 (79) Northwest 0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 39.07 (79) Northwest 0.9x 0.77 x 11.88 x 22.97 x 0.55 x 0.7 = 72.8 (81) Northwest 0.9	<u>L</u>	0.77	X	4.65	X	118.15		0.55	X	0.7	=	146.58	(79)
Southwest0.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 (79) Southwest0.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwest0.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwest0.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 (79) Northwest0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 39.07 (79) Northwest0.9x 0.77 x 11.88 x 22.97 x 0.55 x 0.7 = 35.76 (81) Northwest0.9x 0.77 x 11.88 x 41.38 x 0.55 x 0.7 = 131.16 (81) Northwest0.9x 0.77 x 11.88 x 91.35 x 0.55 <td< td=""><td><u> </u></td><td>0.77</td><td>X</td><td>4.65</td><td>X</td><td>113.91</td><td>]</td><td>0.55</td><td>X</td><td>0.7</td><td>=</td><td>141.32</td><td>(79)</td></td<>	<u> </u>	0.77	X	4.65	X	113.91]	0.55	X	0.7	=	141.32	(79)
Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 (79) Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 (79) Northwest 0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 35.76 (81) Northwest 0.9x 0.77 x 11.88 x 41.38 x 0.55 x 0.7 = 72.8 (81) Northwest 0.9x 0.77 x 11.88 x 67.96 x 0.55 x 0.7 = 131.16 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 215.4 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x <	<u> </u>	0.77	X	4.65	X	104.39		0.55	X	0.7	=	129.51	(79)
Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 (79) Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 (79) Northwest 0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 35.76 (81) Northwest 0.9x 0.77 x 11.88 x 22.97 x 0.55 x 0.7 = 72.8 (81) Northwest 0.9x 0.77 x 11.88 x 41.38 x 0.55 x 0.7 = 131.16 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 215.4 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 289.53 (81) Northwest 0.9x 0.77 x 11.88 x 97.38	<u>L</u>	0.77	X	4.65	X	92.85		0.55	X	0.7	=	115.2	(79)
Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 (79) Northwest 0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 35.76 (81) Northwest 0.9x 0.77 x 11.88 x 41.38 x 0.55 x 0.7 = 72.8 (81) Northwest 0.9x 0.77 x 11.88 x 67.96 x 0.55 x 0.7 = 131.16 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 215.4 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 289.53 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 =	<u> </u>	0.77	X	4.65	X	69.27]	0.55	X	0.7	=	85.94	(79)
Northwest 0.9x 0.77 x 11.88 x 11.28 x 0.55 x 0.7 = 35.76 (81) Northwest 0.9x 0.77 x 11.88 x 22.97 x 0.55 x 0.7 = 72.8 (81) Northwest 0.9x 0.77 x 11.88 x 67.96 x 0.55 x 0.7 = 131.16 (81) Northwest 0.9x 0.77 x 11.88 x 91.35 x 0.55 x 0.7 = 215.4 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 289.53 (81) Northwest 0.9x 0.77 x 11.88 x 97.38 x 0.55 x 0.7 = 288.76 (81) Northwest 0.9x 0.77 x 11.88 x 72.63 x 0.55 x 0.7	<u> </u>	0.77	X	4.65	X	44.07]	0.55	X	0.7	=	54.68	(79)
Northwest 0.9x	<u>L</u>	0.77	X	4.65	X	31.49		0.55	X	0.7	=	39.07	(79)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	11.88	x	11.28	X	0.55	X	0.7	=	35.76	(81)
Northwest 0.9x	Northwest 0.9x	0.77	X	11.88	X	22.97	X	0.55	X	0.7	=	72.8	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	11.88	X	41.38	x	0.55	X	0.7	=	131.16	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	11.88	X	67.96	x	0.55	X	0.7	=	215.4	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	11.88	X	91.35	X	0.55	X	0.7	=	289.53	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	11.88	×	97.38	x	0.55	X	0.7	=	308.67	(81)
Northwest 0.9x 0.77 x 11.88 x 50.42 x 0.55 x 0.7 = 159.82 (81)	Northwest _{0.9x}	0.77	X	11.88	×	91.1	X	0.55	X	0.7	=	288.76	(81)
	Northwest _{0.9x}	0.77	x	11.88	x	72.63	x	0.55	x	0.7	=	230.2	(81)
Northwest $0.9x$ 0.77 x 11.88 x 28.07 x 0.55 x 0.7 = 88.96 (81)	Northwest 0.9x	0.77	×	11.88	x	50.42	x	0.55	x	0.7	=	159.82	(81)
	Northwest 0.9x	0.77	X	11.88	×	28.07	×	0.55	X	0.7	=	88.96	(81)

Northw	vest _{0.9x}	0.77	x	11.	00	x		14.2	l x 厂	0.55	□ x [0.7		45	(81)
	vest _{0.9x} [_		╎╶╞		≓		=		= `
NOLLIN	vesi ().9x	0.77	X	11.	88	X		9.21	X	0.55	X	0.7	=	29.21	(81)
	gains in		alculated	934.71		$\overline{}$	105.04		(83)m = 944.19	Sum(74)m	' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' 	200	200.00	1	(83)
(83)m=		475.85			1114.12		135.61	1082.55	944.18	777.29	537.76	326	228.82	J	(63)
•	gains – ir			<u> </u>	`	·					T	T		1	(0.4)
(84)m=	679.24	883.31	1087.82	1303.77	1458.94	1.	457.1	1389.33	1257.7	7 1103.42	887.87	703.29	626.35		(84)
7. Me	ean inter	nal temp	perature	(heating	season	1)									
Tem	perature	during h	neating p	eriods ir	n the livi	ng	area	from Tab	ole 9, T	h1 (°C)				21	(85)
Utilis	ation fac	tor for g	ains for l	iving are	ea, h1,m	า (ร	ee Ta	ıble 9a)							
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(86)m=	0.99	0.98	0.94	0.82	0.63		0.44	0.32	0.37	0.62	0.9	0.99	1		(86)
, ,					T	<u></u>				<u> </u>			<u> </u>	l	
	n internal		1		· `	1		i		<u> </u>	T	T	l	1	(07)
(87)m=	19.85	20.12	20.46	20.8	20.95	2	20.99	21	21	20.97	20.71	20.2	19.8		(87)
Tem	perature	during h	neating p	eriods ir	n rest of	dw	elling/	from Ta	ıble 9,	Th2 (°C)					
(88)m=	19.92	19.93	19.93	19.94	19.94	1	19.96	19.96	19.96	19.95	19.94	19.94	19.93		(88)
l Itilie	ation fac	tor for a	aine for i	rest of d	welling	h2	m (se	a Tahla	02)				•	1	
(89)m=		0.97	0.92	0.77	0.57	_	0.37	0.25	0.29	0.53	0.87	0.98	0.99		(89)
(09)111=	0.99	0.97	0.92	0.77	0.57	L'	0.57	0.23	0.29	0.55	0.07	0.90	0.95		(00)
Me <mark>a</mark> ı		temper	rature in	the rest	of dwell	ing	T2 (f	ollow ste	ps 3 to	7 in Tab	le 9 <mark>c)</mark>			,	
(90)m=	18.41	18.8	19.29	19.73	19.9	1	19.95	19.95	19.96	19.93	19.63	18.93	18.35		(90)
						K					fLA = Livii	ng area ÷ (4	4) =	0.4	(91)
Mear	n internal	l temper	rature (fo	r the wh	ole dwe	llin	a = f	I A × T1	+ (1 _	fLA) × T2					
(92)m=		19.32	19.75	20.15	20.32	_	20.36	20.37	20.37	20.34	20.06	19.43	18.92]	(92)
` ′						_				nere appr		10110		I	. ,
(93)m=	18.83	19.17	19.6	20	20.17	_	20.21	20.22	20.22	20.19	19.91	19.28	18.77	1	(93)
	pace hear				20.17			20.22	20:22	20.10	10:01	10.20	10.17		(3.5)
				mporatu	ro obtair	200	l at et	on 11 of	Table	Oh so tha	ot Ti m-/	76\m an	d ro calc	oulato.	
	itilisation					ieu	al Si	ер птог	lable	9b, so tha	11,111-	(10)III aII	u re-car	Julate	
	Jan	Feb	Mar	Apr	May	Г	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Utilis	ation fac				1	_		00.	7 10 2	1 000		1		l	
(94)m=	0.99	0.97	0.91	0.78	0.58		0.39	0.27	0.31	0.55	0.86	0.98	0.99	1	(94)
	ul gains,				L 4)m	<u> </u>				-			!	l	
(95)m=		855.16	992.36	1013.26	848.17	5	70.97	369.75	388.86	609.71	767.7	685.74	621.68]	(95)
	thly avera									1	1	1		ļ	` '
(96)m=	_	4.9	6.5	8.9	11.7	$\overline{}$	14.6	16.6	16.4	14.1	10.6	7.1	4.2	1	(96)
			<u> </u>								ļ	7.1	٦.٢	J	(00)
			1380.07		877.88	_	74.28	370.11	389.6	n- (96)m 626.39	965.04	1270.07	1526.93	1	(97)
(97)m=			l .								ļ	Į	1520.93	ļ	(37)
•		•	1	1	I	vvn T				7)m – (95	í - `	Τ΄	070.54	1	
(98)m=	644.53	438.35	288.46	101.24	22.11	L	0	0	0	0	146.82	420.71	673.51		—
									To	tal per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	2735.72	(98)
Spac	e heating	g require	ement in	kWh/m²	²/year									30.91	(99)
9a Fr	nergy red	ıuiremer	nts – Indi	vidual h	eating s	vst	ems i	ncludina	micro	·CHP)					
	ce heatir				Jaming 0	you	J-110-1								
-	tion of sp	_	at from so	econdar	v/supnle	eme	entarv	system						0	(201)
	or op	5.00 1100	5.11 5		,		y	-, 5.5						<u> </u>	(=0.)

									_
Fraction of space heat from main system(s)		(202	2) = 1 –	(201) =				1	(202)
Fraction of total heating from main system 1		(204	4) = (20	2) × [1 – ((203)] =			1	(204)
Efficiency of main space heating system 1								90.4	(206)
Efficiency of secondary/supplementary heating s	system, 9	%						0	(208)
	Jun	Jul A	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement (calculated above) 644.53 438.35 288.46 101.24 22.11	0	0	0	0	146.82	420.71	673.51		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$		<u> </u>	<u> </u>		140.02	420.71	070.01		(211)
712.98 484.9 319.09 111.99 24.45	0	0	0	0	162.41	465.39	745.03		(=11)
			Total	(kWh/yea	r) =Sum(2	211),15,1012	=	3026.24	(211)
Space heating fuel (secondary), kWh/month									-
= {[(98)m x (201)] } x 100 ÷ (208)							_	1	
(215)m= 0 0 0 0 0	0	0	0 Total	0 (kWh/yea	0 ar) =Sum(2	0	0	0	(215)
Water heating			rotar	(KVVIII y CC	ii) Guii(2	715,1012		U	
Output from water heater (calculated above)									
	144.72 1	38.66 15	54.57	156.28	177.95	189.06	202.71		,
Efficiency of water heater					-			80.3	(216)
` '	80.3	80.3	30.3	80.3	84.57	87.01	87.84		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)m= 236.75 210.02 222.29 202.54 201.92 1	180.23 1	72.67 19	20 40	104.00	210.42	047.00	230.77		
` '	100.20	72.07	92.49	194.62		217.29	230.77		7
	100.20	72.67		= Sum(21	19a) ₁₁₂ =			2472.01	(219)
Annual totals	100.20	72.07			19a) ₁₁₂ =	Vh/year		kWh/year	(219)
Annual totals Space heating fuel used, main system 1	00.25	72.67			19a) ₁₁₂ =			kWh/year 3026.24	(219)
Annual totals Space heating fuel used, main system 1 Water heating fuel used	00.20	72.67			19a) ₁₁₂ =			kWh/year	(219)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot			Total	= Sum(21	19a) ₁₁₂ =			kWh/year 3026.24]
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos			Total	= Sum(21	19a) ₁₁₂ =		182.2	kWh/year 3026.24	(230a)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump:			Total	= Sum(21	19a) ₁₁₂ = k\	Vh/year		kWh/year 3026.24 2472.01	(230a) (230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year			Total	= Sum(21	19a) ₁₁₂ =	Vh/year	182.2	2472.01 212.2	(230a) (230c) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting			Total	= Sum(21	19a) ₁₁₂ = k\	Vh/year	182.2	kWh/year 3026.24 2472.01	(230a) (230c) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs	sitive inpu	ut from ou	Total utside sum c	= Sum(21	19a) ₁₁₂ = k\	Vh/year	182.2	2472.01 212.2	(230a) (230c) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting	sitive inpu	ut from ou	Total utside sum c	= Sum(21	19a) ₁₁₂ = k\	Vh/year	182.2	212.2 372.02	(230a) (230c) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs	sitive inpu	ut from ou	Total utside sum c	= Sum(21	(19a) ₁₁₂ = k\	Vh/year	182.2	2472.01 212.2 372.02 -1086.82 Emissions	(230a) (230c) (231) (232) (233)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs	sitive inpu	ut from ou	Total utside sum c	= Sum(21	19a) ₁₁₂ = k\ (230g) =	Vh/year	182.2	2472.01 2472.01 212.2 372.02 -1086.82	(230a) (230c) (231) (232) (233)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs	sitive inpu	ing micro-	Total utside sum c	= Sum(21	(19a) ₁₁₂ = k\	Wh/year	182.2	2472.01 212.2 372.02 -1086.82 Emissions	(230a) (230c) (231) (232) (233)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central heating pump: Total electricity for the above, kWh/year Electricity for lighting Electricity generated by PVs 12a. CO2 emissions – Individual heating systems	ns includi	ing micro-	Total utside sum c	= Sum(21	(230g) = Emiss kg CO2	ion fac 2/kWh	182.2 30	2472.01 212.2 372.02 -1086.82 Emissions kg CO2/yea	(230a) (230c) (231) (232) (233)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central 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)	esitive inputes includii Ener kWh/(211)	ing micro-	Total utside sum c	= Sum(21	(230g) = Emiss kg CO2	ion fac 2/kWh	182.2 30	212.2 372.02 -1086.82 Emissions kg CO2/yea	(230a) (230c) (231) (232) (233)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or pos central 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)	Ener kWh/ (211) (215) (219)	ing micro-	utside sum c	= Sum(21	(230g) =	ion fac 2/kWh	182.2 30	212.2 372.02 -1086.82 Emissions kg CO2/yea 653.67	(230a) (230c) (231) (232) (233) (233)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot mechanical ventilation - balanced, extract or post central 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	Ener kWh/ (211) (215) (219)	ing micro- rgy /year x x + (262) + (26	utside sum c	= Sum(21	(230g) =	ion fac 2/kWh	182.2 30	2472.01 212.2 372.02 -1086.82 Emissions kg CO2/yea 653.67 0 533.95	(230a) (230c) (231) (232) (233) (261) (263) (264)

Electricity for lighting	(232) x	0.519	193.08	(268)
Energy saving/generation technologies Item 1		0.519 =	-564.06	(269)
Total CO2, kg/year		sum of (265)(271) =	926.77	
Dwelling CO2 Emission Rate		(272) ÷ (4) =	10.47	(273)
El rating (section 14)			91	(274)