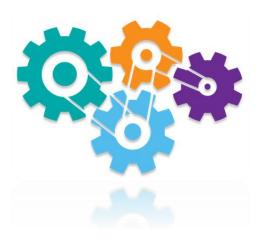


Energy and Sustainability Statement

15-1601 28 Redington Road, Hampstead, NW3 7RB

August 2016



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Quality Standards Control

The signatories below verify that this document has been prepared in accordance with our quality control requirements. These procedures do not affect the content and views expressed by the originator.

This document must only be treated as a draft unless it has been signed by the originators and approved by a director.

Revision	Rev A	Rev B	Rev C	
Date	15/04/2016	18/05/2016	19/08/2016	
Prepared by	A. Fuentes	S. Lee	S. Lee	
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The methodology adopted and the sources of information used by SC in providing its services are outlined in this report. The work described in this report was undertaken in **August 2016** and is based on the conditions encountered and the information available during the said period of time. The scope of this report and the services are accordingly factually limited by these circumstances.

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1. Executive Summary

The design of the proposed development, **28 Redington Road, Hampstead, London**, will be comprised a new construction of 8 no. of residential units. The design has incorporated building fabric enhancement (above current building regulations requirements) to increase the energy efficiency of the building. This includes that the development uses less energy, by adopting sustainable design and construction measures and by supplying energy efficiently.

Given the complexity of calculating and assessing CO₂ emissions, **the London Borough of Camden** requires all proposed developments to incorporate sustainable design and construction measures by expecting **the new developments to achieve an overall 35% reduction of CO₂ emissions over the Part L2013 with 20% reduction of CO₂ emissions via onsite renewables, in accordance with London Plan and Local Policies.**

To meet the Local policy requirements, the development incorporates various sustainable design and construction measures including energy/ carbon reduction, water consumption, material procurement, and waste management. The recommendation for the energy/ carbon reduction is to enhance fabric elements (U-values) as per Building Regulations Part L1A; to install communal air source heat pumps (minimum 350% efficiency for heating, 270% for cooling) for space heating, cooling and domestic hot water; to install low energy lights. This results in followings:

- The strategy would provide an average of 53% CO₂ reduction savings against the TER set by Building Regulation Part L1A. Therefore, the strategy meets requirements of Building Regulations L1A 2013, the London Plan, and Local Policies.
- 2. The following hierarchy of the strategy has been explored and implemented:
 - BE LEAN: Energy efficient design
 - BE CLEAN: Connection to district heat networks or communal heating systems (e.g. Combined Heat and Power)
 - BE GREEN: Installation of on-site renewable energy technologies
- The strategy at BE GREEN stage would provide an average 29% reduction of CO₂ emissions via onsite renewable technology (communal air source heat pumps) for the overall development. This reduction is calculated after comparing with a communal gas boiler system with 95% efficiency.
- Although the policy encourages that new residential developments meet the Code for Sustainable Homes (CSH) Level 6, the CSH has been withdrawn by the Government as of April 2015. As such a pre-assessment has not been provided as part of this strategy.

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After the application of the proposed strategy, the regulated carbon dioxide emissions are presented on the table below:

	Energy Hierarchy	Regulated Carbon Emissions (Tonnes CO ₂ /yr)
BASELINE	TER set by Building Regulations 2013 Part L	32.42
BE LEAN After energy demand reduction		21.44
BE CLEAN	After CHP/ Communal Heating	21.44
BE GREEN After renewable energy		15.17

Table 1 Carbon Emissions after each stage of the proposed strategy

This carbon savings from each stage can be calculated based on the results above. The chart below summarises the total cumulative savings:

Energy Hierarchy		Regulated Carbon Savings	
		Tonnes CO₂/yr.	%
BE LEAN	BE LEAN After energy demand reduction		33.88 %
BE CLEAN After heat network/ CHP		-	-
BE GREEN After renewable energy		6.27	29.23 %
Total Cumul	ative Savings	17.25	53.21%
Total Target	Savings	11.35	35 %

Table 2 Carbon dioxide Emissions after each stage of the Energy Hierarchy

In summary, the strategy demonstrates a <u>53%</u> CO₂ reduction against the baseline (TER) through energy efficient design and onsite renewables. The full SAP worksheets per each of the energy hierarchy are attached in Appendix B.

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2. Introduction

Syntegra Consulting Ltd has been appointed as sustainability consultants to produce an energy strategy for the **new construction of 6 storey building comprising of 8 no. of residential units** located in **Hampstead, Camden Borough** – to support the scheme design process, demonstrate Building regulations Part L1A 2013 compliance and intent to target a 20% reduction of CO_2 emissions reduction via onsite renewable energy technology for the overall development in accordance with the planning policy requirements.

This report will outline the following:

- This report will assess the proposed development site's estimated energy demand & CO₂ emissions. It will look into the feasibility of Low Zero Carbon technologies, examining the following aspects relative to LZC/renewable technologies:
- Energy generated by Renewable/Low Zero Carbon Technologies (LZC)
- > Feasibility assessment for each Renewable/Low Zero Carbon Technologies (LZC)
- Local Planning Requirements
- Life cycle Costs & payback period for the technology investment
- Available Grants
- 2) The proposed building fabric and Low Zero Carbon (LZC) design strategy and analysis calculations, with respect to the Standard Assessment energy assessment Procedure (SAP). Demonstration of how the design is compliant against the current Part L 2013 building regulations i.e. the 35% reduction in CO₂ emissions in accordance with the local planning policy.
- 3) The target of **a 20% reduction of the development's CO₂ Emissions** through the utilisation of renewable technology as per the planning policy requirements
- 4) Assessment of opportunities for utilising Decentralised Energy Networks and Combined Heat and Power (CHP) as per the planning policy requirements.

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3. Site Description

The proposed development will be comprised of the **new construction of 6 storey building with a total of 8 no. of residential units** located in **Hampstead, Camden Borough**. The development is located in the area of Hampstead, North London and it is in close proximity to West Hampstead station (approximately 0.8 miles), Hampstead Underground Station (approx. 0.5 miles). The site is within the London Borough of Camden.

4. Planning Policy

4.1. National Planning Policy Framework (March 2012)

The National Planning Policy Framework is a key part of our reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth.

4.2. The London Plan Renewable Energy Policy 2011 (Policy 5.2, 5.6 & 5.7)

The Mayor and boroughs should in their DPDs adopt a presumption that developments will achieve a reduction in carbon dioxide emissions of 20% from onsite renewable energy generation according to 5.42 section of Policy 5.7 Renewable Energy (which can include sources of decentralised renewable energy). According to Policy 5.2 (clause B) all residential and non-residential buildings should show an improvement of 40% BER/TER from 2013 to 2016, unless it can be demonstrated that such provision is not feasible. Furthermore, intent must be shown for connecting to a Decentralised Energy Network according to Policy 5.6 and utilizing a Combined Heat & Power.

4.3. London Borough of Camden



Camden Development Policies 2010-2025

Policy DP22: Promoting Sustainable Design and Construction

The Council will require development to incorporate sustainable design and construction measures. Schemes must:

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- a. demonstrate how sustainable development principles, have been incorporated into the design and proposed implementation; and
- b. incorporate green or brown roofs and green walls wherever suitable.

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

- c. expecting new build housing to meet Code for Sustainable Homes Level 3 by 2010 and Code Level 4 by 2013 and **encouraging Code Level 6 (zero carbon) by 2016.**;
- expecting developments (except new build) of 500sqm of residential floor space or above or 5 or more dwellings to achieve 'very good' in EcoHomes assessments prior to 2013 and encouraging 'excellent' from 2013;
- e. expecting non-domestic developments of 500sqm of floor space or above to achieve 'very good' in BREEAM assessments and 'excellent' from 2016 and encouraging zero carbon from 2019.

The Council will require development to be resilient to climate change by ensuring schemes include appropriate climate change adaptation measures, such as:

- f. summer shading and planting;
- g. limiting run-off;
- h. reducing water consumption;
- i. reducing air pollution; and
- j. not locating vulnerable uses in basements in flood-prone areas.

Policy DP23: Water

The Council will require developments to reduce their water consumption, the pressure on the combined sewer network and the risk of flooding by:

- a) incorporating water efficient features and equipment and capturing, retaining and re-using surface water and grey water on-site;
- b) limiting the amount and rate of run-off and waste water entering the combined storm water and sewer network through the methods outlined in part a) and other sustainable urban drainage methods to reduce the risk of flooding;
- c) reducing the pressure placed on the combined storm water and sewer network from foul water and surface water run-off and ensuring developments in the areas identified by the North London Strategic Flood Risk Assessment and shown on Map 2 as being at risk of surface water flooding are designed to cope with the potential flooding;
- d) ensuring that developments are assessed for upstream and downstream groundwater flood risks in areas where historic underground streams are known to have been present; and
- e) encouraging the provision of attractive and efficient water features.

Camden Core Strategy 2010-2025

Policy CS13 – Tackling climate change through promoting higher environmental standards

Reducing the effects of and adapting to climate change

The Council will require all development to take measures to minimise the effects of, and adapt to, climate change and encourage all development to meet the highest feasible environmental standards that are financially viable during construction and occupation by:

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a. ensuring patterns of land use that minimise the need to travel by car and help support local energy networks;

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- b. promoting the efficient use of land and buildings;
- c. minimising carbon emissions from there development, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:
 - 1. ensuring developments use less energy,
 - 2. making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralized energy networks;
 - generating renewable energy on-site; and
- d. ensuring buildings and spaces are designed to cope with, and minimise the effects of, climate change.

The Council will have regard to the cost of installing measures to tackle climate change as well as the cumulative future costs of delaying reductions in carbon dioxide emissions

Local energy generation

The Council will promote local energy generation and networks by:

- e. working with our partners and developers to implement local energy networks in the parts of Camden most likely to support them, i.e. in the vicinity of
 - housing estates with community heating or the potential for community heating and other uses with large heating loads;
 - the growth areas of King's Cross; Euston; Tottenham Court Road; West Hampstead Interchange and Holborn;
 - schools to be redeveloped as part of Building Schools for the Future programme;
 - existing or approved combined heat and power/local energy networks (see Map4);

and other locations where land ownership would facilitate their implementation.

f. protecting existing local energy networks where possible (e.g. at Gower Street and Bloomsbury) and safeguarding potential network routes (e.g. Euston Road);

Water and surface water flooding

We will make Camden a water efficient borough and minimise the potential for surface water flooding by:

- g. protecting our existing drinking water and foul water infrastructure, including Barrow Hill Reservoir, Hampstead Heath Reservoir, Highgate Reservoir and Kidderpore Reservoir;
- h. making sure development incorporates efficient water and foul water infrastructure;
- i. requiring development to avoid harm to the water environment, water quality or drainage systems and prevents or mitigates local surface water and downstream flooding, especially in areas up-hill from, and in, areas known to be at risk from surface water flooding such as South and West Hampstead, Gospel Oak and King's Cross (see Map 5).

Camden's carbon reduction measures

The Council will take a lead in tackling climate change by:

- j. taking measures to reduce its own carbon emissions;
- k. trialling new energy efficient technologies, where feasible; and
- 1. raising awareness on mitigation and adaptation measures.

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Generating renewable energy on-site

13.11 Buildings can also generate energy, for example, by using photovoltaic panels to produce electricity, or solar thermal panels, which produce hot water. Once a building and its services have been designed to make sure energy consumption will be as low as possible and the use of energy efficient sources has been considered, **the Council will expect developments to achieve a reduction in carbon dioxide emissions of 20% from on-site renewable energy generation** (which can include sources of site-related decentralised renewable energy) unless it can be demonstrated that such provision is not feasible. Details on ways to generate renewable energy can be found in our Camden Planning Guidance supplementary document.

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5. Sustainable Design and Construction

5.1. Bicycle Storage

To promote exercise and help reduce congestion and carbon emissions, cyclist facilities are provided on the lower ground floor in line with the sustainable development principles in the Local Policy DP22. The facility includes bike storage and private lockers. As each residential unit has their own shower facilities, additional showers are not provided on the lower ground floor.

5.2. Water Efficiency

The development will be based upon the specification of water efficient fittings across the development including low volume dual flush WCs, low flow taps and showers in accordance with planning requirements - i.e. **the targeted water consumption is 105 l/p/day** plus an additional 5 litres for external water use.

Since the proposed scheme is categorised as a minor development (8 dwelling units), rainwater/ grey water harvesting systems have not been considered at this early design stage. However, if required they would be considered in the course of design development where feasible.

5.3. Waste

The proposed development will adopt the best waste management procedures to reduce the amount of waste going to landfill. This will be established by creating provisions for recycling and also waste segregation from general to recyclable waste. To enhance the waste reduction potential, the provision of kitchen and garden waste composting will be considered as a measure of reducing the amount of waste going to landfill in accordance with the council's recycling collection scheme. The construction waste should also be considered to minimise, recycle and reuse on site where possible, this will reduce the overall construction cost and at the same time minimise the amount of waste diverting to landfill. Site Waste Management Plan (SWMP) will be formalised before the construction works start and updated as the works continue on the site.

5.4. Materials

The development will aim to procure/ utilise European compliant construction material including Sustainable timber. All the other building materials will achieve 'A' or higher ratings against BRE Green guide rating where feasible. The materials will be responsibly and locally sourced from suppliers where feasible. In order to minimise the environmental impact of construction the existing building materials such as aggregates will be reused on site where possible. This is in line with Camden council's policy requirements for DP22.

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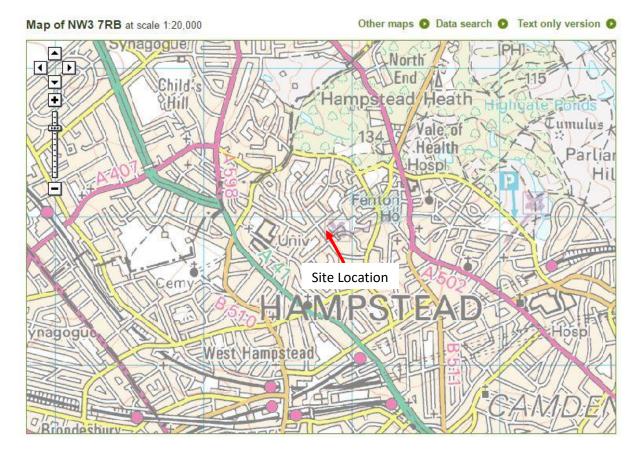
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5.5. Flood Risk

The Environmental Agency map shows that the site surrounding area is within zone 1 of the flood risk. However, the detail flood assessment on the site will be undertaken for the proposed scheme to identify anticipated level of flooding and recommendations will also be obtained to improve the flood levels. In order to protect the site for future climate change impacts the Sustainable drainage strategy (SUDS) has been developed to minimise the risk of flooding in accordance with the National Planning Policy Framework and Camden's requirements.



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6. Energy Assessment

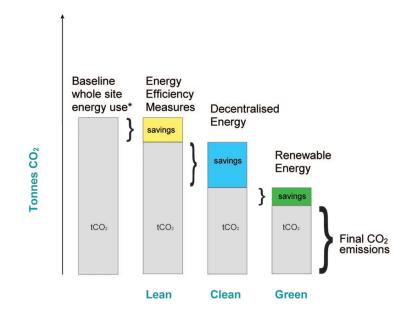
6.1. The Energy Hierarchy

The Mayor's Energy Strategy adopts a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. These guiding principles have been reordered since the publication of the Mayor's Energy Strategy in Feb 2004 and the adopted replacement London Plan 2011 states that 'The following hierarchy should be used to assess applications:

- Using less energy, in particular by adopting sustainable design and construction measures;
- Supplying energy efficiency, in particular by prioritising decentralised energy generation; and
- Using renewable energy.

The development's Energy Strategy has adopted the following design ethos:

- ✓ BE LEAN By using less energy and taking into account the further energy efficiency measure in comparison to the baseline building.
- ✓ BE CLEAN By supplying energy efficiently. The clean building looks at further carbon dioxide emission savings over the lean building by taking into consideration the use of decentralise energy via CHP.
- ✓ BE GREEN By integrating renewable energy into the scheme which can further reduce the carbon dioxide emission rate.



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6.2. Input data for energy assessment

Syntegra received the architectural drawings in AutoCAD format, and they were used to undertake the energy assessments i.e. SAP calculations. The drawing references are listed in table below.

No.	Drawing Name	Format
1	JCA-RR-PR-001 Location Plan	.dwg
2	JCA-RR-PR-002 Site Plan	.dwg
3	JCA-RR-PR-003 Site Plan	.dwg
4	JCA-RR-PR-010 Lower ground Floor	.dwg
5	JCA-RR-PR-011 Ground Floor	.dwg
6	JCA-RR-PR-012 First Floor	.dwg
7	JCA-RR-PR-013 Second Floor	.dwg
8	JCA-RR-PR-014 Third Floor	.dwg
9	JCA-RR-PR-015 Third Floor	.dwg
10	JCA-RR-PR-015 Roof Plan	.dwg

Table 3 The drawing list

The following table presents the type, area and number of units to be assessed within this report:

NEW BUILD					
Туре	Name of unit	Storey	No. of Bedrooms	Floor Area (m ²)	
	1	2-storey	2	144	
	2	1-storey	3	224	
	3	2-storey	3	242	
Residential	4	1-storey	2	178	
Residential	5	1-storey	2	151	
	6	1-storey	2	167	
	7	2-storey	4	271	
	8	2-storey	2	166	
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Table 4 Proposed units to be assessed for the development

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The assessment has assumed the following fuel carbon emissions factors. The fuel carbon emissions factors used are in accordance with **SAP 2012 (for Building Regs Part L1A 2013).**

Carbon Emissions Factor	SAP 2013 kgCO2/kW
Natural Gas	0.216
LPG	0.241
Biogas	0.098
Heating Oil	0.298
Coal (traditional British Coal)	0.394
Anthracite	0.394
Smokeless fuel	0.433
Dual Fuel (mineral + wood)	0.226
Biomass	0.123
Grid Electricity	0.519
Waste Heat	0.058

Table 5. Carbon emission factors

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6.3. BASELINE

The baseline energy use and resulting CO₂ emissions rates of the development have been assessed using the SAP 2012 Government approved software. The SAP 2012 calculations have been produced according to the ADL1A 2013 building regulation requirements.

For the purpose of this report the baseline energy use and CO₂ emissions for the development are calculated based on the minimum requirements as per the Building Regulations AD L1A (Table below).

		Part L1A 2013 min. required values
	Wall	0.30
U-value	Window	2.00
(W/m² K)	Floor	0.25
	Roof	0.20
Air Permeability (m ³ /h.m ² at 50 Pa)		10

Table 6 Required values set by Building Regulations Part L1A 2013

The baseline average energy use and CO₂ emissions for the development are presented in the tables below:

BASELINE: TER	Regulated CO ₂ Emissions (Tonnes CO ₂ /yr)
Flat 1	3.52
Flat 2	4.30
Flat 3	4.31
Flat 4	3.41
Flat 5	3.44
Flat 6	3.70
Flat 7	5.48
Flat 8	4.26
TOTAL	32.42

Table 7 Regulated Carbon Emissions at Baseline

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6.4. BE LEAN – Energy Efficient Design

This section outlines the design energy efficient measures taken in order to minimise the building's energy demand and therefore reduce energy use and CO₂ emissions further than the Baseline (Building Regulations 2013 Part L compliance).

The energy efficient measures include:

- 1. Inclusion of better U-values than the minimum U-values set in the ADL1A 2013 document.
- 2. Designing for a buildings air permeability exceeding ADL1A 2013 target values.
- 3. Utilising the highly efficient heating and hot water systems.
- 4. Utilising low energy efficient lighting such as LED lighting.

Efficient Building elements

At the 'BE LEAN' stage of the energy hierarchy, energy efficient building elements have been incorporated into the build. Please see below more specifically:

		Part L1A 2013 min. required values	Proposed building values
	Wall	0.3	0.12
U-value	Window	2	1.2 (Roof light 1.3)
(W/m² K)	Floor	0.25	0.12
	Roof	0.2	0.12
Air Permeability (m ³ /h.m ² at 50 Pa)		10	4.5

Table 8 Proposed Building Elements

Heating, Cooling and Hot Water

At the 'BE LEAN' stage, communal gas boilers have been examined for space heating and hot water in accordance with GLA Guidance on preparing energy assessment (March 2016). Detailed specifications that have been used at BE LEAN stage are in the table below.

Please note that above systems have been used only for carbon emissions calculation at BE LEAN stage as per GLA Guidance on energy assessment. Suggested systems for this development will be mentioned at BE GREEN stage as renewable technology (ASHPs) has been suggested – Section 6.6.

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Systems	General Specification	Controls/ Other inputs	
Heating	Heat Efficiency of 95%	 Charing system linked to use of community heating, programmer and at least two room thermostat Heating Emitter – Underfloor heating 	
Cooling	Split/ multiple systems (EER of 2.7)	On/ Off control	
Hot water	From main heating system	 Plate heat exchanger of 1 litre Jacket insulation of 50mm Fully insulated primary pipework Cylinderstat Water Heating Timed Seperately 	

Table 9 Be Lean Stage Heating and Hot water systems

Ventilation

A natural supply ventilation strategy will be adopted with extract fans in bathrooms and kitchen. Therefore, higher energy consumption and CO₂ emissions due to mechanical ventilation is avoided.

Lighting

The proposed light fittings will be low energy efficient fittings; these can be T5 fluorescent fittings with high frequency ballasts, or LED fittings.

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The following tables demonstrate the reduction in CO_2 emissions from the energy efficiency measures mentioned above. It can be seen that the overall CO_2 reduction at Be Lean stage is <u>33%</u> for the total emissions.

	Regulated CO ₂ Emissions (Tonnes CO ₂ /yr)		
	BASELINE	BE LEAN	
Flat 1	3.52	2.31	
Flat 2	4.30	2.83	
Flat 3	4.31	2.68	
Flat 4	3.41	2.12	
Flat 5	3.44	2.28	
Flat 6	3.70	2.47	
Flat 7	5.48	3.78	
Flat 8	4.26	2.97	
TOTAL	32.42	21.44	
Carbon Reduction	-	33.88 %	

🖊 BE LEAN STAGE

Table 10 Regulated Carbon Emissions at Be Lean Stage

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6.5. BE CLEAN – CHP & Decentralised Energy Networks

The Energy Hierarchy encourages the use of a CHP system and the connection to District Heating system to reduce CO_2 emissions further.

<u>CHP</u>

The Energy Hierarchy identifies the combined heat and power (CHP) as a method of producing heat and electricity with much lower emissions than separate heat and power. Also, it encourages the creation of district heating systems supplied by CHP.

The implementation of a CHP strategy should be decided according to good practice design. Key factors for the efficient implementation of the CHP system are:

- > Development with high heating load for the majority of the year.
- > CHP operation based on maximum heat load for minimum 10 hours per day.
- > CHP operation at maximum capacity of 90% of its operating period.

To ensure that CHP is financially viable it is essential that the unit is selected to meet the base heat load and that this load is maintained over a large proportion of the day (a figure of 14 - 17 hours per day is often quoted subject to the load profiles and gas and electricity prices) to ensure that the additional costs (maintenance) associated with running a CHP unit can be recovered.

This need to run the CHP plant, as far as possible continuously makes the building load profile of prime importance when reviewing the viability of such solutions and in particular the summer time heat load profile. CHP systems only make financial sense to operate when the waste heat associated with generating the electricity is usefully used. To enable the CHP plant to run continuously when it is operating, a thermal store is often used so that excess CHP capacity can be used to generate hot water for use at a later time.

The load profile for this kind of development is intermittent. Hence a CHP system has not been considered for this development

Micro-CHP

Micro CHP has not been considered further for this project due to the following reasons:

Micro-CHP is a relatively new concept and issues are raised in relation to unproven technology, inefficiency for shorter run cycles and lack of technical knowledge that can limit the practical application of micro CHP at present. In addition, other issues surrounding the fact that around 50% of electricity generated in domestic properties is surplus, high installation costs and estimated low life expectancy has also been taken into consideration as to its Commercial unit's un-viability for this development scheme. Micro-CHP also has lower FIT tariff rate and period duration and is only applicable for systems under 2kW.

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Decentralised Energy Network

The Mayor's Energy Strategy favours community heating systems because they offer:

- ✓ Potential economies of scale in respect of efficiency and therefore reduced carbon emissions; and
- ✓ Greater potential for future replacement with Low or Zero Carbon (LZC) technologies.

The feasibility of connecting into an existing heating network or providing the building with its own combined heat and power plant has been assessed alongside the **London Heat Map Study for the London Borough of Camden** as part of this assessment. The study identifies that the site is not located near the existing or potential district heating networks. This is demonstrated clearly from the London Heat Map (http://www.londonheatmap.org.uk) snapshot below.



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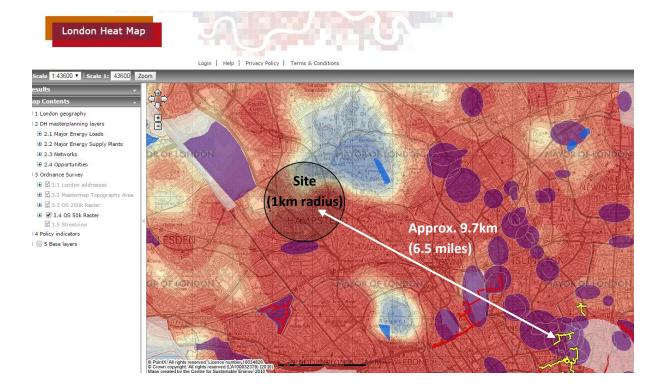
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Moreover, the London heat map below identifies existing DH networks in more broaden area, and it could not find any existing DH networks (in yellow) within 1km radius from the property. The costs involved in extending the existing DH network would outweigh the advantages in this development. Therefore, utilisation of the DH network has not been a feasible option for this development.



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6.6. BE GREEN – Renewable Energy

In this section the viable renewable energy technologies that will reduce the development's CO₂ emissions further by 20% are examined. Incorporating lean design measures will significantly reduce the onsite energy consumption and the CO₂ emissions of the building however the reduction in emissions is still short of the target set out in the 'London Plan'. The 'London Plan' also states that a 20% CO₂ reduction must be achieved by the installation of renewable technologies. Below is a review of possible renewable technologies for incorporation in the proposed development.

All of the LZC technologies are assessed against a number of criteria. Hence, LZC technology feasibility will be assessed according to the following criteria:

- ✓ Renewable energy resource or fuel availability of the LZC technology on the site.
- ✓ Space limitations due to building design and urban location of the site.
- ✓ Capital, operating and maintenance cost.
- ✓ Planning Permission
- ✓ Implementation with regards the overall M&E design strategy for building type
- ✓ Available Grants [See Appendix Section 8.9]

The renewable/LZC technologies which were found non feasible based on the above criteria are the following:

- PV panels [See Appendix Section 8.1]
- Solar Thermal [See Appendix Section 8.2]
- Wind Turbines [See Appendix Section 8.3]
- Small scale hydro power [See Appendix Section 8.4]
- Biomass Heating [See Appendix Section 8.5]
- Ground Source Heat Pump (GSHP) [See Appendix Section 8.6]
- CHP & Micro CHP [See Appendix Section 8.7]
- Hydrogen Fuel Cells [See Appendix Section 8.8]

<u>Air Source Heat Pump (ASHP) – Proposed Technology</u>

ASHP can meet the space heating demands on site efficiently in comparison with gas boilers. Although this low carbon technology consumes electricity to operate due to higher efficiency the heat output is much greater. Therefore, it has been suggested for the space heating, cooling and hot water. The specification of these are in the table below. **Emergency immersion heaters in the energy store can be used as a back-up system. And, the energy storage tanks will be used to account for fluctuations in load. Hence, this system can provide consistent space heating and hot water all year around.**

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Systems	General Specification	Controls/ Other inputs
Heating	Heat Efficiency of 350%	 Charing system linked to use of community heating, programmer and at least two room thermostat Heating Emitter – Underfloor heating
Cooling	EER of 2.7	Split/multiple systemsOn/Off control
Hot Water	From main heating system	 Plate heat exchanger of 1 litre Jacket insulation of 50mm Fully insulated primary pipework Cylinderstat Water Heating Timed Seperately

Table 11 Be Green Stage Heating and Hot water systems

All suggested specifications above are provisional at this early design stage, and therefore have to be reviewed with mechanical engineers and contractors in the course of design development.

Tariffs that apply for domestic Renewable Heat Incentive (RHI) is as shown in the table below based on the following link. https://www.ofgem.gov.uk/environmental-programmes/domesticrhi/contacts-guidance-and-resources/tariffs-and-payments-domestic-rhi/current-future-tariffs.

Туре	Technology	RHI	Eligibility
Domestic	Air source heat pumps	7.51 in pence per kWh	Application submitted between 01/04 2016 – 30/09/2016

Table 12 Current tariffs for Renewable Heat Incentive (RHI)

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To check the compliance with target reduction (20%) via onsite renewables, the communal ASHP system has been compared with the communal gas boiler as mentioned at BE LEAN stage. The table below confirms that the communal ASHP system can achieve the <u>29%</u> carbon reduction against the communal gas system.

	Regulated CO ₂ Emissions (Tonnes CO ₂ /yr)		
	BE LEAN	BE GREEN	
Flat 1	2.31	1.63	
Flat 2	2.83	2.01	
Flat 3	2.68	1.94	
Flat 4	2.12	1.53	
Flat 5	2.28	1.61	
Flat 6	2.47	1.74	
Flat 7	3.78	2.64	
Flat 8	2.97	2.07	
TOTAL	21.44	1.52	
Carbon Reduction	-	29.23 %	

📥 BE GREEN stage

Table 13 Regulated Carbon Emissions at Be Lean Stage

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7. Conclusion

The design of the proposed development, **28 Redington Road, Hampstead, London**, will be comprised a new construction of 8 no. of residential units. To meet the Local policy requirements, the development incorporates various sustainable design and construction measures including energy/ carbon reduction, water consumption, material procurement, and waste management. The recommendation for the energy/ carbon reduction is **to enhance fabric elements (U-values) as per Building Regulations Part L1A; to install communal air source heat pumps (minimum 350% efficiency for heating, 270% for cooling) for space heating, cooling and domestic hot water; to install low energy lights. This results in followings:**

- The strategy would provide an average of 53% CO₂ reduction savings against the TER set by Building Regulation Part L1A. Therefore, the strategy meets requirements of Building Regulations L1A 2013, the London Plan, and Local Policies.
- The strategy at BE GREEN stage would provide an average 29% reduction of CO₂ emissions via onsite renewable technology (communal air source heat pumps) for the overall development. This reduction is calculated after comparing with a communal gas boiler system with 95% efficiency.

The carbon savings from each stage can be calculated based on the results above. The chart below summarises the total cumulative savings:

Energy Hierarchy		Regulated Carbon Savings	
		Tonnes CO ₂ /yr.	%
BE LEAN	After energy demand reduction	10.98	33.88 %
BE CLEAN	After heat network/ CHP	-	-
BE GREEN	After renewable energy	6.27	29.23 %
Total Cumul	ulative Savings 17.25 53		53.21%
Total Target Savings		11.35	35 %

Table 14 Carbon dioxide Emissions after each stage of the Energy Hierarchy

In summary, the strategy demonstrates a <u>53%</u> CO_2 reduction against the baseline (TER) through energy efficient design and onsite renewables, and therefore the proposed scheme meets the planning requirement of a 35% reduction.

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8. Appendix A – Low & Zero Carbon Energy Systems

8.1. Photovoltaic Systems

Description of PV Systems

Photovoltaic systems convert energy from the sun directly into electricity. They are composed of photovoltaic cells, usually a thin wafer or strip of semiconductor material that generates a small current when sunlight strikes them. Multiple cells can be assembled into modules that can be wired in an array of any size. These flat-plate PV arrays can be mounted at a fixed angle facing south, or they can be mounted on a tracking device that follows the sun, allowing them to capture the most



sunlight over the course of a day, or even in the form of a solar PV facade. Several connected PV arrays can provide enough power for a household/building.

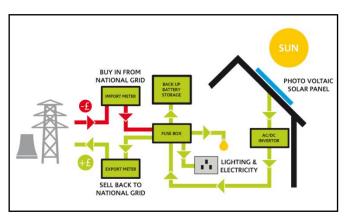
Thin film solar cells use layers of semiconductor materials only a few micrometers thick. Thin film technology has made it possible for solar cells to now double as rooftop shingles, roof tiles, building facades, or the glazing for skylights or atria. The solar cell version of items such as shingles offer the same protection and durability as ordinary asphalt shingles.

Advantages

The PV systems are relatively simple, modular, and highly reliable due to the lack of moving parts. Moreover, PV systems do not produce any greenhouse gases, on the contrary they save approximately 325kg of CO₂ per year kWp they generate.

Best Practice Design

PV installations performance is proportional to the active area (area covered by PVs). The desirable location for PV panels is on a south facing roof or façade, as long as no other building or tall trees overshadows it, resulting in reduced PV efficiency. PV panels are required strong structurally roofs due to their heavy weight, especially if the panels are placed on top of existing tiles. The area of PV panels required to generate 1 kWp



varies but generally 6-8m² for mono-crystalline and 10m² for polycrystalline panels will generate 1kWp (kWp-energy generated at full sunlight) of electricity.

Cost & Maintenance

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Prices for PV systems vary, depending on the size of the system to be installed, type of PV cell used and the nature of the actual building on which the PV is mounted. The size of a PV system depends on the buildings electricity demand. Solar tiles cost more than conventional panels, and panels that are

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integrated into a roof are more expensive than those that sit on top. Grid connected systems require very little maintenance, generally limited to ensuring that the panels are kept relatively clean and that shade from trees does not obstruct the sunlight path. However, the wiring and system components should be checked regularly by a qualified technician.

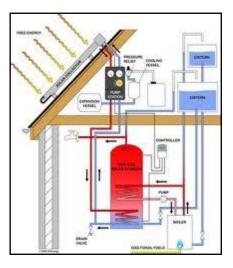
Feasibility on the site

The property falls within sub-area four 'Redington Road and Templewood Avenue' of the conservation area, and Policy DP25 seeks the retention of the appearance of the conservation area. Therefore, installing PV panels on the roof would harm keeping the character of the conservation area, and discussion with the planning authority is required in advance. Moreover, the roof space is not sufficient to meet a 35% carbon reduction. In this circumstances, PV panels is not a suitable technology for this development.

8.2. Solar Thermal Systems

Solar systems can be used wherever moderately hot water is required. Off-the-shelf packages provide hot water to the bathroom and kitchen of a house; custom systems are designed for bigger loads, such as multi-unit apartments.

The most common collector is called a flat-plate collector. Mounted on the roof, it consists of a thin, flat, rectangular box with a transparent cover that faces the sun. Small tubes run through the box and carry the fluid – either water or other fluid, such as an antifreeze solution – to be heated. The tubes are attached to an absorber plate, which is painted black to absorb the heat. As heat builds up in the collector, it heats the fluid passing through the tubes.



Cost & Maintenance

Evacuated tube systems are more expensive due to their higher manufacturing cost. SWH systems in general have a 5-10 years warranty and require little maintenance. A yearly check by the owner of the system and a more detailed maintenance check by a qualified installer every 3-5 years should be adequate.

Feasibility on the site

As mentioned in the previous section, the property falls within the conservation area, and therefore installing solar thermal systems on the roof would harm keeping the character of the conservation area. Moreover, the use of solar thermal for this development would be limited to domestic hot water only. The use of solar thermal for space heating would not be practical as it is not required when solar thermal is at its most effective during the summer months. Therefore, this system would require additional plumbing and space for hot water storage, incurring additional financial cost. Hence, this technology is deemed to be unsuitable for this development.

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8.3. Wind Turbines

Description of Wind Turbine

Wind energy systems convert the kinetic energy of moving air into electricity or mechanical power. They can be used to provide power to central grids or isolated grids, or to serve as a remote power supply or for water pumping. Wind turbines are commercial units available in a vast range of sizes. The turbines used to charge batteries and pump water off-grid tend to be small, ranging from as small as 50 W up to



10 kW. For isolated grid applications, the turbines are typically larger, ranging from about 10 to 200 kW. Wind turbines are mounted on a tower to harness the most energy. At 30 meters or more aboveground, they can capture the faster and less turbulent wind in an urban environment. Turbines harness the wind's energy with their propeller-like blades. In most of the cases, two or three blades are mounted on a shaft to form a rotor.

There are two types of wind turbines that can be used for buildings:

- Mast mounted which are free standing and located near the building that will be consuming the generated electricity.
- Roof Mounted which can be installed on house roofs and other buildings.

Planning Issues

Planning issues such as visual impact, noise and conservation issues also have to be considered. System installation normally requires permission from the local authority.

Cost & Maintenance

- Roof mounted turbines cost from £3000. The amount of energy and carbon that roof top micro wind turbines save depends on size, location, wind speed, nearby buildings and the local landscape. At the moment there is not enough data from existing wind turbine installations to provide a figure of how much energy and CO₂ could typically be saved. The Energy saving trust is monitoring up to 100 installations nationwide which will give ball park figures of carbon savings.
- Mast Mounted turbines in the region of 2.5kW to 6kW would cost approximately £11000-£19000. These costs are inclusive of the turbine, mast, inverters, battery storage and installation cost. It should be noted that these costs vary depending on location, size and type of system to be installed.
- Turbines have an operational lifetime of up to 22.5 years but require service checks every few years to ensure efficient operation. For battery storage systems, typical battery life is around 6-10 years, depending on the type, so batteries may have to be replaced at some point in the system's life.

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Feasibility on the site

Wind turbines are not feasible for the development due to the insufficient wind speed. Since the development is located in a dense residential and commercial units area; the wind resource may be restricted due to the adjacent large trees and air turbulence generated between them. As shown below (http://tools.decc.gov.uk/en/windspeed/default.aspx), the yearly average wind speed at this site is quite low at 10 meters above ground.

Wind speed at 45m agl (in m/s)

6	6	6	
6	6	6	
6	6	6	

Wind speed at 25m agl (in m/s)

5.5	5.5	5.5	
5.5	5.5	5.5	
5.5	5.5	5.5	

Wind speed at 10m agl (in m/s)

4.7	4.7	4.7	
4.7	4.7	4.7	
4.7	4.8	4.8	

Blank squares indicate areas outside the land area of the UK - i.e. areas at sea or of neighbouring countries.

agl = above ground level.

Squares surrounding the central square correspond to wind speeds for surrounding grid squares.

An actual wind-speed measurement using an anemometer has not been used for the purpose of this energy strategy report.

Wind turbine(s) have been discounted for this development scheme for the following reasons:

- A large mast horizontal axis wind turbine will not be able to generate electricity at optimal operating range since it requires higher average wind speeds. Furthermore, the installation of small scale wind turbines won't be feasible due to low average wind speed at 10 meters height, 25m & 45metre heights.
- Due to the close proximity of neighbouring Commercial units & residential properties and trees.
- In addition, the low frequency noise generated by wind turbines might cause inconvenience to the neighbouring residents. However, the level a person can be affected by low frequency noise varies from individual to individual.

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- Due to the size and the required height of a potential wind turbine scheme there is also an issue with the propellers' impacting bird traffic, obtrusiveness, shadow flicker which means that generally large wind turbines need to be located at least 300m from any residential properties, which would not be possible on this site.
- Roof mounted units are limited in size due to wind induced stresses which are transmitted to the building structure. Most roof mounted turbines currently on the market are approximately 2m diameter and capable of producing 1-1.5kW each. However, the output is dependent on the surrounding obstructions and local wind speed. Thus small scale wind turbines would not make any meaningful impact on a site such as this.
- There are likely to be planning issues associated with wind turbines of a size necessary to affect any significant CO2 savings or energy savings.
- Because of the above the investment case with regards this technology solution is not viable compared to other solutions with a more attractive ROI.
- Finally, the installation of wind turbines on the development requires planning permission (and is likely to instigate neighbourhood committee interest regarding its aesthetics and acoustic issues).

8.4. Small Scale Hydro

Description of Small Scale Hydro System

Small hydro systems convert the potential and kinetic energy of moving water into electricity, by using a turbine that drives a generator. As water moves from a higher to lower elevation, such as in rivers and waterfalls, it carries energy with it; this energy can be harnessed by small hydro systems. Used for over one hundred years, small hydro systems are a reliable and well-understood technology that can be used to provide power to a central grid, an isolated grid or an off-grid load, and may be either run-of-river systems or include a water storage reservoir.

In a residential small scale hydro system the constant flow of water is critical to the success of the project. The energy available from a hydro turbine is proportional to the flow rate of the water and the head height. Since the majority of the cost of a small hydro project stems from up front expenses in construction and equipment purchase, a hydro project can generate large quantities of electricity with very low operating costs and modest maintenance expenditures for 50 years or longer.

Advantages

For houses with no mains connection but with access to a micro hydro site, a good hydro system can generate a steady, more reliable electricity supply than other renewable technologies at lower cost. Total system costs can be high but often less than the cost of a grid connection and with no electricity bills to follow.

Cost & Maintenance

Small hydro schemes are very site specific and are related to energy output. For low heat systems, costs may lie in the region of £4,000 per kW installed up to about 10kW and would drop per kW for larger schemes.

For medium heads, there is a fixed cost of about £10,000 and about £2,500 per kW up to around 10kW

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Unit costs drop for larger schemes. Maintenance costs vary but small scale hydro systems are very reliable.

Feasibility on the site

Small scale hydro-electric will not be studied any further because of the location and the spatial limitations of the development. There is no river or lake within the development site boundaries. As a result, this solution will not be assessed any further.

8.5. Biomass Heating

Description of Biomass Heating System

Biomass heating systems also known as biomass boilers burn organic matter—such as wood chips, agricultural residues or municipal waste—to generate heat for buildings. They are highly efficient heating systems, achieving near complete combustion of the biomass fuel through control of the fuel and air supply, and often incorporating automatic fuel handling transport systems. Biomass boilers consist of a boiler, a heat distribution system, and a fuel transportation system. The biomass heating system typically makes use of multiple heat sources, including a waste heat recovery system, a biomass combustion system, a peak load boiler, and a back-up boiler. The heat distribution system conveys hot water or steam from the heating plant to the loads that may be located within the same building as the heating plant, as in a system for a single institutional or industrial building, or, in the case of a "district heating" system, clusters of buildings located in the vicinity of the heating plant.

Biomass heating systems have higher capital costs than conventional boilers and need diligent operators. Balancing this, they can supply large quantities of heat on demand with very low fuel costs, depending on the origin of the fuel.

Best Design Practice

It's important to have storage space for the fuel and appropriate access to the boiler for loading the fuel. A local fuel supplier should be present in order to make the scheme viable.

The vent material must be specifically designed for wood appliances and there must be sufficient air movement for proper operation of the stove. Chimneys can be fitted with a lined flue.

A Biomass heating system installation should comply with all safety and building regulations. Wood can only be burned in exempted appliances, under the Clean Air Act.

Advantages

Producing energy from Biomass has both environmental and economic advantages. Although Biomass produces CO_2 it only releases the same amount that is absorbed whilst growing, which is why it is considered to be carbon neutral. Furthermore, Biomass can contribute to waste management by harnessing energy from products that are often disposed at landfill sites.

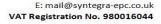
It is most cost effective and sustainable when a local fuel source is used, which results in local investment and employment, which in addition minimizes transport emissions.

Planning Issues

If the building is listed or is in an area of outstanding natural beauty, then it is required that the Local Authority Planning department is notified before a flue is fitted.

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Cost & Maintenance

Stand-alone room heaters cost £2,000 to £4,000. Savings will depend on how much they are used and which fuel you are replacing. A Biomass stove which provides a detached home with 10% of annual space heating requirements could save around 840kg of CO₂ when installed in an electrically heated home. Due to the higher cost of Biomass pellets compared with other heating fuels, and the relatively low efficiency of the stove compared to a central heating system it will cost more to run.

The cost of Biomass boilers varies depending on the system choice; a typical 15kW pellet boiler would cost about £5,000-£14,000 installed, including the cost of the flue and commissioning process. A manual log feed system of the same size would be slightly cheaper. A wood pellet boiler could save around £750 a year in energy bills and around 6 tons of CO_2 per year when installed in an electrically heated home. In terms of biomass fuel costs, they generally depend on the distance between the dwelling and the supplier and whether large quantities can be bought.

Feasibility on the site

Biomass boilers should not be considered for this project due to the following reasons:

- Furthermore, in common with other types of combustion appliances, biomass boilers are potentially a source of air pollution. Pollutants associated with biomass combustion include particulate matter (PM₁₀/ PM_{2.5}) and nitrogen oxides (NO_x) EMISSIONS. These pollution emissions can have an impact on local air quality and affect human health. Biomass has recently been rejected by many London Boroughs as means of obtaining the on-site renewable contribution (and this will soon send ripples out to other regions). This is because of their associated flue emissions (which can be significantly higher than gas fired boilers) and the difficulty of ensuring the boiler will operate at its optimum efficiency, which is often quoted by designers at the initial design stages. Biomass flue emissions are often difficult to control because the quality of fuel can vary significantly between suppliers. Given this a bio fuel system may not be acceptable to the Council on planning grounds (e.g. concerns about associated flue emissions/impact on local 'Air Quality', increase in road traffic from pellet delivery lorries).
- Biomass fuel requires more onerous and frequent wood fuel silo (site storage issues) replenishing by delivery trucks- which in turn can cause site transportation issues that will need to be considered and addressed along with the impact on the other residents and neighborhood infrastructure.
- Restrictions on the type of fuel and appliance may apply to the development and according to studies commissioned by DEFRA the levels of particles emitted by the burning of wood chip or waste would be considered to outweigh the benefits of carbon reduction especially in an urban environment such as the proposed development site.
- Dependent on a fuel supply chain contract being confirmed.
- There is no suitable location for the plant and storage of the pellets on site at present.

8.6. Ground Source Heat Pumps (GSHP)

Description of Ground Source Heat Pumps

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Ground-source heat pumps provide low temperature heat by extracting it from the ground or a body of water and provide cooling by reversing this process. Their principal application is space heating and

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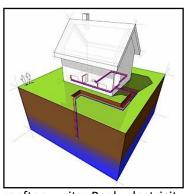
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cooling, though many also supply hot water. They can even be used to maintain the integrity of building foundations in permafrost conditions, by keeping them frozen through the summer.

A ground-source heat pump (GSHP) system has three major components: the earth connection, a heat pump, and the heating or cooling distribution system. The earth connection is where heat transfer occurs. One common type of earth connection comprises tubing buried in horizontal trenches or vertical boreholes, or alternatively, submerged in a lake or pond. An antifreeze mixture, water or another heat-transfer fluid is circulated from the heat pump, through the tubing, and back to the heat pump in a "closed loop." "Open loop" earth connections draw water from a well or a body of water, transfer heat to or from the water, and then return it to the ground or the body of water.

Since the energy extracted from the ground exceeds the energy used to run the heat pump, GSHP "efficiencies" can exceed 100%, and routinely average 200 to 500% over a season. Due to the stable, moderate temperature of the ground, GSHP systems are more efficient than air-source heat pumps, which exchange heat with the outside air. GSHP systems are also more efficient than conventional heating and Air-conditioning technologies, and typically have lower maintenance costs. They require less space, especially when a liquid building loop replaces voluminous air ducts, and, since the tubing is



located underground, are not prone to vandalism like conventional rooftop units. Peak electricity consumption during cooling season is lower than with conventional air-conditioning, so utility demand charges may be reduced. Heat pumps typically range in cooling capacity from 3.5 to 35 kW (1 to 20 tons of Cooling). A single unit in this range is sufficient for a house or small Commercial units Building. The heat pump usually generates hot or cold air to be distributed locally by conventional ducts.

Advantages

The efficiency of GSHP system is measured by the coefficient of performance (COP). This is the ratio of units of heat output for each unit of electricity used to drive the compressor and pump for the ground loop. Average COP known as seasonal efficiency, is around 3-4 although some systems may produce a greater rate of efficiency. This means that for every unit of electricity used to pump the heat, 3-4 units of heat are produced, making it an efficient way of heating a building. If grid electricity is used for the compressor and pump, then a range of energy suppliers should be consulted in order to benefit from the lower running costs.

Cost & Savings

A typical 8-12kW system costs $\pm 6,000-\pm 12,000$ (not including the price of distribution system). This can vary with property and location. When installed in an electrically heated home a GSHP could save as much as ± 900 a year on heating bills and almost 7 tonnes of CO₂ a year. Savings will vary depending on what fuel is being replaced.

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Feasibility on the site

GSHP will not be studied any further for the following reasons:

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- If an open loop configuration was to be adopted, a test borehole would be needed to assess the available resource. The test resource process is expensive and of course does not guarantee an acceptable resource in the ground. Additionally, a closed loop borehole configuration could not be used due to spatial limitations of the site.
- There are likely to be planning issues associated with borehole excavation and drilling.
- Running costs and maintenance may be minimal. However, installation is a costly affair. A GSHP solution would represent a relatively expensive option in comparison to other renewable technologies available.
- Additional electric immersion and pumps would be required to heat the GSHP water up to suitable temperature to be used around the building and it's likely a centralised plant area will also be required to house the circulation pumps.
- This technology is not recommended due to the increased plant energy consumption requirements in turn impacting the DER/TER score for the required energy strategy objectives.
- Furthermore, boreholes also destabilize the ground surface and may be considered a minus for environmentally friendly endeavours.

8.7. Combined Heat and Power (CHP) & Micro CHP

Description of CHP

The principle behind combined heat and power (cogeneration) is to recover the waste heat generated by the combustion of a fuel6 in an electricity generation system. This heat is often rejected to the environment, thereby wasting a significant portion of the energy available in the fuel that can otherwise be used for space heating and cooling, water heating, and industrial process heat and cooling loads in the vicinity of the plant. This cogeneration of electricity and heat greatly increases the overall efficiency of the system, anywhere from 25-55% to 60-90% depending on the equipment used, and the application.



A CHP installation comprises four subsystems: the power plant, the heat recovery and distribution system, an optional system for satisfying heating and/or cooling loads and a control system. A wide range of equipment can be used in the power plant, with the sole restriction being that the power equipment rejects heat at a temperature high enough to be useful for the thermal loads at hand. In a CHP system, heat may be recovered and distributed as hot water, conveyed from the plant to low temperature thermal loads in pipes for hot water, or for space heating.

Advantages

CHP can significantly reduce primary energy consumption, and can therefore have a major impact on CO2 emissions associated with the combustion of fossil fuels in conventional boilers. Each 1 kW of electrical capacity provided by CHP plant using fossil fuels has the potential to reduce annual CO2 emissions by around 0.6 tonnes compared to gas-fired boilers and fully grid-derived electricity. For plant which is fuelled by renewable energy sources the potential is much greater.

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Costs & Savings

Capital costs for CHP installations are higher than for alternative systems, but this can be recovered over a relatively short period of time (typically 5–10 years) for installations where there is a demand for heat and power for 4500 hours or more each year. The cost effectiveness is very sensitive to the relative price of electricity and fossil fuel which have been subject to frequent variations since deregulation of the energy supply industries.

Micro CHP

Micro CHP (Combined Heat & Power) is the simultaneous production of useful heat and power within the home. It works very much like the gas boiler in a central heating system and heats the home in just the same way. However, at the same time it generates electricity, some of which will be used in the dwelling and the remainder will be exported to the electricity grid. Effectively the micro CHP unit replaces the gas central heating boiler and provides heat and hot water as usual, but additionally provides the majority of the home's electricity needs. Although



individual units produce, by definition, relatively small amounts of electricity, the significance of micro CHP lies in the potentially huge numbers of systems which may ultimately be installed in the millions of homes in the UK where natural gas is currently the dominant heating fuel.

Feasibility on the site

CHP has not been considered further for this project for the following reasons:

- The average maximum heating load of a new apartment (built to 2010 building regs) is approximately 3kW and therefore most individual heating systems with independent condensing gas boilers would be incapable of working at optimal efficiencies or achieving their stated SEDBUK rating due to boiler cycling.
- Traditional CHP should not be considered for this project due to the spatial constraints of the development plot and dwelling layouts. There is not suitable space in the development for CHP plant.
- Heat from the CHP plant could be utilized to drive an absorption chiller during the summer months (tri-generation), but due to the sustainable design of the building fabric, and the use of natural ventilation wherever possible, we anticipate that the cooling load will be minimal, making this a non-viable proposition.
- Micro-CHP is a relatively new concept and issues are raised in relation to unproven technology, inefficiency for shorter run cycles and lack of technical knowledge that can limit the practical application of micro CHP at present. In addition, high installation costs and estimated low life expectancy has also been taken into consideration as to its commercial unit's un-viability for this development scheme. Micro-CHP also has a lower FIT tariff rate and period duration and is only applicable for systems under 2kW.

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Fuel Cells 8.8.

Description of Fuel Cells

A fuel cell is a device that generates more electricity by a chemical reaction. Every fuel cell has two electrodes, one positive and one negative, called, respectively, the anode and cathode. The reactions that produce electricity take place at the electrodes.

Every fuel cell also has an electrolyte, which carries electrically charged particles from one electrode to the other, and a catalyst, which speeds the reactions at the electrodes. Hydrogen is the basic fuel, but fuel cells also require oxygen.

One great appeal of fuel cells is that they generate electricity with very little pollution-much of the hydrogen and oxygen used in generating electricity ultimately combine to form a harmless by product, namely water.

Fuel Cell Operation

The purpose of a fuel cell is to produce an electrical current that can be directed outside the cell to do work, such as powering an electric motor or illuminating a light bulb or a city. Because of the way electricity behaves, this current returns to the fuel cell, completing an electrical circuit. The chemical reactions that produce this current are the key to how a fuel cell works.

There are several kinds of fuel cells, and each operates a bit differently. But in general terms, hydrogen atoms enter a fuel cell at the anode where a chemical reaction strips them of their electrons. The hydrogen atoms are now "ionized," and carry a positive electrical charge. The negatively charged electrons provide the current through wires to do work. If alternating current (AC) is needed, the DC output of the fuel cell must be routed through a conversion device called an inverter.

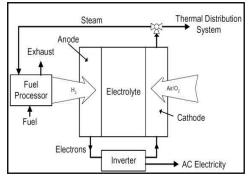
Advantages

Even better, since fuel cells create electricity chemically, rather than by combustion, they are not subject to the thermodynamic laws that limit a conventional power plant. Therefore, fuel cells are more efficient in extracting energy from a fuel. Waste heat from some cells can also be harnessed, boosting system efficiency still further.

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Fuel Cells with Hydrogen from Renewable Sources

Fuel cells can be used as CHP systems in buildings. There are currently several different systems under development using different chemical processes, which operate at different temperatures. They currently use natural gas as the fuel, which is reformed to produce hydrogen, the required fuel for the fuel cell. When and if hydrogen becomes available from renewable energy, fuel cell CHP from renewable sources may be possible in buildings.



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8.9. Available Grants

8.9.1. Renewable Heat Incentive (RHI)

✓ Domestic RHI tariff rates

Table below specifies the current and future tariffs for each available renewable technology on the 31st of March 2016 (<u>https://www.ofgem.gov.uk/environmental-programmes/domestic-renewable-heat-incentive-domestic-rhi/about-domestic-rhi/tariffs-and-payments-domestic-rhi</u>). As the tariff keeps changing, it has to be checked at appropriate design stage.

Applications submitted	Biomass boilers and stoves	Air source heat pumps	Ground source heat pumps	Solar thermal
01/01/16 - 31/03/16	5.14p	7.42p	19.10p	19.51p
01/04/16 - 30/06/16*	5.20p	7.51p	19.33p	19.74p
01/07/2016 -	lf any <mark>n</mark> ew tariff (changes are to be	made due to degr	ession, the
30/09/2016**	next announcem	ent by DECC woul	d be by 1 June 201	16.

✓ Non-Domestic RHI tariff rates

The table below specifies tariffs that apply for installations with an accreditation date on or after 1 April 2016 (https://www.ofgem.gov.uk/environmental-programmes/non-domestic-renewable-heat-incentive-rhi/tariffs-apply-non-domestic-rhi-great-britain).

Tariff name	Eligible technology	Eligible sizes	Tariffs
		Less than 200 kWth	
Small commercial biomass		Tier 1	3.62
Sinai commerciai biomass		Less than 200 kWth	
	Solid biomass including	Tier 2	0.96
Medium commercial biomass	solid biomass contained in waste	200 kWth and above & less than 1MWth Tier 1	5.24
Medium commercial biomass		200 kWth and above & less than 1MWth Tier 2	2.27
Large commercial biomass		1MWth and above	2.05
Solid biomass CHP systems (commissioned on or after 4 December 2013)	Solid biomass CHP systems	all capacities	4.22
Water/Ground-source heat	Ground-source heat	all capacities Tier 1	8.95
pumps	pumps & Water-source heat pumps	Tier 2	2.67

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Air-source heat pumps (commissioned on or after 4 December 2013)	Air-source heat pumps	all capacities	2.57
Deep geothermal (commissioned on or after 4 December 2013)	Deep geothermal	all capacities	5.14
All solar collectors	Solar collectors	Less than 200 kWth	10.28
		On the first 40,000 MWh of eligible biomethane Tier 1	5.35
Biomethane injection	Biomethane	Next 40,000 MWh of eligible biomethane Tier 2	3.14
		Remaining MWh of eligible biomethane Tier 3	2.42
Small biogas combustion		Less than 200 kWth	6.94
Medium biogas combustion (commissioned on or after 4 December 2013)	Biogas combustion	200 kWth and above & less than 600 kWth	5.45
Large biogas combustion (commissioned on or after 4 December 2013)		600 kWth and above	2.04

8.9.2. Feed In Tariff (FIT)

The table below shows the listing of all generation tariff levels for installations before 1st April 2016, which is current data on the official webpage (http://www.fitariffs.co.uk/eligible/levels/). Tariffs after 1st April 2016 as per the degression table, but adjusted for RPI indexation and contingent degression. Therefore, the detailed tariff has to be checked at appropriate design stage.

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Energy Source	Scale	Type / Rate	Tariff (p/kWh)			
		Non-PV	< 15/01/16	> 8/2/16		
Anaerobic digestion	≤250kW		9.12	tba [1]		
Anaerobic digestion	>250kW - 500kW		8.42	tba [1]		
Anaerobic digestion	>500kW		8.68	tba [1]		
Hydro	≤15 kW		15.45	8.54		
Hydro	>15 - 100kW		14.43	8.54		
Hydro	>100kW - 500kW		11.40	6.14		
Hydro	>500kW - 2MW		8.91	6.14		
Hydro	>2MW - 5MW		2.43	4.43		
Micro-CHP	<2 kW	(iimited)	13.45	tba [1]		
Solar PV	≤4 kW	Higher rate	12.88	4.39		
Solar PV	≤4 kW	Medium rate	11.67			
Solar PV	>4 - 10kW	Higher rate	11.71	4.39		
Solar PV	>4 - 10kW	Medium rate	10.54			
Solar PV	>10 - 50kW	Higher rate	11.71	4.59		
Solar PV	>10 - 50kW	Medium rate	10.54			
Solar PV	>50 - 150kW	Higher rate	9.63	2.70		
Solar PV	>50 - 150kW	Medium rate	8.67			
Solar PV	>150 - 250kW	Higher rate	9.21	2.70		
Solar PV	>150 - 250kW	Medium rate	8.29			
Solar PV	≤250kW	Lower rate	6.16			
Solar PV	>250kW - 5MW		5.94	2.27		
Solar PV	>1MW - 5MW		5.94	0.87		
Solar PV	≤5MW	Standalone	4.44	0.87		
Wind	≤100kW		13.73	8.53		
Wind	>100 - 500kW		10.85	8.53		
Wind	>500kW - 1.5MW		5.89	5.46		
Wind	>1.5MW - 5MW		2.49	0.86		
Апу	existing systems trans	sferred from RO	10.66	10.66		

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9. Appendix B – SAP Worksheets

9.1. SAP Worksheets at BE LEAN stage

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Block Compliance WorkSheet: 28 Redington Road_Rev C

		User Details				
Assessor Name: Software Name:	Stroma FSAP	Softwa	a Number: are Versior		/ersion: 1.0.3	3.11
	Ca	lculation Detail	S			
Dwelling		DER	TER	DFEE	TFEE	TFA
Flat 1		16.01	16.59	47.6	58.7	144
Flat 2		12.34	12.84	36.6	45.9	229
Flat 3		11.04	12	34.7	46.1	243
Flat 4		11.91	13.04	33.8	45.8	178
Flat 5		15.12	15.51	43.8	53.7	151
Flat 6		14.77	15	45.2	54.3	167
Flat 7		13.96	13.64	46.1	53.4	271
Flat 8		19.42	18.68	64.5	72.4	153

Calculation Summary

Total Floor Area	1536.00
Average TER	14.30
Average DER	13.96
Average DFEE	43.10
Average TFEE	52.76
Compliance	Pass
% Improvement DER TER	2.38
% Improvement DFEE TFEE	18.31

					User D	etails:						
Assessor Name: Software Name:	Stro	oma FS	AP 201	2		Strom Softwa				Versio	on: 1.0.3.11	
				Р	roperty .	Address	: Flat 1					
Address :		•	on Road,	NW3 71	RB							
1. Overall dwelling din	hension	s:										
					Area	a(m²)		Av. He	ight(m)	_	Volume(m ³)
Basement						75	(1a) x	2	2.8	(2a) =	210	(3a)
Ground floor						69	(1b) x	3	3.1	(2b) =	213.9	(3b)
Total floor area TFA = ((1a)+(1b	o)+(1c)+	(1d)+(1e)+(1n	ı)	144	(4)					
Dwelling volume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	423.9	(5)
2. Ventilation rate:												
		main neating		econdar leating	у	other		total			m ³ per hou	r
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	fans							4	X	10 =	40	(7a)
Number of passive ven	ts							0	×	10 =	0	(7b)
Number of flueless gas	fires							0	x	40 = Air ch	0 anges per ho	(7c)
Infiltration due to chimn	ieys, flu	es and fa	ans = (6	a)+(6b)+(7	<mark>a)+</mark> (7b)+(7c) =	Г	40		÷ (5) =	0.09	(8)
If a pressurisation test has				ed, proceed	d to (17), o	otherwise o	continue fr	om (9) to ((16)			_
Number of storeys in Additional infiltration	the dw	elling (ne	5)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration:	0.25 for	r steel oi	r timber f	frame or	0.35 fo	r masoni	v constr	uction	[(0)	1100.1 -	0	(11)
if both types of wall are deducting areas of ope	present, i	use the va	lue corres				•				Ŭ	
If suspended wooder	ו floor, e	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	enter 0.0)5, else e	enter 0								0	(13)
Percentage of window	ws and	doors dr	aught st	ripped							0	(14)
Window infiltration						0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value	э, q50, е	expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	4.5	(17)
If based on air permeat	oility val	ue, then	(18) = [(1	7) ÷ 20]+(8	3), otherwi	se (18) = ((16)				0.32	(18)
Air permeability value app		ressurisatio	on test has	s been don	e or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides shelte	red					(20) 1	10 07E v (1	0)]			1	(19)
Shelter factor		. e				(20) = 1 -		9)] =			0.92	(20)
Infiltration rate incorpor	•			1		(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified			· · ·		Jul	Au. ~	Son	Oct	Nov	Dec		
	Mar	Apr	May -	Jun	Jui	Aug	Sep	Oct		Dec		
Monthly average wind s (22)m= 5.1 5	4.9	om Tabl 4.4	e 7 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	l	
,				0.0	0.0	<u> </u>				L		

$\begin{array}{c c c c c c c c c c c c c c c c c c c $
0.38 0.37 0.36 0.32 0.32 0.28 0.27 0.3 0.32 0.33 0.35 Calculate effective air change rate for the applicable case If mechanical ventilation: if exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0 (23a) if balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c) a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] (24a)m = 0 0 0 0 0 0 0 0 0 0 (24a)m = 0 (24c)m + (23b) × [1 - (23c) ÷ 100] (24a)m = 0
Calculate effective air change rate for the applicable caseIf mechanical ventilation:if exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)if exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)if balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =if balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100](24a)m = 00 </td
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c) a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] (24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) 0 (23b) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c) a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × $[1 - (23c) \div 100]$ (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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) × $[1 - (23c) \div 100]$ (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
a) If balanced mechanical ventilation with heat recovery (MVHR) $(24a)m = (22b)m + (23b) \times [1 - (23c) \div 100]$ (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
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$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
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d) If natural ventilation or whole house positive input ventilation from loft if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$ (24d)m = 0.57 0.57 0.57 0.55 0.55 0.54 0.54 0.54 0.54 0.55 0.56 0.56 (24d) Effective air change rate - enter $(24a)$ or $(24b)$ or $(24c)$ or $(24d)$ in box (25) (25)m = 0.57 0.57 0.57 0.55 0.55 0.54 0.54 0.54 0.54 0.55 0.56 0.56 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross Openings Net Area U-value A X U k-value kJ/m ² ·K KJ/K Doors 2.1 x $0.8 = 1.68$ (26)
if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$ (24d)m = 0.57 0.57 0.57 0.55 0.55 0.54 0.54 0.54 0.54 0.55 0.56 0.56 (24d) Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m = 0.57 0.57 0.57 0.55 0.55 0.54 0.54 0.54 0.54 0.55 0.56 0.56 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m ²) Doors beta Area and area area area area area area area are
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Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.57 0.57 0.55 0.54 0.54 0.54 0.55 0.56 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m ²) Openings m ² Net Area A, m ² U-value W/m2K A X U K-value KJ/K A X k KJ/K Doors 2.1 x 0.8 = 1.68 (26)
(25)m= 0.57 0.57 0.55 0.54 0.54 0.54 0.55 0.56 0.56 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m ²) Openings m ² Net Area A, m ² U-value A X U (W/K) kJ/m ² ·K k-value kJ/K A X k kJ/K Doors 2.1 x 0.8 = 1.68 (26)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Doors Openings m² A, m² W/m2K W/m2K (W/K) k-value kJ/K K, V/m²-K K, V/m²-K Losses Losses <
ELEMENTGross area (m²)Openings m²Net Area A ,m²U-value W/m2KA X U (W/K)k-value kJ/m²-KA X k kJ/KDoors2.1x0.8=1.68(26)
area (m ²) m ² A ,m ² W/m2K (W/K) kJ/m ² ·K kJ/K Doors 1.68 (26)
Doors $2.1 \times 0.8 = 1.68$ (26)
Windows Type 1 1.085 $x^{1/[1/(1.2)+0.04]} = 1.24$ (27)
Windows Type 2 $1.02 \times 1/[1/(1.2) + 0.04] = 1.17$ (27)
Floor $75 \times 0.12 = 9$ (28)
Walls Type1 14 2.1 11.9 x 0.12 = 1.43 (29)
Walls Type 2 30.8 0 30.8 x 0.11 = 3.42 (29)
Walls Type3 20.44 0 20.44 x 0.11 = 2.27 (29)
Walls Type4 33.6 14.74 18.86 x 0.12 = 2.26 (29)
Walls Type5 8.4 0 8.4 x 0.11 = 0.91 (29)
Walls Type6 8.4 0 8.4 x 0.11 = 0.91 (29)
Walls Type7 5.88 0 5.88 x 0.11 = 0.65 (29)
Walls Type8 12.9 0 12.9 x 0.12 = 1.55 (29)
Walls Type9 17.36 0 17.36 x 0.11 = 1.88 (29)
Walls Type10 24.8 0 24.8 × 0.12 = 2.98 (29)
Walls Type11 30.69 0 30.69 × 0.11 = 3.32 (29)
Walls Type12 30.69 0 30.69 x 0.13 = 3.99 (29)
Total area of elements, m ² 312.96 (31)

				effective wi nternal wal			lated using	i formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	n 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				53.12	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	eter (TMF	⁻ = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	-		ere the de tailed calc		construct	ion are no	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	K						46.94	(36)
			are not kn	own (36) =	= 0.15 x (3	1)								_
	abric he								(33) +	(36) =			100.06	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y		1		(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	79.87	79.48	79.1	77.33	77	75.45	75.45	75.17	76.05	77	77.67	78.37		(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	179.93	179.54	179.17	177.39	177.06	175.51	175.51	175.23	176.11	177.06	177.73	178.43		
											Sum(39)1.	12 /12=	177.39	(39)
	· · · · · · · · · · · · · · · · · · ·	· · · ·	HLP), W/	r						= (39)m ÷	r		1	
(40)m=	1.25	1.25	1.24	1.23	1.23	1.22	1.22	1.22	1.22	1.23	1.23	1.24		
Numbe	er of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1	12 /12=	1.23	(40)
- Norther	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)
(+1)11-		20							00				1	()
4. Wa	ater heat	ting ener	rgy requ	irement:								kWh/y	ear:	
Assum	ned occu	ipancy, I	N								2.	92		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	<mark>[1 - </mark> exp	(-0.0003	349 x (TF	- A -13.9)2)] + 0.(00 <mark>13 x (</mark>	TF <mark>A -13</mark> .	9)			
								(25 x N)				3.65		(43)
		-		usage by : r day (all w		-	-	to achieve	a water us	se target o	Ť			
		· ·		r		<u> </u>	, 	Aug	San	Oct	Nev	Dee	1	
Hot wat	Jan er usage i	Feb	Mar dav for ea	Apr ach month	May Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec	J	
	114.02	109.87	105.73	101.58	97.43	93.29	93.29	97.43	101.58	105.73	109.87	114.02	1	
(44)m=	114.02	109.07	103.73	101.50	37.43	33.23	93.29	37.43			m(44) ₁₁₂ =	-	1243.84	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	m x nm x E) Tm / 3600			× /		1243.04	()
(45)m=	169.09	147.88	152.6	133.04	127.66	110.16	102.08	117.14	118.54	138.14	150.79	163.75]	
			ļ	ļ	ļ		ļ	<u> </u>		I Total = Su	m(45) ₁₁₂ =		1630.87	(45)
lf instan	taneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46						
(46)m=	25.36	22.18	22.89	19.96	19.15	16.52	15.31	17.57	17.78	20.72	22.62	24.56		(46)
	storage						•						-	
-		. ,					-	within sa	ame ves	sel		1		(47)
	•	-		nk in dw	-			. ,						
			hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage nanufact		eclared I	oss facto	or is kno	wn (kWł	n/dav).					0	1	(48)
			m Table			(0]	(40)
. Suibe												0]	(-3)

		om water turer's de	-	•		or is not		(48) x (49)) =			1		(50)
		age loss		•							0.	03		(51)
	•	neating s		on 4.3										
		from Ta										93		(52)
•		actor fro									0	.6		(53)
		om water	-	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	0	.1		(54)
	. ,	(54) in (5	,								0	.1		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m	-			
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)
If cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(57)
Prima	v circuit	loss (ar	nual) fro	om Table	3		•	•				0		(58)
	•	loss (al	,			59)m = ((58) ÷ 36	65 x (41)	m			•		. ,
	•					•	. ,	, ,		r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi		l loulatad	for ooob	month	(61)m -	(60) · 20	$\frac{1}{25} \times (41)$							
(61)m=		Iculated			01)11 =	(00) - 30			0	0	0	0		(61)
	Ţ	_	-	-	-	÷	÷	_	-		-			(01)
	<u> </u>								1		. ,	<u> </u>	(59)m + (61)m	(00)
(62)m=	195.38	171.63	178.9	158.49	153.95	135.6	128.37	143.43	143.98	164.43	176.24	190.04		(62)
						-				r contributi	on to wate	er heating)		
(add a	dditiona	l lines <mark>if</mark>	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	195.38	171.63	178.9	158.49	153.95	135.6	128.37	143.43	143.98	164.43	176.24	190.04		
								Outp	out from w	ater heater	r (annual)₁	12	1940.44	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	« [(46)m	+ (57)m	+ (59)m]	
(65)m=	74.83	65.98	69.35	62.25	61.06	54.64	52.55	57.56	57.42	64.54	68.15	73.06		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	vlinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
	. ,	ains (see		. ,	•	,		- J					J	
	Ŭ				/•									
wetab	Jan	is (Table Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	175.46	175.46	175.46	175.46	175.46	175.46	175.46	175.46	175.46	175.46	175.46	175.46		(66)
										173.40	170.40	170.40		(00)
•	73.13	(calcula 64.95	·	·	· ·		· · · ·	-		00.44	70.5	75.40		(67)
(67)m=	13.13													
•••			52.82	39.99	29.89	25.24	27.27	35.45	47.58	60.41	70.5	75.16		(67)
	nces ga	ins (calc	ulated in	n Append	dix L, eq	uation L	13 or L1	i 3a), also	see Ta	ble 5				
(68)m=	nces ga										416.91	447.86		(67)
	nces ga 468.53	ins (calc	ulated in 461.14	Append 435.06	dix L, eq 402.13	uation L 371.19	13 or L1 350.52	3a), also 345.65	see Ta 357.91	ble 5 383.99				(68)
	nces ga 468.53	ins (calc 473.39	ulated in 461.14	Append 435.06	dix L, eq 402.13	uation L 371.19	13 or L1 350.52	3a), also 345.65	see Ta 357.91	ble 5 383.99				
Cookir (69)m=	nces ga 468.53 ng gains 55.47	ins (calc 473.39 (calcula	ulated in 461.14 ated in A 55.47	Append 435.06 ppendix 55.47	dix L, eq 402.13 L, equat	uation L 371.19 ion L15	13 or L1 350.52 or L15a)	3a), also 345.65), also se	see Ta 357.91 ee Table	ble 5 383.99 5	416.91	447.86		(68)
Cookir (69)m=	nces ga 468.53 ng gains 55.47	ins (calc 473.39 (calcula 55.47	ulated in 461.14 ated in A 55.47	Append 435.06 ppendix 55.47	dix L, eq 402.13 L, equat	uation L 371.19 ion L15	13 or L1 350.52 or L15a)	3a), also 345.65), also se	see Ta 357.91 ee Table	ble 5 383.99 5	416.91	447.86		(68)
Cookir (69)m= Pumps (70)m=	nces ga 468.53 ng gains 55.47 s and fai	ins (calc 473.39 (calcula 55.47 ns gains	ulated ir 461.14 ited in A 55.47 (Table \$ 0	Append 435.06 ppendix 55.47 5a) 0	dix L, eq 402.13 L, equat 55.47	uation L 371.19 ion L15 55.47	13 or L1 350.52 or L15a) 55.47	3a), also 345.65), also se 55.47	55.47	ble 5 383.99 5 55.47	416.91 55.47	447.86 55.47		(68) (69)
Cookir (69)m= Pumps (70)m=	nces ga 468.53 ng gains 55.47 s and fai	ins (calc 473.39 (calcula 55.47 ns gains 0	ulated ir 461.14 ited in A 55.47 (Table \$ 0	Append 435.06 ppendix 55.47 5a) 0	dix L, eq 402.13 L, equat 55.47	uation L 371.19 ion L15 55.47	13 or L1 350.52 or L15a) 55.47	3a), also 345.65), also se 55.47	55.47	ble 5 383.99 5 55.47	416.91 55.47 0	447.86 55.47		(68) (69)

Water I	heating	gains (T	able 5)													
(72)m=	100.58	98.18	93.21	86.45	82.06	7	5.89	70.63	77.3	36	79.75	86.75	94.65	98.19]	(72)
Total i	nternal	gains =				-	(66)	m + (67)m	ı + (68	s)m + (6	59)m + (7	70)m + (71)m + (72)	m	1	
(73)m=	756.2	750.49	721.13	675.46	628.05	58	36.27	562.38	572.	.42 5	599.19	645.1	696.03	735.17]	(73)
	ar gain	s:				<u> </u>									<u> </u>	
			using sola	r flux from	Table 6a	and	associ	ated equa	tions t	o conv	ert to the	e applica	ble orientat	ion.		
Orienta	ation:	Access F	actor	Area			Flu	х		g	L_		FF		Gains	
	-	Table 6d		m²			Tab	ole 6a		Tab	ole 6b	-	Table 6c		(W)	
South	0.9x	1	x	1.0)9	x	4	6.75	x		0.9	x	0.9	=	258.85	(78)
South	0.9x	1	x	1.0)2	x	4	6.75	x		0.9	×	0.9	=	243.35	(78)
South	0.9x	1	x	1.()9	x	7	6.57	x		0.9	_ × [0.9	=	423.94	(78)
South	0.9x	1	x	1.0)2	x	7	6.57	x		0.9	_ x [0.9	=	398.54	(78)
South	0.9x	1	x	1.()9	x	9	7.53	x		0.9	_ x [0.9	=	540.02	(78)
South	0.9x	1	x	1.0)2	x	9	7.53	x		0.9	_ x [0.9	=	507.67	(78)
South	0.9x	1	x	1.0)9	x	11	10.23	x		0.9	×	0.9	=	610.34	(78)
South	0.9x	1	x	1.()2	x	11	10.23	×		0.9	_ × [0.9	=	573.78	(78)
South	0.9x	1	x	1.0)9	x	11	14.87	×		0.9	x	0.9	=	636.01	(78)
South	0.9x	1	x	1.0)2	x	11	14.87	x		0.9	x	0.9	_	5 <mark>97.91</mark>	(78)
South	0.9x	1	x	1.0)9	x	1'	10.55	×		0.9	×	0.9	=	612.08	(78)
South	0.9x	1	x	1.0)2	x	11	10.55	× [0.9	x	0.9	=	575.41	(78)
South	0.9x	1	x	1.0)9	x	1(08.01	×		0.9	× [0.9	=	5 <mark>98.04</mark>	(78)
Sout <mark>h</mark>	0.9x	1	x	1.0)2	x	1(08.01	x		0.9	x	0.9	=	5 <mark>62.21</mark>	(78)
Sout <mark>h</mark>	0.9x	1	x	1.0)9	x	1(04.89	x		0.9	x	0.9	=	5 <mark>80.78</mark>	(78)
South	0.9x	1	x	1.0)2	x	1(04.89	x		0.9	×	0.9	=	545.98	(78)
South	0.9x	1	x	1.0)9	x	1(01.89	x		0.9	_ x [0.9	=	564.12	(78)
South	0.9x	1	x	1.0)2	x	1(01.89	x		0.9	_ × [0.9	=	530.32	(78)
South	0.9x	1	x	1.0)9	x	8	2.59	x		0.9	×	0.9	=	457.26	(78)
South	0.9x	1	x	1.0)2	x	8	2.59	x		0.9	_ x [0.9	=	429.86	(78)
South	0.9x	1	x	1.0)9	x	5	5.42	x		0.9	_ × [0.9	=	306.83	(78)
South	0.9x	1	x	1.0)2	x	5	5.42	x		0.9	×	0.9	=	288.45	(78)
South	0.9x	1	x	1.0)9	x	2	10.4	x		0.9	_ x [0.9	=	223.67	(78)
South	0.9x	1	x	1.0)2	x	2	10.4	x		0.9	_ × [0.9	=	210.27	(78)
Solar g	ains in	watts, ca	alculated	for eac	h month	<u>۱</u>			(83)m	= Sum	n(74)m	.(82)m			•	
(83)m=	502.2	822.48		1184.12				1160.24	1126	6.76 1	094.44	887.12	595.28	433.95		(83)
-		nternal a		· ,	<u> </u>	<u> </u>							1		1	(- · · ·
(84)m=	1258.4	1572.96	1768.82	1859.58	1861.97	17	73.75	1722.62	1699	.18 1	693.63	1532.22	2 1291.31	1169.12	J	(84)
7. Me	an intei	rnal temp	erature	(heating	seasor	า)									-	
Temp	erature	during h	eating p	eriods ir	n the liv	ing	area f	rom Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ition fac	ctor for g	ains for l	iving are	ea, h1,n	n (se	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	лд	Sep	Oct	Nov	Dec	ļ	
(86)m=	0.99	0.97	0.94	0.88	0.77).61	0.44	0.4	7	0.67	0.89	0.98	0.99	J	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) $(87)m=$ 19.8720.1320.420.6720.8720.9720.9920.9920.9520.720.2219.82(87)Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) $(88)m=$ 19.8819.8819.8919.919.919.919.919.919.919.919.919.919.9Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) $(89)m=$ 0.990.970.920.850.710.510.340.360.580.850.970.99(89)Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)(90)(90)m=18.4218.7819.1719.5419.819.919.919.8719.5818.9318.35(90)Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2(92)m=18.9319.2519.619.9420.1620.2720.2920.2419.9719.3818.86(92)Apply adjustment to the mean internal temperature from Table 4e, where appropriate
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
fLA = Living area \div (4) = (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 18.93 19.25 19.6 19.94 20.16 20.27 20.29 20.24 19.97 19.38 18.86 (92)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m=18.9319.2519.619.9420.1620.2720.2920.2419.9719.3818.86(92)
(92)m= 18.93 19.25 19.6 19.94 20.16 20.27 20.29 20.29 20.24 19.97 19.38 18.86 (92)
(93)m= 18.93 19.25 19.6 19.94 20.16 20.27 20.29 20.29 20.24 19.97 19.38 18.86 (93)
8. Space heating requirement
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
the utilisation factor for gains using Table 9a
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Utilisation factor for gains, hm:
(94)m= 0.98 0.96 0.92 0.85 0.73 0.54 0.37 0.4 0.61 0.86 0.96 0.99 (94)
Useful gains, hmGm , W = $(94)m \times (84)m$ (95)m= 1237.69 1509.38 1625.86 1574.83 1352.4 966.16 643.19 675.78 1032.66 1314.25 1245.56 1154.73 (95)
(95)m= 1237.69 1509.38 1625.86 1574.83 1352.4 966.16 643.19 675.78 1032.66 1314.25 1245.56 1154.73 (95) Monthly average external temperature from Table 8 643.19 675.78 1032.66 1314.25 1245.56 1154.73 (95)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]
(97)m= 2631.82 2577.3 2347.23 1957.71 1497.58 994.32 646.88 680.85 1082.19 1659.25 2183.37 2616.43 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m
(98)m= 1037.23 717.65 536.7 275.67 108.02 0 0 0 0 256.68 675.22 1087.51
Total per year (kWh/year) = Sum(98) _{15,912} = 4694.67 (98)
Space heating requirement in kWh/m²/year 32.6 (99)
8c. Space cooling requirement
Calculated for June, July and August. See Table 10b
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)
(100)m= 0 0 0 0 0 1649.84 1298.81 1331.74 0 0 0 0 (100
Utilisation factor for loss hm
(101)m= 0 0 0 0 0 0.86 0.92 0.91 0 0 0 0 (101
Useful loss, hmLm (Watts) = (100) m x (101)m
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 1773.75 1722.62 1699.18 0 0 0 (103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
space cooling requirement for month, whole dwelling, continuous (xwn) = 0.024 x [(103)m – (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m
(104)m= 0 0 0 0 0 0 260.19 391.44 361.17 0 0 0 0
Total = Sum(10.4) = 1012.8 (104)

Cooled fraction	า							f C =	cooled	area ÷ ((4) =	1	(105)
Intermittency f	actor (Ta	able 10b) 	1	1								-
(106)m= 0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
Space cooling	requirer	nent for	month =	: (104)m	× (105)	x (106)ı	m	Total	' = Sum((104)	=	0	(106)
(107)m= 0	0	0	0	0	65.05	97.86	90.29	0	0	0	0	7	
								Total	= Sum((107)	=	253.2	(107)
Space cooling	requirer	ment in l	kWh/m²/	year				(107)	÷ (4) =			1.76	(108)
9b. Energy rec	quiremer	nts – Co	mmunity	heating	scheme	e							
This part is use Fraction of spa	•		• •		-		• •	•		unity sc	heme.	0	(301)
Fraction of spa						•		,				1	(302)
The community so	cheme mag	y obtain h	eat from se	everal sou	rces. The	procedure	allows for	CHP and ι	up to four	other hea	t sources	; the latter	J
includes boilers, h Fraction of hea		-			from powe	r stations.	See Apper	ndix C.					(303a)
					oiloro				(2	(20) v (20)	20) -	1	(303a) (304a)
Fraction of tota Factor for cont							unity boo	ting eve		602) x (303	5a) =	1	(304 <i>a</i>) (305)
Distribution los					,		•	ung sys	lem			1.05	(306)
Space heating		(Table	120) 101 0	Johnmun	ity neat	ng syste						kWh/year](300)
Annual space		requirer	nent									4694.67	1
Space heat fro	om Comr	<mark>nun</mark> ity b	oilers					(98) x (30	04a) x (30	5) x (306)	=	4 <mark>929.4</mark>	(307a)
Efficiency of se	econdary	y/supple	ementary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	<mark>m se</mark> cor	dary/su	oplemen	ntary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating													1
Annual water h		equirem	nent									1940.44	7
If DHW from c Water heat fro								(64) x (30)3a) x (30	5) x (306)	=	2037.46	_](310a)
Electricity used		-					0.01	× [(307a).					(313)
Cooling Syster				0								3.38	(314)
Space cooling	(if there	is a fixe	ed coolin	g systen	n, if not (enter 0)		= (107) ÷	(314) =			75.02	(315)
Electricity for p	oumps a	nd fans	within d	velling (Table 4f):							_
mechanical ve	ntilation	- balano	ced, extr	act or po	ositive in	put from	outside					0	(330a)
warm air heati	ng syste	m fans										0	(330b)
pump for solar	water h	eating										0	(330g)
Total electricity	y for the	above,	kWh/yea	ır				=(330a) -	+ (330b) +	(330g) =		0	(331)
Energy for ligh	iting (cal	culated	in Apper	ndix L)								516.59	(332)
10b. Fuel cos	sts – Cor	nmunity	heating	scheme)								
					Fu kV	iel Vh/year			Fuel P (Table			Fuel Cost £/year	
Space heating	from CH	ΗP			(30	7a) x			4.2	24	x 0.01 =	209.01	(340a)

Water heating from CHP	(310a) x	4.24	x 0.01 =	86.39	(342a)
Space cooling (community cooling syster	n) (315)	Fuel Price	x 0.01 =	9.9	(348)
Pumps and fans	(331)	13.19	x 0.01 =	0	(349)
Energy for lighting	(332)	13.19	x 0.01 =	68.14	(350)
Additional standing charges (Table 12)				120	(351)
Total energy cost	= (340a)(342e) + (345)(354) =		[493.43	(355)
11b. SAP rating - Community heating sc	heme				
Energy cost deflator (Table 12)			ſ	0.42	(356)
Energy cost factor (ECF)	(355) x (356)] ÷ [(4) + 45.0] =			1.1	(357)
SAP rating (section12)			Ì	84.7	(358)
12b. CO2 Emissions – Community heatin	g scheme				
			sion factor	Emissions kg CO2/year	
CO2 from other sources of space and wa		ing ee			
Efficiency of heat source 1 (%)	If there is CHP using two fuels	s repeat (363) to (366) for t	he second fuel	95	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x	0 =	1584.04	(367)
Electrical energy for heat distribution	[(313) x	0	.52 =	36.16	(372)
Total CO2 associated with community sys	stems (363)(3	66) + (368)(372)	=	1620.2	(373)
CO2 associated with space heating (seco	ondary) (309) x		0 =	0	(374)
CO2 associated with water from immersion	on heater or instantaneous hea	ater (312) x 0.	.22 =	0	(375)
Total CO2 associated with space and wa	ter heating (373) + (3	74) + (375) =		1620.2	(376)
CO2 associated with space cooling	(315) x	0	.52 =	38.94	(377)
CO2 associated with electricity for pumps	and fans within dwelling (331)) x 0	.52 =	0	(378)
CO2 associated with electricity for lighting	(332))) x	0	.52 =	268.11	(379)
Total CO2, kg/year	sum of (376)(382) =			1927.25	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =		[13.38	(384)
El rating (section 14)			ſ	86.34	(385)
13b. Primary Energy – Community heatin					
		ergy Prima /h/year factor	•	P.Energy kWh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)	water heating (not CHP) If there is CHP using two fuels	s repeat (363) to (366) for t	the second fuel	95	(367a)
Energy associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x	0 =	8946.91	(367)
Electrical energy for heat distribution	[(313) x		=	213.88	(372)
Total Energy associated with community	systems (363)(3	66) + (368)(372)	=	9160.8	(373)
if it is negative set (373) to zero (unless	s specified otherwise, see C7 i	n Appendix C)		9160.8	(373)

Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from immersion heater or	instantaneous heater(312) x	1.22	=	0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =			9160.8	(376)
Energy associated with space cooling	(315) x	3.07	=	230.32	(377)
Energy associated with electricity for pumps and fans with	thin dwelling (331)) x	3.07	=	0	(378)
Energy associated with electricity for lighting	(332))) x	3.07	=	1585.92	(379)
Total Primary Energy, kWh/year sum	of (376)(382) =			10977.04	(383)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201			Stroma Softwa Address:	re Ver			Versic	on: 1.0.3.11	
Addross I	28 Redington Road,			Address.	Fial Z					
Address : 1. Overall dwelling dimer	•	, 199375								
Ground floor		\		229	(1a) x		ight(m) 3.1	(2a) =	Volume(m³) 709.9) (3a)
Total floor area TFA = (1a	i)+(1b)+(1c)+(1d)+(1e	e)+(1n) 2	229	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	709.9	(5)
2. Ventilation rate:									-	_
Number of chimneys Number of open flues		econdary eating 0 0	/] + [_] + [_	0 0 0] = [total 0 0		40 = 20 =	m³ per hou	(6a) (6b)
Number of intermittent fan	IS				- -	5	x ′	10 =	50	(7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fire	es				L L	0	X 4	40 =	0	(7c)
								Air ch	ange <mark>s per</mark> ho	ur
Infiltration due to chimney					ontinue fre	50 om (9) to (÷ (5) =	0.07	(8)
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dw <mark>elling</mark> (ns)							-1]x0.1 =	0	(9) (10)
if both types of wall are pre deducting areas of opening	esent, use the value corres gs); if equal user 0.35	ponding to	the greate	er wall area	a (after				0	(11)
If suspended wooden flo		ed) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente									0	(13)
Percentage of windows	and doors draught st	ripped		0.25 - [0.2	v (14) · 1	001 -			0	(14)
Window infiltration				(8) + (10) ·		-	± (15) –		0	(15)
Infiltration rate Air permeability value, c	750 overaged in out	ic motro						aroa	0	(16)
If based on air permeabilit	. , .			•	•		invelope	aica	4.5 0.3	(17) (18)
Air permeability value applies						is being u	sed		0.3	
Number of sides sheltered			-		-	-			1	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.27	(21)
Infiltration rate modified fo	or monthly wind speed	1								
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	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltrat	tion rate	e (allowi	ng for sh	elter an	d wind s	peed) =	= (21a) x	(22a)m						
	0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.31	0.32			
	ate effect echanical		•	rate for t	he appli	cable ca	se							(23a)	`
	aust air hea			endix N. (2	3b) = (23a	a) x Fmv (e	equation ((N5)) . othe	rwise (23b) = (23a)			0		
	anced with I		• • •		, ,	, ,) (200)			0		
	balanced		-		-					2b)m + ('	23h) v [*	l _ (23c)	0 	(23c))
(24a)m=				0	0					0	0	1 - (230)	- 100j	(24a))
	balanced	-	-	_		-	-	-	-		-	Ŭ		,	
(24b)m=	0	0	0	0	0	0					0	0		(24b))
	whole ho	use ext	ract ven	tilation	or positiv	le input v	/entilati	on from (outside						
,	f (22b)m				•	•				5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c))
d) If	natural v	entilatio	n or wh	ole hous	e positiv	/e input v	ventilati	ion from	loft		L				
i r	f (22b)m	= 1, the	en (24d)	m = (22k)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			1		
(24d)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d))
Effec	ctive air c		rate - er	· ·		o) or (240	, ,	4d) in bo	x (25)				1		
(25)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)	
3. Hea	at l <mark>osses</mark>	and he	at loss p	paramete	er:										
ELEM	IENT	Gros	-	Openin	gs	Net Ar		U-val		AXU		k-value		AXk	
		area	(m²)	m	2	A ,n	n²	W/m2	2K	(VV/I	<)	kJ/m²-ł	<	kJ/K	
Doors						2.1	×		= [1.68				(26)	
	ws Type					0.9	×	1/[1/(1.2)+	- 0.04] =	1.03				(27)	
Window	ws Type 2	2				1.2	x	1/[1/(1.2)+	0.04] =	1.37				(27)	
Window	ws Type :	3				2.8	x	1/[1/(1.2)+	- 0.04] =	3.21				(27)	
Window	ws Type	4				1.2	X	1/[1/(1.2)+	0.04] =	1.37				(27)	
Walls T	Гуре1	33.1	7	8.1		25.07	' x	0.12	=	3.01				(29)	
Walls T	Гуре2	48.3	6	0		48.36	x	0.11	=	5.24				(29)	
Walls T	ГуреЗ	28.52	2	0		28.52	x	0.12	=	3.42				(29)	
Walls T	Гуре4	63.24	4	4.9		58.34	. x	0.12	=	7				(29)	
Walls T	Гуре5	14.20	6	0		14.26	x	0.11	=	1.54				(29)	
Total a	rea of ele	ements,	m²			187.5	5							(31)	
	dows and r e the areas						ated usin	g formula 1	1/[(1/U-valı	ie)+0.04] a	is given in	paragraph	3.2		
Fabric	heat loss	s, W/K =	= S (A x	U)				(26)(30) + (32) =				34.	37 (33)	
Heat ca	apacity C	; m = S(/	Axk)						((28).	.(30) + (32	2) + (32a).	(32e) =	0	(34)	
Therma	al mass p	paramet	ter (TMF	P = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		25	0 (35)	
-	gn assessn sed instead				construct	ion are not	known p	precisely the	e indicative	values of	TMP in Ta	able 1f			
Therma	al bridges	s : S (L	x Y) cal	culated u	using Ap	pendix k	<						28.	13 (36)	
	of thermal		are not kn	own (36) =	= 0.15 x (3	1)									
Total fa	abric hea	t loss							(33) +	(36) =			62.	51 <mark>(37)</mark>	

Ventila	tion hea	at loss ca	alculated	d monthly	y		-		(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	131.35	130.8	130.26	127.72	127.24	125.03	125.03	124.62	125.88	127.24	128.2	129.21		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	193.86	193.31	192.77	190.22	189.75	187.54	187.54	187.12	188.39	189.75	190.71	191.72		
Heat lo	oss para	imeter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁. · (4)	12 /12=	190.22	(39)
(40)m=	0.85	0.84	0.84	0.83	0.83	0.82	0.82	0.82	0.82	0.83	0.83	0.84		
Numbe	er of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 /12=	0.83	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
										<u> </u>				
4. Wa	ater heat	ting ene	rav reau	irement:								kWh/ye	ear:	
		Ŭ												
if TF				(1 - exp	(-0.0003	849 x (TF	-A -13.9)2)] + 0.(0013 x (⁻	FFA -13.		04		(42)
			ater usa	ae in litre	es per da	av Vd.av	erade =	(25 x N)	+ 36		10	6.39		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed	to achieve		se target o		5.00		(10)
not more	e that 125	litres per	person pe	r day (all w	rater use, l	hot and co	ld)					_		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	117.03	112.7 <mark>7</mark>	108.52	104.26	100.01	95.75	95.75	100.01	104.26	108.52	112.77	117.03		_
Energy	content of	hot water	used - cal	lculated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1276.69	(44)
(45)m=	173.55	151.79	156.63	136.56	131.03	113.07	104.77	120.23	121.67	141.79	154.78	168.08		
lf instan	taneous w	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46,		Total = Su	- m(45) ₁₁₂ =	-	1673.95	(45)
(46)m=	26.03	22.77	23.5	20.48	19.65	16.96	15.72	18.03	18.25	21.27	23.22	25.21		(46)
Water	storage	loss:		1										
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		1		(47)
	•	-		ank in dw er (this ir	-			(47) ombi boil	ers) ente	er '0' in ((47)			
	storage					<i></i>	<i>.</i>							
,				oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	e 2b								0		(49)
			•	e, kWh/ye cylinder l		or is not		(48) x (49)) =			1		(50)
				rom Tabl							0.	03		(51)
		eating s			- (<i>.</i> ,					00		()
Volum	e factor	from Ta	ble 2a								4.	93		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/ye	ear			(47) x (51)	x (52) x (53) =	0	.1		(54)
Enter	(50) or ((54) in (5	55)								0	.1		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) <mark>× (</mark> 41)ı	m				
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)

(57)m= 3.03 2.74 3.03 2.93 3.03 2.93 3.03 2.93 3.03 2.93 3.03 2.93 3.03	
	57)
Primary circuit loss (annual) from Table 3	58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26 22.51 23.26	59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	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= 199.84 175.54 182.93 162 157.32 138.51 131.07 146.52 147.11 168.08 180.22 194.37	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	63)
Output from water heater	
(64)m= 199.84 175.54 182.93 162 157.32 138.51 131.07 146.52 147.11 168.08 180.22 194.37	
Output from water heater (annual) 1983.52	64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
	65)
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= 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38	66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 108.63 96.48 78.46 59.4 44.4 37.49 40.51 52.65 70.67 89.73 104.73 111.64	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
	68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
	69)
Pumps and fans gains (Table 5a)	
	70)
Losses e.g. evaporation (negative values) (Table 5)	
	71)
Water heating gains (Table 5)	,
	72)
)
Total internal gains = $(66)m + (67)m + (68)m + (70)m + (71)m + (72)m$	72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 922.06 913.61 874.97 815.91 754.68 702.21 673.64 686.53 722.52 781.82 846.66 896.43	73)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 922.06 913.61 874.97 815.91 754.68 702.21 673.64 686.53 722.52 781.82 846.66 896.43 6. Solar gains: 6. Solar gains:	73)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 922.06 913.61 874.97 815.91 754.68 702.21 673.64 686.53 722.52 781.82 846.66 896.43	73)

East	0.9x	1	x	2.8	x	19.64	x	0.9	x	0.9	=	40.09	(76)
East	0.9x				1						1	78.42](70)](76)
East	0.9x	1	X	2.8	x	38.42	x	0.9	x	0.9	=		(76)
East	0.9x	1	x x	2.8	x x	63.27	x x	0.9	x x	0.9	=	129.15](76)](76)
East	0.9x	1		2.8	1	92.28					-	188.36](70)](76)
East	0.9x	1	X	2.8	x	113.09	x	0.9	x	0.9	1	230.84	(76)
East	0.9x	1	x x	2.8	x x	115.77 110.22	x	0.9	x x	0.9	=	236.31 224.98](76)](76)
East	0.9x	1			1		x				1](70)](76)
East	0.9x	1	X	2.8	x	94.68	x	0.9	x	0.9	=	193.25	(76)
East	0.9x	1	x x	2.8	x x	73.59 45.59	x x	0.9	x x	0.9	=	150.21](76)](76)
East	0.9x	1	x		1				x			93.06](70)](76)
East	0.9x	1	x	2.8	x	24.49	x	0.9		0.9	=	49.99	(76)
South	0.9x	1		2.8	X	16.15	X	0.9	x	0.9	1	32.97	_(78)
South	0.9x	1	X	L	x	46.75	x		x	0.9	=	153.37	(78)
South	0.9x	1	x x	1.2	x	46.75	x x	0.9	x	0.9	=	81.8 40.9	(78)
South	0.9x	1			x	46.75			x		1		4
South	0.9x	1	X	0.9	X	76.57	X	0.9	x	0.9	=	251.18	(78)
South		1	X	1.2	×	76.57	X	0.9	X	0.9	=	133.96	(78)
South	0.9x	1	X	1.2		76.57	×	0.9	X	0.9	=	66.98	(78)
South	0.9x 0.9x	1	X	0.9	X	97.53	X	0.9	X	0.9	=	319.96	(78)
South	0.9x	1	X	1.2	x	97.53	X	0.9	X	0.9	=	170.65	(78)
South	0.9x	1	X	1.2		97.53	X	0.9	x	0.9	=	85.32	(78)
South	0.9x		x	0.9	X	110.23	X	0.9	x	0.9	=	3 <mark>61.62</mark>	(78) (78)
South	0.9x	1	X	1.2	X	110.23	x	0.9	x x	0.9	1	192.87	(78)
South	0.9x		x	1.2	X	110.23	x	0.9		0.9	=	9 <mark>6.43</mark>	_(78) _(78)
South	0.9x	1	X	0.9	x	114.87	x	0.9	x	0.9	=	376.83	(78)
South	0.9x	1	x	1.2	x	114.87	x x	0.9	x	0.9	=	200.98	(78)
South	0.9x	1	x x	0.9	x x	114.87 110.55	x	0.9	x x	0.9	- =	100.49 362.65	_(78)
South	0.9x		x		x		x		x			193.41	(78)
South	0.9x	1	x	1.2	x	110.55 110.55	x	0.9	x	0.9		96.71	_(78)
South	0.9x	1	x	0.9	x	108.01	x	0.9	x	0.9			(78)
South	0.9x	1	x	1.2	x		x	0.9	x	0.9		354.33	(78)
South	0.9x	1	x	1.2	x	108.01 108.01	x	0.9	x	0.9	=	188.98 94.49](70)](78)
South	0.9x	1	x	0.9	x	104.89	x	0.9	x	0.9	=	344.11](78)
South	0.9x	1	x	1.2	x	104.89	x	0.9	x	0.9	-	183.52](70)](78)
South	0.9x		x		1				x		=](78)
South	0.9x	1	x	1.2	x x	104.89	x x	0.9	x	0.9	= =	91.76	(78)
South	0.9x	1	x	0.9	x	101.89	x	0.9	x	0.9	=	334.24	(78)
South	0.9x	1	x	1.2	x	101.89 101.89	x	0.9	x	0.9	=	178.26 89.13	(78)
South	0.9x	1	x		x		x		x		=		(78)
South	0.9x			0.9	1	82.59		0.9		0.9	= =	270.92	(78)
Coun	0.98	1	X	1.2	×	82.59	x	0.9	x	0.9		144.49	

	_															
South	0.9x	1	x	1	.2	x	8	32.59	x		0.9	×	0.9	=	72.25	(78)
South	0.9x	1	x	0	.9	x	5	5.42	x		0.9	x	0.9	=	181.8	(78)
South	0.9x	1	x	1	.2	x	5	5.42	x		0.9	×	0.9	=	96.96	(78)
South	0.9x	1	x	1	.2	x	5	5.42	x		0.9	×	0.9	=	48.48	(78)
South	0.9x	1	x	0	.9	x	4	40.4	x		0.9	x	0.9	=	132.53	(78)
South	0.9x	1	x	1	.2	x	4	40.4	x		0.9	×	0.9	=	70.68	(78)
South	0.9x	1	x	1	.2	x	4	40.4	x		0.9	×	0.9	=	35.34	(78)
Solar g	ains in	watts, ca	alculated	d for eac	h month	1		-	(83)m	= Sur	m(74)m .	(82)m				
(83)m=	316.16	530.55	705.08	839.29	909.15	8	89.08	862.78	812.	64	751.83	580.72	377.22	271.51		(83)
Total g	ains – i	nternal a	and sola	r (84)m :	= (73)m	+ (83)m	, watts								
(84)m=	1238.21	1444.16	1580.05	1655.2	1663.83	15	591.29	1536.41	1499	.17 [·]	1474.36	1362.54	1223.88	1167.94		(84)
7. Me	an inter	nal temp	perature	(heating	g seasor	າ)										
Temp	erature	during h	neating p	periods i	n the livi	ng	area	from Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living ar	ea, h1,m	า (s	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.96	0.89		0.72	0.53	0.5	7	0.81	0.97	1	1		(86)
Me <mark>an</mark>	interna	temper	ature in	living ar	ea T1 (f		w ste	ps 3 to 7	in T	able			•			
(87)m=	20.13	20.27	20.46	20.69	20.88	T	0.98	21	21		20.95	20.72	20.38	20.11		(87)
	oroturo	during h		l oriodo i	n root of	du	ulling	from To								
(88)m=	20.21	20.22	20.22	20.23	20.23	1	20.24	from Ta 20.24	20.2		2 (C) 20.23	20.23	20.22	20.22		(88)
						1					20.23	20.20	20.22	20.22		(00)
		tor for g		_		T -		e Table	<u>,</u>						1	(00)
(89)m=	1	1	0.99	0.95	0.86		0.65	0.44	0.4	8	0.74	0.96	1	1		(89)
Me <mark>an</mark>	interna	l temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9 <mark>c)</mark>				
(90)m=	19.04	19.25	19.53	19.86	20.1	2	20.22	20.24	20.2	24	20.2	19.9	19.41	19.01		(90)
											f	LA = Livi	ng area ÷ (4	4) =	0.23	(91)
Mean	interna	l temper	ature (fo	or the wh	nole dwe	ellin	g) = fl	LA × T1	+ (1 ·	– fLA	() × T2					
(92)m=	19.29	19.49	19.75	20.05	20.29		20.4	20.41	20.4	42	20.37	20.09	19.63	19.27		(92)
Apply	adjustr	nent to t	he mear	n interna	I tempe	atu	ire fro	m Table	4e, v	wher	e appro	priate				
(93)m=	19.29	19.49	19.75	20.05	20.29		20.4	20.41	20.4	42	20.37	20.09	19.63	19.27		(93)
8. Spa	ace hea	ting requ	uiremen	t												
				•		ned	l at ste	ep 11 of	Tabl	e 9b,	so that	t Ti,m=	(76)m an	d re-calo	culate	
the ut		factor fo Feb	Mar	r – –	1	\mathbf{T}	Jun	Jul	۸.		Sep	Oct	Nov	Dec	1	
l Itilisa	Jan tion fac	tor for g		Apr	May		Jun	Jui	Αι	Jg [Sep	Oci	INOV	Dec		
(94)m=	1	0.99	0.98	0.95	0.86		0.67	0.46	0.5	5	0.76	0.96	0.99	1		(94)
	l gains.	hmGm]	
	.	1434.91	, <u> </u>	1571.26	r Ó	1	058.6	713.03	747.	56	1115.46	1302.45	5 1216.43	1166.06		(95)
Month	nly aver	age exte	rnal terr	peratur	e from T	abl	e 8				I		1		1	
(96)m=	4.3	4.9	6.5	8.9	11.7	-	14.6	16.6	16.	4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for me	an interr	nal temp	erature,	Lm	1, W =	=[(39)m :	x [(93	3)m–	(96)m]				
(97)m=	2906.87	2819.87	2553.41	2121.85	1629.25	10	087.52	715.4	751.	33	1181.93	1800.56	3 2390.38	2888.42		(97)
Space	e heatin	g require	ement fo	r each r	nonth, k	Wh	/mont	th = 0.02	24 x [(97)r	n – (95))m] x (4	11)m		-	
(98)m=	1243.61	930.7	744.53	396.42	148.93		0	0	0		0	370.59	845.24	1281.44		

Total per year (kWh/year) = Sum(98) _{15,912} =									5961.46	(98)				
Spac	e heatir	ng requir	ement ir	n kWh/m²	²/year								26.03	(99)
8c. S	pace co	oling rea	quiremer	nt										
Calcu	lated fo	or June, .	July and	August.	See Tal	ble 10b			1				1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	r	<u> </u>	1	<u> </u>	r	· · · · ·	-		î	· · · · · · · · · · · · · · · · · · ·	re from T	· · · · · ·	1	
(100)m=		0	0	0	0	1762.83	1387.76	1422.15	0	0	0	0		(100)
	r	ctor for lo	1	i	·						i	i	I	(1.5.1)
(101)m=		0	0	0	0	0.82	0.91	0.89	0	0	0	0		(101)
		r È	r	(100)m >	r`					i		i	ı	
(102)m=		0	0	0	0	1447.03			0	0	0	0		(102)
	<u> </u>	Ť	1	for appli		r	<u> </u>	r	r í		r	r	I	
(103)m=		0	0	0	0	1591.29			0	0	0	0		(103)
•		•				dwelling,	continue	ous (kN	h) = 0.0	24 x [(1	03)m – (102)m]:	x (41)m	
(104)m=	<u> </u>		0	< 3 × (98	0	103.86	204.42	172.31	0	0	0	0		
(104)11=	0	0	0	0	0	103.80	204.42	172.31	_	-	-		100 50	
Cooler	d fractio	n								= Sum(area ÷ (4	= 1) _	480.59	(104) (105)
		factor (T	ahle 10h						10 -	coolea	aiea - (*	+) —		(103)
(106)m=				0	0	0.25	0.25	0.25	0	0	0	0		
(1.2.)		1 -								I = Sum		=	0	(106)
Space	coolinc	ı reauire	ment for	month =	: (104)m	× (105)	× (106)r	n	, ora	Carri	(1000 1)			
(107)m=		0	0	0	0	25.97	51.1	43.08	0	0	0	0		
									Total	= Sum((107)	=	120.15	(107)
Space	coolinc	require	ment in I	kWh/m²/	vear) ÷ (4) =			0.52	(108)
				mmunity		schome			(107)	, . (+) -			0.52	(!00)
								ting prov	ided by	2 comm	unity scł	omo		
•				condary		•		•••			unity Sci	ienie.	0	(301)
				-			•	,	,					
				ommunity	•		,						1	(302)
	-		-							up to four	other heat	sources; t	he latter	
			-	<i>mal and w</i> anity boile		rom powe	รเลแบกร.	See Appe	nuix C.				1	(303a)
				-						(0)				
Fractic	on of tot	al space	neat fro	om Comr	nunity do	ollers				(3	802) x (303	a) =	1	(304a)
Factor	for con	trol and	charging	g methoc	(Table	4c(3)) fo	r commu	unity hea	ating sys ⁻	tem			1	(305)
Distrib	ution lo	ss factor	(Table	12c) for (commun	ity heati	ng syste	m					1.05	(306)
Space	heatin	g											kWh/yea	r
Annua	l space	heating	requirer	nent									5961.46	
Space	heat fro	om Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	6259.54	(307a)
Efficie	ncy of s	econdar	y/supple	ementary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	g require	ment fro	m secor	idary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water	heating	a												_
		heating	requirem	nent									1983.52	

If DHW from community scheme:

Water heat from Community boilers		(64) x (303a) x (305) x (306) =	2082.6	9 (310a)
Electricity used for heat distribution	0	.01 × [(307a)(307e) + (310a)(310e		
Cooling System Energy Efficiency Ratio	Ŭ		3.38	(314)
Space cooling (if there is a fixed cooling	system if not enter ()	= (107) ÷ (314) =	35.6	(315)
Electricity for pumps and fans within dwe mechanical ventilation - balanced, extract	elling (Table 4f):		0	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	0	(331)
Energy for lighting (calculated in Append	lix L)		767.34	
10b. Fuel costs – Community heating s				
	Fuel kWh/year	Fuel Price (Table 12)	Fuel C £/year	ost
Space heating from CHP	(307a) x	(10210 12) 4.24 × 0.0		(340a)
Water heating from CHP	(310a) x	4.24 × 0.0		
Space cooling (community cooling syste		Fuel Price		(348)
Pumps and fans	(331)	13.19 X 0.0	4.7	(349)
Energy for lighting	(332)	13.19 × 0.0		
Additional standing charges (Table 12)		13.19	101.21	(351)
Total energy cost	= (340a)(342e) + (345)(354) =		579.62	
11b. SAP rating - Community heating s	cheme			
Energy cost deflator (Table 12)			0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =		0.89	(357)
SAP rating (section12)			87.61	(358)
12b. CO2 Emissions – Community heati	ng scheme			
		Energy Emission fac Wh/year kg CO2/kWh	tor Emission kg CO2/ye	-
CO2 from other sources of space and wa Efficiency of heat source 1 (%)		uels repeat (363) to (366) for the secon	id fuel 95	(367a)
CO2 associated with heat source 1	[(307b)+(310b)]] x 100 ÷ (367b) x 0	= 1896.	.76 (367)
Electrical energy for heat distribution	[(313) >	x 0.52	= 43.3	3 (372)
Total CO2 associated with community sy	/stems (363)	.(366) + (368)(372)	= 1940.	.06 (373)
CO2 associated with space heating (sec	ondary) (309) x	0	= 0	(374)
CO2 associated with water from immersi	ion heater or instantaneous h	neater (312) x 0.52	= 0	(375)
Total CO2 associated with space and wa	ater heating (373) +	- (374) + (375) =	1940.	.06 (376)
CO2 associated with space cooling	(315) x	0.52	= 18.4	.8 (377)

CO2 associated with electricity for pump	os and fans within dw	elling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	398.25	(379)
Total CO2, kg/year	sum of (376)(382) =				2356.78	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				10.29	(384)
El rating (section 14)					88.47	(385)
13b. Primary Energy – Community heat	ing scheme					
		Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)		CHP) sing two fuels repeat (363) to	(366) for the secon	d fuel	95	(367a)
Energy associated with heat source 1	[(307	b)+(310b)] x 100 ÷ (367b) x	0	=	10713.18	(367)
Electrical energy for heat distribution		[(313) x		=	256.11	(372)
Total Energy associated with communit	y systems	(363)(366) + (368)(37	(2)	=	10969.29	(373)
if it is negative set (373) to zero (unle	ss specified otherwise	e, see C7 in Appendix (C)		10969.29	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from imm	ersion heater or insta	ntaneous heater(312) x	3.07	=	0	(375)
Total Energy associated with space and	water heating	(373) + (374) + (375) =			10969.29	(376)
Energy associated with space cooling		(315) x	3.07	=	109.29	(377)
Energy associated with electricity for pu	mps and fans within	dwelling (331)) x	3.07	=	0	(378)
Energy associated with electricity for lig	hting	(332))) x	3.07	=	2355.75	(379)
Tot <mark>al Primary Energy, kWh/</mark> yea	r sum of (37	6)(382) =			13434.32	(383)

	User Details:												
Assessor Name: Software Name:	on: 1.0.3.11												
						Address	: Flat 3						
Address :			n Road,	NW3 7	RB								
1. Overall dwelling dim	nensions	S:											
					Area	a(m²)		Av. He	ight(m)	-	Volume(m ³)	
Ground floor						65	(1a) x	3	3.1	(2a) =	201.5	(3a)	
First floor						178	(1b) x	2	2.9	(2b) =	516.2	(3b)	
Total floor area TFA = (1a)+(1b)+(1c)+((1d)+(1e)+(1n	i) :	243	(4)						
Dwelling volume $(3a)+(3c)+(3c)+(3d)+(3e)+(3n) =$													
2. Ventilation rate:													
2. Ventilation rate: main secondary other total m ³ p heating heating													
Number of chimneys	0	(6a)											
Number of open flues	Γ	0		0	ī + Г	0] = [0	x	20 =	0	(6b)	
Number of intermittent f	fans						, L	4	x	10 =	40	(7a)	
Number of passive vent	ts						Г	0	x	10 =	0	(7b)	
Number of flueless gas	fires						Ē	0	x	40 =	0	(7c)	
										Air ch	anges per ho	ur	
Infiltration due to chimn								40		÷ (5) =	0.06	(8)	
Number of storeys in				a, proceed	10 (17), 0	Juliel Wise (Jointinue III	0111 (9) 10 (10)		0	(9)	
Additional infiltration		,	-)						• [(9)	-1]x0.1 =	0	(10)	
Structural infiltration:	0.25 for	steel or	timber f	frame or	0.35 for	r masoni	v constr	uction	[(0)	.1	0	(11)	
if both types of wall are deducting areas of oper	present, i	use the va	lue corres								Ū		
If suspended wooden	n floor, e	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)	
lf no draught lobby, e	nter 0.0	5, else e	enter 0								0	(13)	
Percentage of window	ws and	doors dr	aught st	ripped							0	(14)	
Window infiltration						0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)	
Infiltration rate						(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)	
Air permeability value	•	•			•	•	•	etre of e	envelope	area	4.5	(17)	
If based on air permeab	•										0.28	(18)	
Air permeability value appl		essurisatio	on test has	s been don	e or a deg	gree air pe	rmeability	is being us	sed			_	
Number of sides shelter	red					(20) – 1 -	[0 075 v (1	0)1 -			1	(19)	
Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$										0.92	(20)		
	-			1		(21) = (18) x (20) =				0.26	(21)	
Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
		Apr	May -	Jun	Jul	Aug	Sep	Oct		Dec			
Monthly average wind s (22)m= 5.1 5	4.9	om Tabl 4.4	e 7 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	l		
	1.0	T. T	1.0	5.0	5.5	U.,	- I	7.5	,				

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					
Ē	0.33	0.32	0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31		
			change i	rate for t	he appli	cable ca	se	Į		!		نــــــــــــــــــــــــــــــــــــ		
		l ventila		andia NL (O	26) (00-		(l) (00-)		l	0	(23a)
								N5)) , othe) = (23a)			0	(23b)
			-	-	-			n Table 4h					0	(23c)
í r						· · · · · ·	, ``	1 ^ `	ŕ	rí (· · ·	l – (23c)	÷ 100]	(240)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
· –						· · · · · ·	r	MV) (24b	ŕ	r í	r í			(2.4)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,					•	•		on from o		E (00h				
	(220)m 0	0	(230), t	nen (240	z = (230)			c) = (22k)	$\frac{5}{0}$ m + 0.	$0 \times (230)$	0	0		(24c)
(24c)m=	-			-				-		0	0	0		(240)
								on from l 0.5 + [(2		0.51				
(24d)m=	0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(24d)
Effect	ive air (change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	ld) in box	(25)					
(25)m=	0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(25)
L													_	
			eat loss p											• >/ 1
ELEM	ENT	Gros area		Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·k		A X k kJ/K
Doors			,			2.1	×	0.8		1.68				(26)
Window	s Type	1				1.5		/[1/(1.2)+	0.04] =	1.72				(27)
Window	s Type	2				2.44		/[1/(1.2)+	0.04] =	2.79				(27)
Window	s Type	3				0.9		/[1/(1.2)+	0.04] =	1.03				(27)
Window	s Type	4				1.4		/[1/(1.2)+	0.04] =	1.6				(27)
Window	s Type	5				0.91		/[1/(1.2)+	0.04] =	1.04				(27)
Window	s Type	6				1.58		/[1/(1.2)+	0.04] =	1.81				(27)
Window	s Type	7				1.6		/[1/(1.2)+	0.04] =	1.83				(27)
Roofligh	nts					0.5		/[1/(1.3) +	0.04] =	0.65				(27b)
Walls Ty	ype1	20.1	6	9.5		10.66	3 X	0.12		1.28				(29)
Walls Ty	ype2	11.8	39	0		11.89) x	0.12		1.43	ה ה		i –	(29)
Walls Ty	ype3	6.5	1	6.37		0.14	×	0.11	=	0.02	i T		7 -	(29)
Walls Ty	ype4	14.2	26	0		14.26	3 X	0.12	=	1.71	-		i –	(29)
Walls Ty	ype5	35.6		28.5		7.17		0.12		0.86	Ξ F		≓ ⊨	(29)
Walls Ty		78.		0		78.3		0.12		9.4	Ξ ř		i –	(29)
Roof		25	;	1		24	×	0.13	=	3.12	-		i –	(30)
Total are	ea of el	ements	, m²			193.8	9	•			L			(31)

	ndows and de the area						lated using	formula 1,	/[(1/U-valu	e)+0.04] a	is given in	paragraph	ı 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				71.53	(33)
Heat o	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	216	(34)
Therm	al mass	parame	ter (TMF		- TFA) ir	n kJ/m²K	,		Indica	tive Value:	Medium		250	(35)
For des		ments wh	ere the de	tails of the				ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix I	K						29.08	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			100.61	(37)
Ventila	ation hea	at loss ca	alculated	I monthly	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	131.4	130.9	130.4	128.08	127.65	125.63	125.63	125.25	126.41	127.65	128.53	129.45		(38)
Heat t	ransfer o	coefficier	nt. W/K				•		(39)m	= (37) + (3	38)m			
(39)m=	232.02	231.51	231.02	228.7	228.26	226.24	226.24	225.87	227.02	228.26	229.14	230.06		
			I						/	Average =	Sum(39)1.	12 /12=	228.69	(39)
Heat le	oss para	meter (H	HLP), W/	′m²K						= (39)m ÷				
(40)m=	0.95	0.95	0.95	0.94	0.94	0.93	0.93	0.93	0.93	0.94	0.94	0.95		
_									/	Average =	Sum(40)1.	₁₂ /12=	0.94	(40)
Numb	er of day	s in moi	nth (Tab	le 1a)									1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing enei	rgy <mark>requ</mark>	irem <mark>ent</mark> :								kWh/y	ear:	
A		manay												
if TF	ned occu FA > 13.9 FA £ 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	-A -13.9)2)] + 0.0	0013 x (1	ΓFA -13.		06		(42)
			ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		106	5.82		(43)
								to achieve	a water us	se target o	f		1	
ποι ποι	e that 125				· · · · ·		r						1	
I lot wor	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	er usage il						·						1	
(44)m=	117.51	113.23	108.96	104.69	100.41	96.14	96.14	100.41	104.69	108.96	113.23	117.51		—
Enerav	content of	hot water	used - cal	culated mo	onthly = 4	190 x Vd r	т х пт х Г)))))))))))))))))))		Total = Su			1281.88	(44)
			1			r				142.37			1	
(45)m=	174.26	152.41	157.27	137.11	131.56	113.53	105.2	120.72	122.16	-	155.4	168.76	1680.75	(45)
lf instan	taneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46,		Total = Su	III(43) ₁₁₂ =		1000.75	(+5)
(46)m= Water	26.14 storage	22.86 IOSS:	23.59	20.57	19.73	17.03	15.78	18.11	18.32	21.36	23.31	25.31		(46)
Storag	je volum	e (litres)	includir	ig any so	olar or W	/WHRS	storage	within sa	ame vess	sel		1		(47)
If com	munity h	eating a	ind no ta	nk in dw	velling, e	nter 110) litres in	(47)			·			
Other	wise if no	stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage												1	
	nanufact				or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)

			r storage eclared o			1		(50)						
		-	s factor fr		e 2 (kWl	h/litre/da	ay)				0.	03		(51)
Volum	e factor	from Ta	ble 2a								4.	93		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
Energy	y lost fro	om wate	r storage	, kWh/ye	ear			(47) x (51) x (52) x (53) =	0	.1		(54)
Enter	(50) or	(54) in (ধ	55)								0	.1		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)r	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	хH	
(57)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(57)
Primar	v circuit	loss (ar	nual) fro	m Table								0		(58)
Primar	y circuit	loss cal	Iculated from Tab	for each	month (. ,	. ,		r thermo		0		()
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
	loss ca	I Iculated	for each	month ((61)m =	(60) ÷ 36	1 65 × (41)	ـــــــــــــــــــــــــــــــــــــ						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total	eat reg	uired for	water h	eating ca	alculated	for eac	r h month	(62)m =	0 85 x ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	200.55	176.15	183.56	162.56	157.85	138.97	131.49	147.01	147.61	168.66	180.85	195.05	(00)	(62)
			using App						L		I			``
			FGHRS			-				reonthout		i neating)		
(63)m=	0				0	0			0	0	0	0		(63)
						0				0	0	Ŭ		(00)
Output	r trom w													
(0.1)				400 50	457.05	100.07	101.10	447.04	4.47.04	100.00	400.05	405.05		
(64)m=	200.55	176.15	183.56	162.56	157.85	138.97	131.49	147.01	147.61	168.66	180.85	195.05	1000.20	
	200.55	176.15	183.56					Out	but from w	ater heater	r (annual)₁	12	1990.32	(64)
Heat g	200.55 ains fro	176.15 m water	183.56 heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	Outr) + (61)m	ב out from w 1] + 0.8 א	ter heater ((46)m	r (annual)₁ + (57)m	+ (59)m		1
Heat g	200.55 ains fro 76.55	176.15 m water 67.48	183.56 heating, 70.9	kWh/mo 63.6	onth 0.28	5 ´ [0.85 55.76	× (45)m 53.59	Outr + (61)n 58.75	but from wa n] + 0.8 > 58.63	ter heater ((46)m 65.95	r (annual)₁ + (57)m 69.68	+ (59)m 74.72]	(64) (65)
Heat g	200.55 ains fro 76.55	176.15 m water 67.48	183.56 heating, 70.9	kWh/mo 63.6	onth 0.28	5 ´ [0.85 55.76	× (45)m 53.59	Outr + (61)n 58.75	but from wa n] + 0.8 > 58.63	ter heater ((46)m 65.95	r (annual)₁ + (57)m 69.68	+ (59)m]	1
Heat g (65)m= inclu	200.55 ains fro 76.55 ide (57)	176.15 m water 67.48 m in cale	183.56 heating, 70.9	kWh/mo 63.6 of (65)m	onth 0.28 62.35 only if c	5 ´ [0.85 55.76	× (45)m 53.59	Outr + (61)n 58.75	but from wa n] + 0.8 > 58.63	ter heater ((46)m 65.95	r (annual)₁ + (57)m 69.68	+ (59)m 74.72]	1
Heat g (65)m= inclu 5. Int	200.55 ains fro 76.55 ide (57) ternal ga	m water 67.48 m in cale	183.56 heating, 70.9 culation o	kWh/mo 63.6 of (65)m 5 and 5a)	onth 0.28 62.35 only if c	5 ´ [0.85 55.76	× (45)m 53.59	Outr + (61)n 58.75	but from wa n] + 0.8 > 58.63	ter heater ((46)m 65.95	r (annual)₁ + (57)m 69.68	+ (59)m 74.72]	1
Heat g (65)m= inclu 5. Int	200.55 ains fro 76.55 ide (57) ternal ga	m water 67.48 m in cale	183.56 heating, 70.9 culation of a Table 5	kWh/mo 63.6 of (65)m 5 and 5a)	onth 0.28 62.35 only if c	5 ´ [0.85 55.76	× (45)m 53.59	Outr + (61)n 58.75	but from wa n] + 0.8 > 58.63	ter heater ((46)m 65.95	r (annual)₁ + (57)m 69.68	+ (59)m 74.72]	1
Heat g (65)m= inclu 5. Int	200.55 ains fro 76.55 ude (57) ternal ga olic gain	m water 67.48 m in cale ains (see	183.56 heating, 70.9 culation of Table 5 5), Wat	kWh/mo 63.6 of (65)m and 5a) ts	onth 0.29 62.35 only if c :	5 ´ [0.85 55.76 ylinder is	× (45)m 53.59 s in the c	Outr + (61)n 58.75 dwelling	out from warn] + 0.8 > 58.63 or hot w	ater heater ((46)m 65.95 ater is fr	r (annual), + (57)m 69.68 rom com	+ (59)m 74.72 munity h]	1
Heat g (65)m= inclu 5. Int Metabo	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47	176.15 m water 67.48 m in cale ains (see ns (Table Feb 183.47	183.56 heating, 70.9 culation of Table 5 a 5), Wat Mar	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47	onth 0.2 62.35 only if c): May 183.47	5 ´ [0.85 55.76 ylinder is Jun 183.47	× (45)m 53.59 s in the o Jul 183.47	Outr + (61)n 58.75 dwelling Aug 183.47	out from war 1] + 0.8 > 58.63 or hot w Sep 183.47	((46)m 65.95 ater is fr	r (annual), + (57)m 69.68 rom com	+ (59)m 74.72 munity h]	(65)
Heat g (65)m= inclu 5. Int Metabo	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47	176.15 m water 67.48 m in cale ains (see ns (Table Feb 183.47	183.56 heating, 70.9 culation (2 Table 5 2 5), Wat Mar 183.47	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47	onth 0.2 62.35 only if c): May 183.47	5 ´ [0.85 55.76 ylinder is Jun 183.47	× (45)m 53.59 s in the o Jul 183.47	Outr + (61)n 58.75 dwelling Aug 183.47	out from war 1] + 0.8 > 58.63 or hot w Sep 183.47	((46)m 65.95 ater is fr	r (annual), + (57)m 69.68 rom com	+ (59)m 74.72 munity h]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	200.55 ains fro 76.55 ide (57) ternal ga olic gain Jan 183.47 g gains 91.44	176.15 m water 67.48 m in cale ains (see ns (Table Feb 183.47 (calcula 81.22	183.56 heating, 70.9 culation of Table 5 5), Wat 183.47 ted in Ap 66.05	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47 opendix 1 50	onth 0.29 62.35 only if c): May 183.47 L, equati 37.38	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32	but from war [] + 0.8 > 58.63 or hot w Sep 183.47 Table 5 59.49	ater heater ([(46)m 65.95 ater is fr Oct 183.47 75.53	r (annual), + (57)m 69.68 rom com Nov 183.47	+ (59)m 74.72 munity h Dec 183.47]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47 g gains 91.44 nces ga	176.15 m water 67.48 m in cale ains (see ns (Table Feb 183.47 (calcula 81.22	183.56 heating, 70.9 culation of a Table 5 b Table 5 Mar 183.47 ted in Ap	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47 opendix 1 50	onth 0.29 62.35 only if c): May 183.47 L, equati 37.38	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32	but from war [] + 0.8 > 58.63 or hot w Sep 183.47 Table 5 59.49	ater heater ([(46)m 65.95 ater is fr Oct 183.47 75.53	r (annual), + (57)m 69.68 rom com Nov 183.47	+ (59)m 74.72 munity h Dec 183.47]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m=	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47 ng gains 91.44 nces ga 612.35	176.15 m water 67.48 m in cale ains (see S (Table Feb 183.47 (calcula 81.22 ins (calc 618.7	183.56 heating, 70.9 culation of Table 5 Table 5 Mar 183.47 ted in Ap 66.05 culated in 602.69	kWh/mo 63.6 of (65)m and 5a) ts Apr 183.47 ppendix l 50 Append 568.6	onth 0.28 62.35 only if c : May 183.47 L, equati 37.38 dix L, eq 525.57	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56 uation L 485.13	× (45)m 53.59 s in the c Jul 183.47 r L9a), a 34.1 13 or L1 458.11	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76	but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 o see Ta 467.77	Atter heater atter heater 65.95 atter atter is fr Oct 183.47 75.53 ble 5 501.86 501.86	r (annual), + (57)m 69.68 rom com Nov 183.47 88.16	+ (59)m 74.72 munity h Dec 183.47 93.98]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47 ng gains 91.44 nces ga 612.35	176.15 m water 67.48 m in cale ains (see S (Table Feb 183.47 (calcula 81.22 ins (calc 618.7	183.56 heating, 70.9 culation of Table 5 5), Wat Mar 183.47 ted in Ap 66.05	kWh/mo 63.6 of (65)m and 5a) ts Apr 183.47 ppendix l 50 Append 568.6	onth 0.28 62.35 only if c : May 183.47 L, equati 37.38 dix L, eq 525.57	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56 uation L 485.13	× (45)m 53.59 s in the c Jul 183.47 r L9a), a 34.1 13 or L1 458.11	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76	but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 o see Ta 467.77	Atter heater atter heater 65.95 atter atter is fr Oct 183.47 75.53 ble 5 501.86 501.86	r (annual), + (57)m 69.68 rom com Nov 183.47 88.16	+ (59)m 74.72 munity h Dec 183.47 93.98]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m= Cookir (69)m=	200.55 ains fro 76.55 ude (57) ternal ga olic gain 183.47 g gains 91.44 nces ga 612.35 ng gains 56.4	176.15 m water 67.48 m in cale ains (see ns (Table Feb 183.47 (calcula 81.22 ins (calcula 618.7 (calcula 56.4	183.56 heating, 70.9 culation of Table 5 Aar 183.47 ted in Ap 66.05 culated in Ap 602.69 ated in Ap 56.4	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47 ppendix 1 50 Appendo 568.6 ppendix 56.4	onth 0.29 62.35 only if c): May 183.47 L, equati 37.38 dix L, equati 525.57 L, equat	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56 uation L 485.13 ion L15	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1 13 or L1 458.11 or L15a)	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76), also se	but from w but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 See Ta 467.77 be Table	Atter heater atter heater 65.95 atter atter is fr Oct 183.47 75.53 ble 5 501.86 5	r (annual), + (57)m 69.68 om com Nov 183.47 88.16 544.89	+ (59)m 74.72 munity h Dec 183.47 93.98 585.33]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m= Cookir (69)m= Pumps	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47 ng gains 91.44 nces ga 612.35 ng gains 56.4 s and fai	176.15 m water 67.48 m in cale ains (see hs (Table 183.47 (calcula 81.22 ins (calc 618.7 c(calcula 56.4	183.56 heating, 70.9 culation of Table 5 Table 5 Mar 183.47 tted in Ap 66.05 culated in Ap 602.69 ated in Ap 56.4 (Table 5)	kWh/mo 63.6 of (65)m and 5a) ts Apr 183.47 ppendix 1 50 Appendix 1 568.6 ppendix 568.4 56.4	onth 0.29 62.35 only if c : 183.47 L, equati 37.38 dix L, equati 525.57 L, equat 56.4	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56 uation L 485.13 ion L15 56.4	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1 13 or L1 458.11 or L15a) 56.4	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76), also se 56.4	but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 o see Ta 467.77 be Table 56.4	Atter heater atter heater 65.95 atter atter is fr Oct 183.47 75.53 ble 5 501.86 5 56.4 56.4	r (annual), + (57)m 69.68 rom com Nov 183.47 88.16 544.89 56.4	+ (59)m 74.72 munity h Dec 183.47 93.98 585.33]	(65)(66)(67)(68)(69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	200.55 ains fro 76.55 ide (57) ternal ga olic gain Jan 183.47 ig gains 91.44 nces ga 612.35 ng gains 56.4 s and fat 0	176.15 m water 67.48 m in cale ains (see ns (Table 183.47 (calcula 81.22 ins (calcula 618.7 calcula 56.4 ns gains 0	183.56 heating, 70.9 culation of a Table 5 a Table 5 b Table 5 a Table 7 b Table 6 a Table 7 b Table 7 b Table 7 culation 0 a Table 7 b Table 7 b Table 7 culated in Apple 602.69 ated in Apple 56.4 a (Table 8 0	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47 ppendix 1 50 568.6 ppendix 56.4 56.4 5a) 0	onth 0.2 62.35 only if c): May 183.47 L, equati 37.38 dix L, equati 525.57 L, equat 56.4	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56 uation L 485.13 ion L15 56.4	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1 13 or L1 458.11 or L15a)	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76), also se	but from w but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 See Ta 467.77 be Table	Atter heater atter heater 65.95 atter atter is fr Oct 183.47 75.53 ble 5 501.86 5	r (annual), + (57)m 69.68 om com Nov 183.47 88.16 544.89	+ (59)m 74.72 munity h Dec 183.47 93.98 585.33]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	200.55 ains fro 76.55 ide (57) ternal ga olic gain Jan 183.47 ig gains 91.44 nces ga 612.35 ng gains 56.4 s and fat 0	176.15 m water 67.48 m in cale ains (see ns (Table 183.47 (calcula 81.22 ins (calcula 618.7 calcula 56.4 ns gains 0	183.56 heating, 70.9 culation of Table 5 Table 5 Mar 183.47 tted in Ap 66.05 culated in Ap 602.69 ated in Ap 56.4 (Table 5)	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47 ppendix 1 50 568.6 ppendix 56.4 56.4 5a) 0	onth 0.2 62.35 only if c): May 183.47 L, equati 37.38 dix L, equati 525.57 L, equat 56.4	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56 uation L 485.13 ion L15 56.4	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1 13 or L1 458.11 or L15a) 56.4	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76), also se 56.4	but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 o see Ta 467.77 be Table 56.4	ater heater ater heater 65.95 ater is fr Oct 183.47 75.53 ble 5 501.86 5 56.4	r (annual), + (57)m 69.68 rom com Nov 183.47 88.16 544.89 56.4	+ (59)m 74.72 munity h Dec 183.47 93.98 585.33]	(65)(66)(67)(68)(69)

(72)m 102.89 100.42 95.3 88.31 77.44 72.03 78.96 81.43 88.44 96.79 100.43 (77) Total internal gains = (68)m + (70)m + (68)m + (70)m + (71)m + (72)m (73)m 52.424 917.9 881.6 82.4 764.32 711.89 881.8 62.22 726.25 73.89 847.38 90.73 (73)m 52.424 917.9 78.96 78.96 78.96 78.96 947.38 967.39 77.30 73.96 87.38 97.30 73.96 78.96 947.38 97.30 73.97 73.96 73.98	Water I	Water heating gains (Table 5)																
North Open Value	(72)m=	102.89	100.42	95.3	88.33	83.81	7	77.44	72.03	78.	96 81.4	3 8	88.64	96.78	100.43			(72)
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux 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 Gains North 0.9 North 0.8 0.9 Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2" North 0.8 0.9 North 0.8 0.9 0.9 Colspan= 2.3.7 Colspan= 2.3.7 <td>Total i</td> <td>nternal</td> <td>gains =</td> <td></td> <td></td> <td>•</td> <td></td> <td>(66)</td> <td>m + (67)m</td> <td>ı + (68</td> <td>3)m + (69)m</td> <td>n + (70</td> <td>)m + (</td> <td>(71)m + (72)</td> <td>m</td> <td></td> <td></td> <td></td>	Total i	nternal	gains =			•		(66)	m + (67)m	ı + (68	3)m + (69)m	n + (70)m + ((71)m + (72)	m			
Solar gave are calculated using solar flux from Table 6a Area Flux Gains North 0.9x 1 × 1.58 × 10.63 × 0.9 × 0.9 = 61.24 (7) North 0.9x 1 × 1.58 × 10.63 × 0.9 × 0.9 = 61.24 (7) North 0.9x 1 × 1.6 × 20.32 × 0.9 × 0.9 = 61.24 (7) North 0.9x 1 × 1.6 × 20.32 × 0.9 × 0.9 = 61.24 (7) North 0.9x 1 × 1.6 × 20.32 × 0.9 × 0.9 = 0.228 (7) North 0.9x 1 × 1.6 × 56.46 × 0.9 × 0.9 = 0.28 (7) North 0.9x 1 × 1.6 × 74.72 ×<	(73)m=	924.24	917.9	881.6	824.5	764.3	2 7	11.69	681.8	692	2.6 726.2	25 7	783.59	847.39	897.31			(73)
Orientation: Access Factor Table 6d Area m ² Flux Table 6a g Table 6b FF Table 6c Gains (W) North 0.9 1 × 1.58 × 10.63 × 0.9 × 0.9 = 61.24 (74) North 0.9 1 × 1.68 × 20.32 × 0.9 × 0.9 = 117.03 (74) North 0.9 1 × 1.68 × 20.32 × 0.9 × 0.9 = 22.7 (74) North 0.9 1 × 1.68 × 20.9 × 0.9 = 20.7 (74) North 0.9 1 × 1.68 × 0.9 × 0.9 = 20.7 (74) North 0.9 1 × 1.58 × 74.72 0.9 × 0.9 = 20.7 (74) North 0.9 <td< td=""><td>6. Sol</td><td>ar gains</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	6. Sol	ar gains	:															
Table 6dm²Table 6aTable 6bTable 6c(W)North0.9x1x1.58x10.63x0.9x0.9=61.24(74)North0.9x1x1.68x20.32x0.9x0.9=12.24(74)North0.9x1x1.58x20.32x0.9x0.9=12.24(74)North0.9x1x1.58x20.32x0.9x0.9=23.7(74)North0.9x1x1.68x34.53x0.9x0.9=40.28(74)North0.9x1x1.68x34.53x0.9x0.9=40.28(74)North0.9x1x1.68x74.72x0.9x0.9=450.3(74)North0.9x1x1.58x79.99x0.9=450.3(74)North0.9x1x1.58x79.99x0.9=450.3(74)North0.9x1x1.58x79.99x0.9=450.3(74)North0.9x1x1.58x79.89x0.9=68.1(74)North0.9x1x1.58x74.58x0.9 <td< td=""><td>Solar g</td><td>ains are c</td><td>alculated us</td><td>sing sola</td><td>r flux fron</td><td>n Table 6</td><td>a and</td><td>lassoci</td><td>ated equa</td><td>tions</td><td>to convert to</td><td>o the a</td><td>applica</td><td>able orientati</td><td>ion.</td><td></td><td></td><td></td></td<>	Solar g	ains are c	alculated us	sing sola	r flux fron	n Table 6	a and	lassoci	ated equa	tions	to convert to	o the a	applica	able orientati	ion.			
North 0.9 1 x 1.58 x 10.63 x 0.9 x 0.9 = 61.24 (74) North 0.9 1 x 1.58 x 20.32 x 0.9 x 0.9 = 117.03 (74) North 0.9 1 x 1.58 x 20.32 x 0.9 x 0.9 = 117.03 (74) North 0.9 1 x 1.58 34.53 x 0.9 x 0.9 = 108.86 (74) North 0.9 1 x 1.58 55.46 x 0.9 x 0.9 = 64.69 (74) North 0.9 1 x 1.6 55.46 0.9 x 0.9 = 64.69 (74) North 0.9 1 x 1.58 74.72 x 0.9 x 0.9 40.02 (74) North 0.9 1 </td <td>Orienta</td> <td></td> <td></td> <td>ctor</td> <td></td> <td>a</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>01</td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Orienta			ctor		a						0 1	-					
North 0.8x 1 x 1.66 x 10.63 x 0.9 x 0.9 = 0.12.4 (74) North 0.9x 1 x 1.58 x 20.32 x 0.9 x 0.9 = 117.03 (74) North 0.9x 1 x 1.58 x 20.32 x 0.9 x 0.9 = 23.7 (74) North 0.9x 1 x 1.58 x 34.53 x 0.9 x 0.9 = 40.28 (74) North 0.9x 1 x 1.58 x 55.46 x 0.9 x 0.9 = 440.64 (74) North 0.9x 1 x 1.58 x 74.72 x 0.9 x 0.9 = 440.3.2 (74) North 0.9x 1 x 1.58 x 74.72 x 0.9 x 0.9 = 440.3.2 (74) North 0.9x		I	able 6d		m²		_	lat	ole 6a		l able 6	6b	_	l able 6c		(VV)	
North 0.9x 1 x 1.58 x 20.32 x 0.9 x 0.9 = 117.03 (74) North 0.9x 1 x 1.65 x 20.32 x 0.9 x 0.9 = 23.7 (74) North 0.9x 1 x 1.65 x 20.32 x 0.9 x 0.9 = 23.7 (74) North 0.9x 1 x 1.65 x 20.32 x 0.9 x 0.9 = 23.7 (74) North 0.9x 1 x 1.65 x 65.46 x 0.9 x 0.9 = 40.28 (74) North 0.9x 1 x 1.56 x 74.72 x 0.9 x 0.9 = 430.64 (74) North 0.9x 1 x 1.56 x 74.99 x 0.9 x 0.9 = 430.07 (74) North 0.9x	North	0.9x	1	x	1.	58	×	1	0.63	x	0.9		x	0.9	=		61.24	(74)
North 0.9x 1 x 1.6 x 0.03 x 0.9 = 0.37 (74) North 0.9x 1 x 1.58 x 0.32.3 x 0.9 = 0.9.3 = 0.9.3 = 0.9.3 = 0.9.3 = 0.9.3 = 0.9.3 1 x 1.6 x 0.3.5 x 0.9 = 0.9.3 = 0.9.3 = 0.9.3 = 0.9.3 = 0.9.3 1 x 1.6 x 55.46 x 0.9 x 0.9 = 0.9.40.28 (74) North 0.9x 1 x 1.6 x 74.72 x 0.9 x 0.9 = 0.480.64 (74) North 0.9x 1 x 1.6 x 74.72 x 0.9 x 0.9 = 0.9 2.9 480.64 (74) North 0.9x 1 x 1.6 74.68 x 0.9 x 0.9 = 0.9.	North	0.9x	1	×	1	.6	×	1	0.63	x	0.9		x	0.9	=		12.4	(74)
North 0.9x 1 x 1.58 x 24.0 x 0.9 x 10.8.6 (74) North 0.9x 1 x 1.6 x 34.53 x 0.9 x 0.9 a 108.66 (74) North 0.9x 1 x 1.6 x 34.53 x 0.9 x 0.9 a 40.28 (74) North 0.9x 1 x 1.6 x 55.46 x 0.9 x 0.9 a 40.28 (74) North 0.9x 1 x 1.6 x 74.72 x 0.9 x 0.9 a 430.3 64.69 (74) North 0.9x 1 x 1.6 x 74.72 x 0.9 a 9.9 a 9.9 a 0.9 a 430.3 64.69 (74) North 0.9x 1 x 1.6 74.68 x 0.9 a 9.9 a 0.9 a 331.21 (74)<	North	0.9x	1	×	1.	58	x	2	0.32	x	0.9		x	0.9	=		117.03	(74)
North $0.5x$ 1 x 1.6 x 34.53 x 0.9 = 40.28 (74) North $0.9x$ 1 x 1.58 x 55.46 x 0.9 x 0.9 = 40.28 (74) North $0.9x$ 1 x 1.58 x 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.58 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.58 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.58 74.72 x 0.9 x 0.9 = 93.29 (74) North $0.9x$ 1 x 1.58 74.68 x 0.9 = 93.29 (74) North $0.9x$ 1 x 1.58 <td>North</td> <td>0.9x</td> <td>1</td> <td>×</td> <td>1</td> <td>.6</td> <td>x</td> <td>2</td> <td>0.32</td> <td>x</td> <td>0.9</td> <td></td> <td>x</td> <td>0.9</td> <td>=</td> <td></td> <td>23.7</td> <td>(74)</td>	North	0.9x	1	×	1	.6	x	2	0.32	x	0.9		x	0.9	=		23.7	(74)
North $0.5x$ 1 x 1.58 x 55.46 x 0.9 x 0.9 = 319.43 (74) North $0.5x$ 1 x 1.6 x 55.46 x 0.9 x 0.9 = 64.69 (74) North $0.9x$ 1 x 1.58 x 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.6 x 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.58 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.58 74.68 x 0.9 = 93.29 (74) North $0.9x$ 1 x 1.58 59.25 x 0.9 = $93.41.21$ (74) North $0.9x$ 1 x	North	0.9x	1	x	1.	58	x	3	4.53	x	0.9		x [0.9	=		198.86	(74)
North 0.9 1 x 1.6 x 55.46 x 0.9 x 0.9 = 64.69 (74) North 0.9 1 x 1.58 x 74.72 x 0.9 x 0.9 = 440.3 (74) North $0.9x$ 1 x 1.58 77.72 x 0.9 x 0.9 = 420.3 (74) North $0.9x$ 1 x 1.58 $77.9.99$ x 0.9 x 0.9 = 48.064 (74) North $0.9x$ 1 x 1.58 79.99 x 0.9 x 0.9 = 48.007 (74) North $0.9x$ 1 x 1.58 74.68 x 0.9 x 0.9 = 34.121 (74) North $0.9x$ 1 x 1.6 59.25 0.9 x 0.9 = 69.1 (74) North $0.9x$ <	North	0.9x	1	x	1	.6	×	3	4.53	x	0.9		x	0.9	=		40.28	(74)
North 0.9x 1 x 1.58 x 74.72 x 0.9 x 0.03 6.04 6.04 7.41 6.03 7.49 8.09 8.09 9.99 1.74 1.6 7.468 8.09 9.99 9.99 9.91 7.41 7.41 7.41 7.41 7.41 7.41 7.41 7.41 7.41 7.41 7.41 7.41	North	0.9x	1	x	1.	58	x	5	5.46	x	0.9		x	0.9	=		319.43	(74)
North 0.99 1 x 1.6 x 74.72 x 0.9 x 0.9 = 07.15 (74) North 0.9x 1 x 1.6 x 74.72 x 0.9 x 0.9 = 07.15 (74) North 0.9x 1 x 1.6 x 79.99 x 0.9 x 0.9 = 07.15 (74) North 0.9x 1 x 1.6 x 74.68 x 0.9 x 0.9 = 450.64 (74) North 0.9x 1 x 1.6 x 74.68 x 0.9 x 0.9 = 430.07 (74) North 0.9x 1 x 1.6 X 59.25 x 0.9 x 0.9 341.21 (74) North 0.9x 1 x 1.6 X 41.52 0.9 x 0.9 239.1 (74) North 0.9x 1 x 1.6 X<	North	0.9x	1	x	1	.6	x	5	5.46	x	0.9		x	0.9	=		64.69	(74)
North $0.9 \times$ 1 \times 1.58 \times 79.99 \times 0.9 \times 0.9 $=$ 460.64 (74) North $0.9 \times$ 1 \times 1.58 \times 79.99 \times 0.9 $=$ 93.29 (74) North $0.9 \times$ 1 \times 1.58 \times 74.68 \times 0.9 $=$ 93.29 (74) North $0.9 \times$ 1 \times 1.58 \times 74.68 \times 0.9 \times 0.9 $=$ 430.07 (74) North $0.9 \times$ 1 \times 1.6 \times 74.68 \times 0.9 \times 0.9 $=$ 430.07 (74) North $0.9 \times$ 1 \times 1.6 \times 74.68 \times 0.9 \times 0.9 $=$ 33.29 (74) North $0.9 \times$ 1 \times 1.6 \times 59.25 \times 0.9 \times 0.9 $=$ 341.21 (74) North $0.9 \times$ 1 \times 1.58 41.52 \times 0.9 \times 0.9 $=$ 239.1 (74) North $0.9 \times$ 1 \times 1.58 24.19 \times 0.9 \times 0.9 $=$ 239.1 (74) North $0.9 \times$ 1 \times 1.6 24.19 \times 0.9 \times 0.9 $=$ 28.21 (74) North $0.9 \times$ 1 \times 1.6 24.19 \times 0.9 <	North	0.9x	1	x	1.	58	×	7	4.72	x	0.9		x	0.9	=		430.3	(74)
North0.9x1x1.6x79.99x0.9x0.9x0.9x0.9x0.9x0.9x0.9x0.9x0.9x0.9x0.9x1.58x74.68x0.9x0.9x0.9x0.9x1.6x74.68x0.9x0.9x0.9x1.6x74.68x0.9x0.9x0.9x1.74x1.6x74.68x0.9x0.9x0.9x1.74x1.6x59.25x0.9x0.9x0.9x1.74x1.6x59.25x0.9x0.9x0.9x1.74x1.6x59.25x0.9x0.9x0.9x1.74x1.6x1.58x1.58x1.58x1.58x1.6x1.6x1.74x0.9x0.9x0.9x0.9x0.9x0.9x0.9x1.74x1.6x1.6x1.16x1.16x1.16x1.16x1.171.16x1.16x1.161.161.161.161.161.161.161.161.161.161.161.161.161.161.161.161.16 <t< td=""><td>North</td><td>0.9x</td><td>1</td><td>×</td><td>1</td><td>.6</td><td>x</td><td>7</td><td>4.72</td><td>x</td><td>0.9</td><td></td><td>x [</td><td>0.9</td><td>_</td><td></td><td>87.15</td><td>(74)</td></t<>	North	0.9x	1	×	1	.6	x	7	4.72	x	0.9		x [0.9	_		87.15	(74)
North $0.9x$ 1 x 1.58 x 74.68 x 0.9 x 0.9 z <	North	0.9x	1	×	1.	58	x	7	9.99	×	0.9		х [0.9	=	,	460.64	(74)
North $0.9x$ 1 x 1.6 x 74.88 x 0.9 x 0.9 z 239.1 (74) North $0.9x$ 1 x 1.58 x 41.52 x 0.9 x 0.9 z 239.1 (74) North $0.9x$ 1 x 1.66 x 41.52 x 0.9 x 0.9 z 239.1 (74) North $0.9x$ 1 x 1.66 x 41.52 x 0.9 x 0.9 z 239.1 (74) North $0.9x$ 1 x 1.66 x 24.19 x 0.9 x 0.9 z 28.21 (74) North $0.9x$ 1 x 1.66 x 24.19 x 0.9 z <	North	0.9x	1	×	1	.6	x	7	9.99	x	0.9		x [0.9	=		93.29	(74)
North $0.9x$ 1x 1.58 x 59.25 x 0.9 x 0.9 = 341.21 (74) North $0.9x$ 1x 1.6 x 59.25 x 0.9 x 0.9 = 69.1 (74) North $0.9x$ 1x 1.6 x 59.25 x 0.9 x 0.9 = 69.1 (74) North $0.9x$ 1x 1.58 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.6 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 139.31 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 51.56 (74) North $0.9x$ 1x 1.58 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 217.1 <td>North</td> <td>0.9x</td> <td>1</td> <td>x</td> <td>1.</td> <td>58</td> <td>x</td> <td>7</td> <td>4.68</td> <td>x</td> <td>0.9</td> <td></td> <td>x</td> <td>0.9</td> <td>=</td> <td>,</td> <td>430.07</td> <td>(74)</td>	North	0.9x	1	x	1.	58	x	7	4.68	x	0.9		x	0.9	=	,	430.07	(74)
North $0.9x$ 1x1.6x 59.25 x 0.9 x 0.9 = 69.1 (74) North $0.9x$ 1x 1.58 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.58 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.6 x 41.52 x 0.9 x 0.9 = 48.42 (74) North $0.9x$ 1x 1.58 x 24.19 x 0.9 x 0.9 = 139.31 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 51.55 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 217.1 <td>North</td> <td>0.9x</td> <td>1</td> <td>×</td> <td>1</td> <td>.6</td> <td>x</td> <td>7</td> <td>4.68</td> <td>х</td> <td>0.9</td> <td></td> <td>x</td> <td>0.9</td> <td>=</td> <td></td> <td>87.1</td> <td>(74)</td>	North	0.9x	1	×	1	.6	x	7	4.68	х	0.9		x	0.9	=		87.1	(74)
North $0.9x$ 1x 1.58 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.6 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.6 x 41.52 x 0.9 x 0.9 = 48.42 (74) North $0.9x$ 1x 1.58 x 24.19 x 0.9 x 0.9 = 139.31 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 139.31 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.66 x 24.19 x 0.9 x 0.9 = 75.55 (74) North $0.9x$ 1x 1.66 x 13.12 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.66 x 8.86 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 =	North	0.9x	1	x	1.	58	x	5	9.25	x	0.9		x	0.9	=		341.21	(74)
North $0.9x$ 1 x 1.6 x 41.52 x 0.9 x 0.9 $=$ 48.42 (74) North $0.9x$ 1 x 1.58 x 24.19 x 0.9 x 0.9 $=$ 139.31 (74) North $0.9x$ 1 x 1.6 x 24.19 x 0.9 x 0.9 $=$ 28.21 (74) North $0.9x$ 1 x 1.6 x 24.19 x 0.9 x 0.9 $=$ 28.21 (74) North $0.9x$ 1 x 1.6 x 213.12 x 0.9 x 0.9 $=$ 28.21 (74) North $0.9x$ 1 x 1.6 x 13.12 x 0.9 x 0.9 $=$ 15.3 (74) North $0.9x$ 1 x 1.6 x 13.12 x 0.9 x 0.9 $=$ 15.3 (74) North $0.9x$ 1 x 1.6 x 8.86 x 0.9 x 0.9 $=$ 217.1 (78) South $0.9x$ 1 x 0.91 x 76.57 x 0.9 x 0.9 $=$ 217.1 (78) South $0.9x$ 1 x 0.91 x 77.53 x 0.9 x 0.9 $=$ 511.9 (78) South $0.9x$ 1 x 0.91	North	0.9x	1	x	1	.6	×	5	9.25	x	0.9		x	0.9	=		69.1	(74)
North $0.9x$ 1x 1.58 x 24.19 x 0.9 x 0.9 = 139.31 (74) North $0.9x$ 1x 1.66 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.66 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.58 x 13.12 x 0.9 x 0.9 = 75.55 (74) North $0.9x$ 1x 1.66 x 13.12 x 0.9 x 0.9 = 15.3 (74) North $0.9x$ 1x 1.66 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.66 x 8.86 x 0.9 x 0.9 = 10.34 (74) North $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 =	North	0.9x	1	x	1.	58	x	4	1.52	x	0.9		x [0.9	=		239.1	(74)
North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.58 x 13.12 x 0.9 x 0.9 = 75.55 (74) North $0.9x$ 1x 1.6 x 13.12 x 0.9 x 0.9 = 75.55 (74) North $0.9x$ 1x 1.6 x 13.12 x 0.9 x 0.9 = 15.3 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 355.56 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 114.87 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 5	North	0.9x	1	x	1	.6	x	4	1.52	x	0.9		x	0.9	=		48.42	(74)
North $0.9x$ 1x 1.58 x 13.12 x 0.9 x 0.9 = 75.55 (74) North $0.9x$ 1x 1.6 x 13.12 x 0.9 x 0.9 = 15.3 (74) North $0.9x$ 1x 1.58 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.58 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 97.53 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	North	0.9x	1	x	1.	58	x	2	4.19	x	0.9		x	0.9	=		139.31	(74)
North $0.9x$ 1x 1.6 x 13.12 x 0.9 x 0.9 = 15.3 (74) North $0.9x$ 1x 1.58 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 10.34 (74) South $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 97.53 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	North	0.9x	1	x	1	.6	x	2	4.19	x	0.9		x	0.9	=		28.21	(74)
North $0.9x$ 1x 1.58 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 10.34 (74) South $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 255.56 (78) South $0.9x$ 1x 0.91 x 97.53 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	North	0.9x	1	x	1.	58	x	1	3.12	x	0.9		x [0.9	=		75.55	(74)
North $0.9x$ 1x1.6x8.86x 0.9 x 0.9 = 10.34 (74) South $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 97.53 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	North	0.9x	1	x	1	.6	x	1	3.12	x	0.9		x	0.9	=		15.3	(74)
South $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 355.56 (78) South $0.9x$ 1x 0.91 x 97.53 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	North	0.9x	1	x	1.	58	x	3	3.86	x	0.9		x	0.9	=		51.05	(74)
South $0.9x$ 1 x 0.91 x 76.57 x 0.9 x 0.9 $=$ 355.56 (78) South $0.9x$ 1 x 0.91 x 97.53 x 0.9 x 0.9 $=$ 452.92 (78) South $0.9x$ 1 x 0.91 x 110.23 x 0.9 x 0.9 $=$ 511.9 (78) South $0.9x$ 1 x 0.91 x 114.87 x 0.9 x 0.9 $=$ 533.43 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 $=$ 513.35 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 $=$ 513.35 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 $=$ 513.35 (78)	North	0.9x	1	x	1	.6	×	8	3.86	x	0.9		×	0.9	=		10.34	(74)
South $0.9x$ 1 x 0.91 x 97.53 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1 x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1 x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	South	0.9x	1	x	0.	91	x	4	6.75	x	0.9		x	0.9	= =		217.1	(78)
South $0.9x$ 1 x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1 x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1 x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	South	0.9x	1	x	0.	91	x	7	6.57	x	0.9		x	0.9	= =		355.56	(78)
South $0.9x$ 1 x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.43 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South 0.9x 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	South	0.9x	1	x	0.	91	x	9	7.53	x	0.9		x	0.9	= =		452.92	(78)
South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	South	0.9x	1	x	0.	91	×	1	10.23	x	0.9		×	0.9	= =		511.9	(78)
	South	0.9x	1	×	0.	91	×	1	14.87	x	0.9		×	0.9	=		533.43	(78)
South $0.9x$ 1 x 0.91 x 108.01 x 0.9 x 0.9 = 501.58 (78)	South	0.9x	1	×	0.	91	x	1	10.55	x	0.9		×	0.9	= =		513.35	(78)
	South	0.9x	1	×	0.	91	x	1	08.01	x	0.9		×	0.9	= =		501.58	(78)
South 0.9x 1 x 0.91 x 104.89 x 0.9 x 0.9 = 487.1 (78)	South	0.9x	1	x	0.	91	×	1	04.89	x	0.9		×	0.9	=		487.1	(78)

South	о o. Г		۱		۱		1				1		
South	0.9x	1	X	0.91	×	101.89	×	0.9	x	0.9	=	473.13	(78)
	0.9x	1	x	0.91	X	82.59	X	0.9	x	0.9	=	383.51	(78)
South	0.9x	1	X	0.91	X	55.42	X	0.9	x	0.9	=	257.34	(78)
South	0.9x	1	x	0.91	X	40.4	X	0.9	x	0.9	=	187.6	(78)
West	0.9x	1	x	1.5	x	19.64	X	0.9	x	0.9	=	107.38	(80)
West	0.9x	1	x	2.44	x	19.64	X	0.9	x	0.9	=	174.68	(80)
West	0.9x	1	x	0.9	×	19.64	X	0.9	x	0.9	=	25.77	(80)
West	0.9x	1	x	1.4	x	19.64	x	0.9	x	0.9	=	100.22	(80)
West	0.9x	1	x	1.5	x	38.42	x	0.9	x	0.9	=	210.06	(80)
West	0.9x	1	x	2.44	x	38.42	x	0.9	x	0.9	=	341.7	(80)
West	0.9x	1	x	0.9	x	38.42	x	0.9	x	0.9	=	50.42	(80)
West	0.9x	1	x	1.4	x	38.42	x	0.9	x	0.9	=	196.06	(80)
West	0.9x	1	x	1.5	x	63.27	x	0.9	x	0.9	=	345.95	(80)
West	0.9x	1	x	2.44	x	63.27	x	0.9	x	0.9	=	562.74	(80)
West	0.9x	1	x	0.9	x	63.27	x	0.9	x	0.9	=	83.03	(80)
West	0.9x	1	x	1.4	x	63.27	x	0.9	x	0.9	=	322.88	(80)
West	0.9x	1	x	1.5	x	92.28	x	0.9	x	0.9	=	504.54	(80)
West	0.9x	1	x	2.44	X	92.28	х	0.9	x	0.9	=	820.72	(80)
West	0.9x	1	x	0.9	x	92.28	x	0.9	x	0.9	=	121.09	(80)
West	0.9x	1	x	1.4	х	92.28	×	0.9	x	0.9	=	4 <mark>70.91</mark>	(80)
West	0.9x	1	x	1.5	x	113.09	x	0.9	x	0.9	=	6 <mark>18.33</mark>	(80)
West	0.9x	1	x	2.44	x	113.09	x	0.9	x	0.9	=	1005.82	(80)
West	0.9x	1	x	0.9	x	113.09	x	0.9	x	0.9	=	148.4	(80)
West	0.9x	1	x	1.4	x	113.09	x	0.9	x	0.9	=	5 <mark>77.11</mark>	(80)
West	0.9x	1	x	1.5	x	115.77	x	0.9	x	0.9	=	632.98	(80)
West	0.9x	1	x	2.44	x	115.77	x	0.9	x	0.9	=	1029.64	(80)
West	0.9x	1	x	0.9	x	115.77	x	0.9	x	0.9	=	151.91	(80)
West	0.9x	1	x	1.4	x	115.77	x	0.9	x	0.9	=	590.78	(80)
West	0.9x	1	x	1.5	x	110.22	x	0.9	x	0.9	=	602.62	(80)
West	0.9x	1	x	2.44	x	110.22	x	0.9	x	0.9	=	980.26	(80)
West	0.9x	1	x	0.9	x	110.22	x	0.9	x	0.9	=	144.63	(80)
West	0.9x	1	x	1.4	x	110.22	x	0.9	x	0.9	=	562.44	(80)
West	0.9x	1	x	1.5	x	94.68	x	0.9	x	0.9	=	517.64	(80)
West	0.9x	1	x	2.44	x	94.68	x	0.9	x	0.9	=	842.03	(80)
West	0.9x	1	x	0.9	x	94.68	x	0.9	x	0.9	=	124.23	(80)
West	0.9x	1	x	1.4	×	94.68	×	0.9	x	0.9	=	483.13	(80)
West	0.9x	1	x	1.5	x	73.59	x	0.9	x	0.9	=	402.35	(80)
West	0.9x	1	x	2.44	x	73.59	x	0.9	x	0.9	=	654.49	(80)
West	0.9x	1	x	0.9	×	73.59	x	0.9	x	0.9	=	96.56	(80)
West	0.9x	1	x	1.4	×	73.59	x	0.9	x	0.9	=	375.53	(80)
West	0.9x	1	x	1.5	x	45.59	x	0.9	x	0.9	=	249.26	(80)

West 0.9x	1 ×	2.44	x	45.59	x	0.9	×	0.9	=	405.46	(80)
West 0.9x	1 x	0.9	x	45.59	x	0.9	×	0.9	=	59.82	(80)
West 0.9x	1 ×	1.4	x	45.59	x	0.9	×	0.9	=	232.64	(80)
West 0.9x	1 ×	1.5	x	24.49	x	0.9	×	0.9	=	133.89	(80)
West 0.9x	1 ×	2.44	x	24.49	x	0.9	x	0.9	=	217.8	(80)
West 0.9x	1 ×	0.9	x	24.49	x	0.9	x	0.9	=	32.13	(80)
West 0.9x	1 ×	1.4	x	24.49	x	0.9	x	0.9	=	124.97	(80)
West 0.9x	1 ×	1.5	x	16.15	x	0.9	x	0.9	=	88.31	(80)
West 0.9x	1 ×	2.44	x	16.15	x	0.9	x	0.9	=	143.65	(80)
West 0.9x	1 ×	0.9	x	16.15	x	0.9	x	0.9	=	21.19	(80)
West 0.9x	1 ×	1.4	x	16.15	x	0.9	x	0.9	=	82.42	(80)
Rooflights 0.9x	1 ×	0.5	x	26	x	0.7	x	0.7	=	11.47	(82)
Rooflights 0.9x	1 ×	0.5	x	54	x	0.7	x	0.7	=	23.81	(82)
Rooflights 0.9x	1 ×	0.5	x	96	x	0.7	x	0.7	=	42.34	(82)
Rooflights 0.9x	1 ×	0.5	x	150	x	0.7	x	0.7	=	66.15	(82)
Rooflights 0.9x	1 ×	0.5	x	192	x	0.7	x	0.7	=	84.67	(82)
Rooflights 0.9x	1 X	0.5	x	200	x	0.7	x	0.7	=	88.2	(82)
Rooflights 0.9x	1 X	0.5	x	189	х	0.7	x	0.7	=	83.35	(82)
Rooflights 0.9x	1 ×	0.5	x	157	x	0.7	x	0.7	- 1	69.24	(82)
Rooflights 0.9x	1 ×	0.5	x	115	x	0.7	x	0.7	=	5 <mark>0.71</mark>	(82)
Rooflights 0.9x	1 ×	0.5	x	66	x	0.7	x	0.7	=	2 <mark>9.11</mark>	(82)
Rooflights 0.9x	1 ×	0.5	x	33	x	0.7	x	0.7		14.55	(82)
Rooflights 0.9x	1 ×	0.5	x	21	x	0.7	x	0.7	=	9.26	(82)
					-						
Solar gains in watts,	calculated	for each mon	th		(83)m	= Sum(74)m	(82)m	-			
(83)m= 710.27 1318.3	35 2048.99	2879.43 3485.2	2 3	560.8 3392.05	2933	3.68 2340.29	1527.3	2 871.54	593.82		(83)
Total gains – interna	l and solar	(84)m = (73)n	า + (ส	83)m, watts						-	
(84)m= 1634.51 2236.2	26 2930.59	3703.93 4249.5	4 42	272.49 4073.85	3626	6.28 3066.54	2310.9	1 1718.93	1491.12		(84)
7. Mean internal ter	mperature	(heating seaso	on)								
Temperature during	g heating p	eriods in the li	ving	area from Tat	ole 9,	Th1 (°C)				21	(85)
Utilisation factor for	gains for I	iving area, h1,	m (s	ee Table 9a)						<u> </u>	1
Jan Fet	o Mar	Apr Ma	/	Jun Jul	A	ug Sep	Oct	Nov	Dec]	
(86)m= 1 0.98	0.9	0.71 0.5		0.34 0.24	0.2	.9 0.51	0.87	0.99	1		(86)
Mean internal temp	erature in l	living area T1	(follo	w steps 3 to 7	7 in T	able 9c)				-	
(87)m= 20.1 20.38		20.94 20.99	<u>`</u>	21 21	2	<u> </u>	20.85	20.4	20.05]	(87)
Temperature during	n heating n	eriode in reet o	of dw	elling from Ta	hle (ነ Th2 (የርነ		1		1	
(88)m= 20.12 20.12		20.13 20.13		20.14 20.14	20.	- 1 - 1 - 1	20.13	20.13	20.13	1	(88)
										1	x /
Utilisation factor for	<u> </u>			<u> </u>	<u> </u>		0.00	0.00	4	1	(20)
(89)m= 1 0.97		0.67 0.45		0.29 0.2	0.2		0.83	0.98	1	J	(89)
Mean internal temp				<u> </u>	r <u> </u>		,			1	
(90)m= 18.92 19.33	3 19.8	20.07 20.13	2	20.14 20.14	20.		19.98		18.85		(90)
						fL	A = Liv	ring area ÷ (4	+) =	0.18	(91)

Mean interna	al temper	ature (fo	or the wh	ole dwe	llina) = fl	A x T1	+ (1 – fl	A) x T2					
(92)m= 19.13	19.52	19.96	20.23	20.28	20.29	20.29	20.29	20.29	20.13	19.55	19.06		(92)
Apply adjust	ment to t	he mear	interna	l I temper	ature fro	n Table	4e, whe	ere appro	opriate				
(93)m= 19.13	19.52	19.96	20.23	20.28	20.29	20.29	20.29	20.29	20.13	19.55	19.06		(93)
8. Space he	ating requ	uirement			•								
Set Ti to the					ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation	Feb	Mar	<u> </u>	· · · · · ·	lun	Jul	A.u.a	Son	Oct	Nov	Dec		
Jan Utilisation fa			Apr	May	Jun	Jui	Aug	Sep		Nov	Dec		
(94)m= 0.99	0.97	0.88	0.67	0.46	0.3	0.21	0.24	0.46	0.83	0.98	1		(94)
Useful gains					0.0	0.2.	0.2.1	0110	0.00	0.00			
	2165.17	· · · ·	ŕ	· · · · · · · · · · · · · · · · · · ·	1287.24	835.49	879.42	1397.23	1915.27	1683.66	1484.76		(95)
Monthly ave													
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for me	an intern	al tempo	i erature.	L	- =[(39)m ;	ı x [(93)m	i – (96)m	1				
(97)m= 3440.76	1	i	2590.77		, 1287.94		879.56	· · ·	2176.38	2853.24	3418.64		(97)
Space heati	ng require	ement fo	r each n	nonth, k	L Wh/mont	h = 0.02	24 x [(97	ı)m – (95)m] x (4 ⁻	1)m	1		
(98)m= 1352.1 ²	r i	397.98	73.8	8	0	0	0	0	194.26	, 842.1	1438.81		
	1		1	1			Tota	l per year	l (kWh/year) = Sum(9	8)15,912 =	5126.24	(98)
Space heating	ng require	ement in	kWh/m ²	²/year								21.1	(99)
8c. Space co	oling rec	uiremer	nt										
Calculated for				See Tal	ble 10b								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
He <mark>at los</mark> s rat	e Lm (ca	lculated	using 2	5°C inter	nal temp	perature	and exte		npe <mark>ratur</mark>	e from T	able 10)		
(100) <mark>m= 0</mark>	0	0	0	0	2126.66	1674.18	1716.58	0	0	0	0		(100)
Utilisation fa	ctor for lo	oss hm											
(101)m= 0	0	0	0	0	0.99	1	0.99	0	0	0	0		(101)
Useful loss,	hmLm (V	Vatts) = ((100)m >	(101)m	1								
(102)m= 0	0	0	0	0	2109.98	1669.3	1706.21	0	0	0	0		(102)
Gains (solar	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)					
(103)m= 0	0	0	0	0	4272.49	4073.85	3626.28	0	0	0	0		(103)
Space coolii set (104)m t	• •				dwelling,	continue	ous (kW	h) = 0.0	24 x [(10)3)m – (102)m]:	x (41)m	
(104)m= 0	0	0	0	0	1557.01	1788.98	1428.54	0	0	0	0		
								Total	= Sum(104)	=	4774.52	(104)
Cooled fraction	n							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermittency	factor (Ta	able 10b)										
(106)m= 0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
• • •				(1		/····		Tota	l = Sum(104)	=	0	(106)
Space cooling	<u> </u>			r`	r <u> </u>	, <i>,</i>	r						
(107)m= 0	0	0	0	0	389.25	447.24	357.13	0	0	0	0		
								Iotal	= Sum(107)	=	1193.63	(107)
Space cooling													
	g require	ment in k	(Wh/m²/	year				(107)) ÷ (4) =			4.91	(108)

This part is used for space heating, space cooling or water heating provided by a community scheme.

			_		_
Fraction of space heat from secondary/supplement	tary heating (Table	11) '0' if none		0	(301)
Fraction of space heat from community system 1 -	- (301) =		[1	(302)
The community scheme may obtain heat from several sources, includes boilers, heat pumps, geothermal and waste heat from Fraction of heat from Community boilers			t sources; th	ne latter	(303a)
Fraction of total space heat from Community boile	rs	(302) × (303	3a) =	1	(304a)
Factor for control and charging method (Table 4c([1	(305)
Distribution loss factor (Table 12c) for community l			L T	1.05	(306)
Space heating			L	kWh/year]()
Annual space heating requirement			[5126.24]
Space heat from Community boilers		(98) x (304a) x (305) x (306)	= [5382.56	(307a)
Efficiency of secondary/supplementary heating sys	stem in % (from Tab	le 4a or Appendix E)	ĺ	0	(308
Space heating requirement from secondary/supple	ementary system	(98) x (301) x 100 ÷ (308) =	Ī	0	(309)
Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306)	[1990.32] (310a)
			L]
Electricity used for heat distribution	0.	01 × [(307a)(307e) + (310a)	(310e)] =	74.72	(313)
Cooling System Energy Efficiency Ratio		(407) + (244)		3.38	(314)
Space cooling (if there is a fixed cooling system, if Electricity for pumps and fans within dwelling (Tab mechanical ventilation - balanced, extract or positi	le 4f):	= (107) ÷ (314) =]	353.67	(315) (330a)
warm air heating system fans			[0	(330b)
pump for solar water heating			[0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	[0	(331)
Energy for lighting (calculated in Appendix L)			ĺ	645.95	(332)
10b. Fuel costs – Community heating scheme			L		_
	Fuel kWh/year	Fuel Price (Table 12)		Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24	x 0.01 =	228.22	(340a)
Water heating from CHP	(310a) x	4.24	x 0.01 =	88.61	(342a)
Space cooling (community cooling system)	(315)	Fuel Price 13.19	x 0.01 =	46.65	(348)
Pumps and fans	(331)	13.19	x 0.01 =	0	(349)
Energy for lighting	(332)	13.19	x 0.01 =	85.2	(350)

Additional standing charges (Table 12)

Total energy cost

= (340a)...(342e) + (345)...(354) =

(351)

(355)

120

568.68

11b. SAP rating - Community heating scheme				
Energy cost deflator (Table 12)			0.42	(356)
Energy cost factor (ECF) [(355) x (356)] ÷ [(4) + 45.0] =	=		0.83	(357)
SAP rating (section12)			88.43	(358)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using	g two fuels repeat (363) to ((366) for the second fue	el 95	(367a)
CO2 associated with heat source 1 [(307b)+((310b)] x 100 ÷ (367b) x	0	= 1698.99	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 38.78	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	= 1737.77	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantane	ous heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		1737.77	(376)
CO2 associated with space cooling	(315) x	0.52	= 183.55	(377)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	= 0	(378)
CO2 associated with electricity for lighting	(33 <mark>2)</mark>)) x	0.52	= 335.25	(379)
Total CO2, kg/year sum of (376)(382) =			2256.57	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			9.29	(384)
El rating (section 14)			89.5	(385)
13b. Primary Energy – Community heating scheme				
	Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) If there is CHP using	P) g two fuels repeat (363) to ((366) for the second fue	el 95	(367a)
Energy associated with heat source 1 [(307b)+((310b)] x 100 ÷ (367b) x	0	= 9596.12	(367)
Electrical energy for heat distribution	[(313) x		= 229.4	(372)
Total Energy associated with community systems	(363)(366) + (368)(372)	= 9825.53	(373)
if it is negative set (373) to zero (unless specified otherwise, s	ee C7 in Appendix C)	9825.53	(373)
Energy associated with space heating (secondary)	(309) x	0	= 0	(374)
Energy associated with water from immersion heater or instanta	neous heater(312) x	3.07	= 0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =		9825.53	(376)
Energy associated with space cooling	(315) x	3.07	= 1085.76	(377)
Energy associated with electricity for pumps and fans within dwe	elling (331)) x	3.07	= 0	(378)
Energy associated with electricity for lighting	(332))) x	3.07	= 1983.06	(379)
Total Primary Energy, kWh/year sum of (376)	.(382) =		12894.35	(383)

Assessor Name: Stroma FSAP 2012 Stroma Variance Version: 1.0.3.11 Career 28 Redington Road, NW3 7RB Image: Comparison of the Co		User Details:											
Address : 28 Redington Road, NW3 7RB Image: Control floor Image: Control floor Ground floor Image: Control floor <thimage: control="" floor<="" th=""> Image: Con</thimage:>		Stroma FS			Softwa	re Ver			Versio	on: 1.0.3.11			
I. Overall dwelling dimensions: Area(m ²) Av. Height(m) Volume(m ²) Ground floor 178 (1a) x 2.9 (2a) = \$16.2 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 178 (4) (3a)+(3b)+(3c)+(3d)+(3c)+(3d)+(3c)+(3n) = 516.2 (5) 2. Ventilation rate: main heating secondary other total m ³ per hour Number of chimneys 0 + 0 = 0 (6a) Number of pan flues 0 + 0 = 0 (6a) Number of pan flues 0 + 0 = 0 (7a) Number of passive vents 0 ×40 = 0 (7a) Number of flueless gas fires 0 ×40 = 0 (7b) Additional infiltration 0.2 S for steel or timber frame or 0.35 for masonry construction (10) 4/f a preseruitsation test has been camed w/ or is interfed, proceed to (17), otherwise continue from (9) to (16) 0 (10) Structural infiltration rate 0 0 (10) 0 (10) I' to traves of avaling?: Headu user 0.35 F		28 Rodinata			Audress.	Fidl 4							
Area(m ²)Av. Height(m)Volume(m ²)Ground floor178(1a) x2.9(2a) =516.2(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)178(4)(4)(5a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3		0	n Road, NVV3	/ KD									
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d$	Ground floor				178				(2a) =	. ,	-		
2. Ventilation rate: main heating secondary other total m³ per hour Number of chimneys 0 + 0 = 0 x40 = 0 (6a) Number of open flues 0 + 0 = 0 x20 = 0 (6b) Number of open flues 0 + 0 = 0 x10 = 0 (7a) Number of fueless gas fires 0 x10 = 0 7(a) Number of fueless gas fires 0 x40 = 0 7(a) Number of fueless gas fires 0 x40 = 0 7(a) Number of storeys in the dwelling (ns) Additional infiltration (9) + 0 (9) Additional infiltration 0.25 for steel or timber frame or 0.35 for masonry construction (9) 1(a) (11) 1(b) 0 (11) If but hyse of wall are present, use the value corresponding to the greater wall area (after defater areas of openingy); equal user 0.35 (11) (11) (12) (11) (12) (11) (12) (11)	Total floor area TFA = (7	1a)+(1b)+(1c)+(1d)+(1e)+(1	In)	178	(4)							
main heating heatingsecondary heatingothertotalm² per hour heatingNumber of chimneys0+0=0x40 =0(6a)Number of open flues0+0=0x20 =0(6b)Number of intermittent fans5x10 =50(7a)Number of passive vents0x40 =0(7a)Number of passive vents0x40 =0(7c)Number of titleless gas fires0x40 =0(7c)Infiltration due to chimneys, flues and fans =160(+(6b)+(7a)+(7b)+(7c) =50+ (6) =0.1If a pessurisation test has blen camed out or is intended, proceed to (77), otherwise continue from (9) to (76)0(9)Additional infiltration(19)-1(b,1) =0(10)Structural infiltration(19)-1(b,1) =0(10)Structural infiltration0.25 for steel or timber frame or 0.35 for masonry construction0(12)If buspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If undarught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration rate(20) = 1.0075 x (19) =0.3Air permeability value, 40, expressed in cubic metres per hour per square metre of envelope area1Air permeability value, 40, expressed in cubic metres per hour per square metre of envelope area1Air permeability value, applies if a pressuriation test has	Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	516.2	(5)		
Number of chimneysneating 0+0=0x40 =0Number of open flues0+0=0x20 =0Number of intermittent fans5x10 =507(a)Number of passive vents0x10 =07(a)Number of flueless gas fires0x40 =07(a)Number of flueless gas fires0x40 =07(a)Number of storeys in the dwelling (ns)0x40 =07(a)Additional infiltration(9) (6) (17), otherwise continue from (0) to (6)(10)Number of storeys in the dwelling (ns)0(9)(10)(10)Additional infiltration(9)(10)(10)(10)Structural infiltration(9)(10)(10)(11)If outgages of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35(12)(12)If no draught lobby, enter 0.25, (10)0(12)(12)(12)Percentage of windows and doors draught stripped0(14)Window infiltration rate0(17)(10)(10)Air permeability value, q50, expressed in cubic metres per hour percentage of windows and bors draught lob(10)(10)(11)(12)Air permeability value, q50, expressed in cubic metres per hour percentage of windows and percentage of (21)(11)(11)(12)Air permeability value, q50, expressed in cubic metres per hour percentage of windows and percentage of (21	2. Ventilation rate:										_		
Number of passive vents 10° $10^{$		heating 0	heating + 0	_ + _	0	j L	0			0	(6a)		
Number of flueless gas fires Number of flueless gas fires 0 × 40 = 0 (7c) Air changes per hour Infiltration due to chimneys, flues and fans = (#e)+(#b)+(7a)+(7c) = 50(6) = 0.1 (#) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if aqual user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 Percentage of windows and doors draught stripped Window infiltration $0.25 - [0.2 \times (14) \pm 100] = 0$ (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 14 based on air permeability value, then (18) = [(17) ± 20]+(8), otherwise (18) = (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 14 based on air permeability value, then (18) = [(17) ± 20]+(8), otherwise (18) = (16) Air permeability value, afs0, expressed in cubic metres per air permeability is being used Number of sides sheltered Number of sides sheltered Number of sides sheltered 1 (19) Shelter factor (20) = 1 - [0.075 x (19)] = 0.32 (20) Infiltration rate modified for monthly wind speed 1 (2) = 1 (0.075 x (19)] = 0.32 (20) Infiltration rate modified for monthly wind speed 2 (2) = 1 (0.075 x (19)] = 0.32 (21) Infiltration rate modified for monthly wind speed 2 (2) = 1 (0.075 x (19)] = 0.32 (21) Infiltration rate modified for monthly wind speed 2 (2) = 1 (0.075 x (19)] = 0.32 (21) Infiltration rate modified for monthly wind speed 3 (2) = 1 (0.075 x (19)] = 0.32 (21) Infiltration rate modified for monthly wind speed 3 (2) = 1 (0.075 x (19)] = 0.32 (21) 3 (2) = 0.3	Number of intermittent fa	ans				- _	5	x /	10 =	50](7a)		
Air changes per hourInfiltration due to chimneys, flues and fans = $(6e)+(6b)+(7a)+(7c) = 50 + (5) = 0.1$ (6)It a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (76)Number of storeys in the dwelling (ns)Additional infiltrationStructural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionIf both ypes of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 0Percentage of windows and doors draught strippedWindow infiltration0.25 - (0.2 x (14) + 100] =Infiltration rate(a) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredNumber of sides shelteredInfiltration rate incorporating shelter factor(20) = 1 - [0.075 x (19)] =Infiltration rate modified for monthly wind speedInfiltration rate modified for monthly wind speedI	Number of passive vent	S					0	x /	10 =	0	_](7b)		
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 50 + (5) = 0.1$ (8) It a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (76) Number of storeys in the dwelling (ns) Additional infiltration (9) to (76) Additional infiltration (9) to (76) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 If based on air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Number of sides sheltered Number of aides sheltered Mair factor (20) = 1 - [0.075 x (19)] = 0.32 (21) Infiltration rate modified for monthly wind speed Infiltration rate modified for monthly wind speed I (19) 0.92 (20) = 0.3 (21) Infiltration rate modified for monthly wind speed I (21) = (18) x (20) = 0.3 (21) Infiltration rate modified for monthly wind speed I (22)m 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4	Number of flueless gas	fires					0	X 4	40 =	0	(7c)		
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration [(9)-1]x0.1 = 0 (10) Structural infiltration 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 (14) Window infiltration $0.25 - [0.2 \times (14) + 100] =$ 0 (15) Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Number of sides sheltered Number of sides sheltered Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m + 4									Air ch	anges <mark>per</mark> ho	ur		
Additional infiltration((9)-1)x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(11)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) + 100] =0Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4.5If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16)0.32Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used1Number of sides sheltered1(19)Shelter factor(20) = 1 - [0.075 x (19)] =0.32Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.3Infiltration rate modified for monthly wind speed0(22)JanFebMarAprMayMonthly average wind speed from Table 7(22)m =5.1(22)m =5.154.94.4Umage4.44.33.83.74Wind Factor (22a)m = (22)m ÷ 4000						ontinue fr			÷ (5) =	0.1	(8)		
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 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration 0.25 - $[0.2 \times (14) \pm 100] =$ Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = $[(17) \pm 20] + (8)$, otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - $[0.075 \times (19)] =$ Infiltration rate modified for monthly wind speed $\boxed{10, 0, 32}$ (20) Infiltration rate modified for monthly wind speed $\boxed{10, 0, 32}$ (21) Infiltration rate modified for Table 7 (22)me $\boxed{5.1 \ 5 \ 4.9 \ 4.4 \ 4.3 \ 3.8 \ 3.8 \ 3.7 \ 4 \ 4.3 \ 4.5 \ 4.7}$ Wind Factor (22a)m = (22)m ÷ 4	Additional infiltration							[(9)	-1]x0.1 =	0	(10)		
If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaIf based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredNumber of sides shelteredInfiltration rate incorporating shelter factorInfiltration rate modified for monthly wind speedInfiltration rate modified for monthly wind speedInfiltration rate incorporating shelter 7(22)me5.154.94.44.33.83.744.34.5<	if both types of wall are p	present, use the va	lue corresponding			•	uction			0	_(11)		
Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ 0Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4.5If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.32Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used1Number of sides sheltered1(19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.3Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.3Infiltration rate modified for monthly wind speed01Monthly average wind speed from Table 7(22)m =5.15(22)m = $(5.1) \times 4.9$ 4.4 4.3 3.8 3.7 4 4.3 4.5 Wind Factor (22a)m = (22)m $\div 4$ 1111	If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)		
Window infiltration $0.25 - [0.2 \times (14) + 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.32 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 0.32 Number of sides sheltered 1 (19) Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.3 Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.3 Infiltration rate modified for monthly wind speed 0.3 3.8 3.7 Monthly average wind speed from Table 7 $(22)m = 5.1$ 5 4.9 4.4 Wind Factor (22a)m = (22)m ÷ 4 4.3 3.8 3.7 4 4.3 4.5 4.7	lf no draught lobby, ei	nter 0.05, else e	enter 0							0	(13)		
Influence in mittationInfiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4.5If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.32Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.32Number of sides sheltered1Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed0.3Monthly average wind speed from Table 70.3(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7	Percentage of window	s and doors dr	aught stripped							0	(14)		
Interfactor and the permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaIf based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.32(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.32(18)Number of sides sheltered1(19)Shelter factor(20) = 1 - [0.075 x (19)] =0.92(20)Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.3(21)Infiltration rate modified for monthly wind speed0.3(21)0.3(21)Monthly average wind speed from Table 7(22)m=5.154.94.44.33.83.744.34.54.7Wind Factor (22a)m = (22)m ÷ 4	Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)		
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = 1 (19) (20) (20) (20) (20) (20) (20) (21) (21) (21) (21) (21) (21) (21) (21										0	(16)		
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 1 (19) Number of sides sheltered 1 (19) Shelter factor (20) = 1 - [0.075 x (19)] = 0.92 (20) Infiltration rate incorporating shelter factor (21) = (18) x (20) = 0.3 (21) Infiltration rate modified for monthly wind speed 0.3 (21) 0.3 (21) Infiltration rate modified for monthly wind speed 0.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7				•	•	•	etre of e	envelope	area	4.5	(17)		
Number of sides sheltered1Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.92 Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.3 Infiltration rate modified for monthly wind speed 0.3 (21) Infiltration rate modified for monthly wind speed 0.3 (21) Monthly average wind speed from Table 7 $(22)m =$ 5.1 5 $(22)m =$ 5.1 5 4.9 4.4 4.3 Wind Factor (22a)m = (22)m ÷ 4 4.3 3.8 3.7 4	•						:	I		0.32	(18)		
Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $(20) = 2$ $(21) = (18) \times (20) \times (21) \times ($			on lest has been d	one or a deg	gree all pei	теаршу	is being u	sea		1	7(19)		
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.3 (21) Infiltration rate modified for monthly wind speed $\boxed{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}$ Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4		04			(20) = 1 -	0.075 x (1	9)] =						
Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7	Infiltration rate incorpora	ating shelter fac	tor		(21) = (18)	x (20) =					4		
Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ 4.4 4.3 4.6 4.7	Infiltration rate modified	for monthly win	d speed								_		
$(22)m = \begin{bmatrix} 5.1 & 5 & 4.9 & 4.4 & 4.3 & 3.8 & 3.8 & 3.7 & 4 & 4.3 & 4.5 & 4.7 \end{bmatrix}$ Wind Factor (22a)m = (22)m ÷ 4	Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Wind Factor (22a)m = (22)m \div 4	Monthly average wind s	peed from Tabl	e 7										
	(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7				
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	Wind Factor (22a)m = (2	22)m ÷ 4											
	(22a)m= 1.27 1.25	1.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18				

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_		
	0.38	0.37	0.36	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.33	0.35			
		<i>ctive air c</i> al ventila		rate for t	he applic	cable ca	se								(23a)
		eat pump i		endix N. (2	3b) = (23a) x Fmv (e	equation (N	N5)), othe	rwise (23b) = (23a)				0	(23a)
		h heat reco) (200)				0	(230) (23c)
		ed mecha	•		Ū		,		,	2h)m + ('	23h) x ['	1 – (23c)	L_{100}	-	(200)
(24a)m=				0	0	0	0			0	0	0]	1	(24a)
		ed mecha	ı anical ve	ntilation	without	heat rec	L Coverv (N	и ЛV) (24b	m = (22)	1 2b)m + (;	1 23b)		1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	positiv	e input v	ventilatio	n from o	outside				J		
,		n < 0.5 ×			-	•				.5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,		ventilation = 1, the			•					0.5]					
(24d)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56]		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (240	c) or (24	d) in bo	x (25)	_	-	_	_		
(25)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56			(25)
3. He	at losse	s and he	eat loss i	paramete	er:							_			_
ELEN		Gros	ss	Openin		Net Ar	ea	U-val		AXU		k-value	е		Xk
ELEN		Gros area			gs	Net Ar A ,r		U-val W/m2		A X U (W/ł	<)	k-value kJ/m²-			X k J/K
Doors		area		Openin	gs		m² x	W/m2	2K		<)				
Doors Windo	ws Type	area		Openin	gs	A ,n	m² x	W/m2	2K	(VV/ł	<)				J/K
Doors Windo		area		Openin	gs	A ,r	m ² x	W/m2	2 K = [.0.04] = [(W/H	<)				J/K (26)
Doors Windo Windo	ws Type	area e 1 e 2		Openin	gs	A ,r 2.1 0.91	m ² x x 1. x 1.	W/m2 0.8 /[1/(1.2)+	2K = [• 0.04] = [• 0.04] = [(W/H 1.68 1.04	<)				J/K (26) (27)
Doors Windo Windo Windo	ws Type ws Type	area e 1 e 2 e 3		Openin	gs	A ,n 2.1 0.91 0.97	n ² x x1. x1. x1.	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+	2K = [• 0.04] = [• 0.04] = [• 0.04] = [(W/H 1.68 1.04 1.11	<)				J/K (26) (27) (27)
Doors Windov Windov Windov Windov	ws Type ws Type ws Type	area e 1 e 2 e 3 e 4		Openin	gs	A ,r 2.1 0.91 0.97 0.79	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{array}{c} 2 \\ \hline \\ 0.04 \\ \hline \\ \end{array} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/H 1.68 1.04 1.11 0.9					J/K (26) (27) (27) (27)
Doors Windov Windov Windov Windov	ws Type ws Type ws Type ws Type	area = 1 = 2 = 3 = 4 = 5		Openin	gs	A ,r 2.1 0.91 0.97 0.79 2.8	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$2K = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(W/k 1.68 1.04 1.11 0.9 3.21					J/K (26) (27) (27) (27) (27)
Doors Windoo Windoo Windoo Windoo Windoo	ws Type ws Type ws Type ws Type ws Type	area = 1 = 2 = 3 = 4 = 5 = 6		Openin	gs	A ,r 2.1 0.91 0.97 0.79 2.8 2.8	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{array}{c} 2 \\ \hline \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	(W/k 1.68 1.04 1.11 0.9 3.21 3.21					J/K (26) (27) (27) (27) (27) (27)
Doors Windoo Windoo Windoo Windoo Windoo	ws Type ws Type ws Type ws Type ws Type ws Type	area = 1 = 2 = 3 = 4 = 5 = 6 = 7		Openin	gs	A ,r 2.1 0.91 0.97 0.79 2.8 2.8 0.78	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{array}{c} 2 \\ \hline \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	(W/k 1.68 1.04 1.11 0.9 3.21 3.21 0.89					J/K (26) (27) (27) (27) (27) (27) (27)
Doors Windoo Windoo Windoo Windoo Windoo	ws Type ws Type ws Type ws Type ws Type ws Type ws Type	area = 1 = 2 = 3 = 4 = 5 = 6 = 7	(m²)	Openin	gs	A ,r 2.1 0.91 0.97 0.79 2.8 2.8 0.78 2.8	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{array}{c} 2 \\ \hline \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	(W/k 1.68 1.04 1.11 0.9 3.21 3.21 0.89 3.21					J/K (26) (27) (27) (27) (27) (27) (27) (27)
Doors Windov Windov Windov Windov Windov Windov	ws Type ws Type ws Type ws Type ws Type ws Type ws Type fype1	area = 1 = 2 = 3 = 4 = 5 = 6 = 7 = 8	(m²) 3	Openin	gs	A ,r 2.1 0.91 0.97 0.79 2.8 2.8 0.78 2.8 2.8 2.8	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+	$2 \mathbf{K} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.0$	(W/k 1.68 1.04 1.11 0.9 3.21 3.21 0.89 3.21 2.86					J/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windo Windo Windo Windo Windo Windo	ws Type ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2	area = 1 = 2 = 3 = 4 = 5 = 6 = 7 = 8 28.1	(m²) 3 46	Openin m	gs	A ,r 2.1 0.91 0.97 0.79 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ 0.12	$2K = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(W/k 1.68 1.04 1.11 0.9 3.21 3.21 0.89 3.21 2.86 3.38					J/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windov Windov Windov Windov Windov Windov Windov Windov	ws Type ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3	area = 1 = 2 = 3 = 4 = 5 = 6 = 7 = 8 28.1 21.4	(m²) 3 16 3	Openin m	gs 2	A ,r 2.1 0.91 0.97 0.79 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.5 28.13 21.46	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.11	$\begin{array}{c} 2 \\ \\ & 0.04 \\ \\ \\ & 0.04 \\ \\ \\ \\ \\ & 0.04 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/A 1.68 1.04 1.11 0.9 3.21 3.21 0.89 3.21 2.86 3.38 2.32					J/K (26) (27) (27) (27) (27) (27) (27) (27) (27

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	50.26
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	0
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: Medium	250

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

(33) (34) (35)

can be i	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	əs : S (L	x Y) cal	culated u	using Ap	pendix l	<						23.43	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			73.68	(37)
Ventila	ation hea	at loss ca	alculated	monthly	ý	-		_	(38)m	= 0.33 × (25)m x (5)	_		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	97.45	96.97	96.5	94.31	93.9	91.99	91.99	91.63	92.72	93.9	94.73	95.6		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	171.13	170.65	170.19	167.99	167.58	165.67	165.67	165.32	166.41	167.58	168.41	169.28		
										-	Sum(39)1.	12 /12=	167.99	(39)
	· · ·	· · · · ·	HLP), W/	1					· · ·	= (39)m ÷			1	
(40)m=	0.96	0.96	0.96	0.94	0.94	0.93	0.93	0.93	0.93	0.94	0.95	0.95		
Numb	er of day	/s in moi	nth (Tab	le 1a)						Average =	Sum(40)₁.	12 /12=	0.94	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
								•		•				
4. Wa	ater hea	tina ener	rav reau	irement:								kWh/ye	ear:	
		ipancy, l		[1 - oxp	(_0_0003		-130)2)] + 0.0	1013 v (TEA -13		97		(42)
	A £ 13.		+ 1.70 X	li - evh	(-0.0000	,43 x (11	A -13.9)2)]+0.0	, 10 10 X (II A -13.	.5)			
								(25 x N)				4.81		(43)
				usage by : r day (<mark>all</mark> w		-	7	to achieve	a water us	se target o	f			
normon														
11-4	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	- -			ach month						1				
(44)m=	115.29	111.1	106.91	102.72	98.52	94.33	94.33	98.52	102.72	106.91	111.1	115.29		-
Enerav	content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd.r	n x nm x D)))))))))))))))))))			<mark>m(44)</mark> 112 = ables 1b. 1		1257.76	(44)
(45)m=	170.98	149.54	154.31	134.53	129.09	111.39	103.22	118.45	119.86	139.69	152.48	165.58		
()				101100							m(45) ₁₁₂ =		1649.12	(45)
lf instan	taneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46			(-)			
(46)m=	25.65	22.43	23.15	20.18	19.36	16.71	15.48	17.77	17.98	20.95	22.87	24.84		(46)
	storage													
		, ,					•	within sa	ame ves	sel		1		(47)
	•	-		nk in dw	-			. ,			47)			
	storage		not wate	er (this in	iciudes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
			m Table			(" ddy)!					0		(49)
				_~ , kWh/y∉	ar			(48) x (49)	1 =			1		(50)
				cylinder l		or is not		(10) x (10)	, –			I		(00)
				om Tabl							0.	03		(51)
	-	-	ee secti	on 4.3										
		from Ta		0								93		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)

Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m = 3.03 2.74 3.03 2.93	(56) (57) (58) (59)
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 = 3.03 2.74 3.03 2.93 2.93 3.03 2.93 2.93 3.03 2.93 2.93 2.93 2.93 2.93 2.93 2.93 2.9	(57) (58) (59)
	(58)
Primary circuit loss (annual) from Table 3 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 heating and a cylinder thermostat) (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 Combi loss calculated for each month (61)m = (60) \div 365 × (41)m (61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(58)
Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) $(59)m = 23.26 \ 21.01 \ 23.26 \ 22.51 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 2$	(59)
Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) $(59)m = 23.26 \ 21.01 \ 23.26 \ 22.51 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 2$	
$ \begin{array}{c} (59)m= \hline 23.26 & 21.01 & 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & 23.26 & 22.51 & 23.26 & 22.51 & 23.26 \\ \hline \\ Combi loss calculated for each month (61)m = (60) \div 365 \times (41)m \\ \hline (61)m= \hline 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \hline \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0$	
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$ (61)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	
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 = 197.27 173.29 180.6 159.98 155.38 136.84 129.51 144.74 145.31 165.98 177.92 191.88 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)	1.2.1
(62)m=197.27173.29180.6159.98155.38136.84129.51144.74145.31165.98177.92191.88Solar 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)	(61)
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)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	(62)
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(22)
	(63)
Output from water heater	
(64)m= 197.27 173.29 180.6 159.98 155.38 136.84 129.51 144.74 145.31 165.98 177.92 191.88	
Output from water heater (annual) ₁₁₂ 1958.69	(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= 75.46 66.53 69.92 62.74 61.53 55.05 52.93 57.99 57.86 65.06 68.71 73.67	(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 (20) 170 20 17	(66)
(66)m= 178.39	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	(67)
(67)m= 77.92 69.21 56.29 42.61 31.85 26.89 29.06 37.77 50.69 64.37 75.13 80.09	(07)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 521.83 527.24 513.6 484.55 447.88 413.41 390.39 384.97 398.62 427.67 464.34 498.8	(68)
	(00)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 55.81 55.81 55.81 55.81 55.81 55.81 55.81	(69)
	(00)
Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0	
	(70)
Losses e.g. evaporation (negative values) (Table 5) (71)m= -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93	(70)
Water heating gains (Table 5) (72)m= 101.43 99 93.98 87.14 82.7 76.45 71.14 77.95 80.37 87.44 95.43 99.01	(70) (71)
	(71)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 816.45 810.73 779.13 729.57 677.71 632.03 605.86 615.97 644.95 694.75 750.17 793.18	
6. Solar gains:	(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)	
North 0.9	x 1	x	0.97	×	10.63	x	0.9	x	0.9	=	37.6	(74)
North 0.9	x 1	x	0.79	x	10.63	x	0.9	x	0.9	=	18.37	(74)
North 0.9	x 1	x	2.8	x	10.63	x	0.9	x	0.9	=	21.7	(74)
North 0.9	x 1	x	0.97	x	20.32	x	0.9	x	0.9	=	71.85	(74)
North 0.9	x 1	x	0.79	x	20.32	x	0.9	x	0.9	=	35.11	(74)
North 0.9	x 1	x	2.8	x	20.32	x	0.9	x	0.9	=	41.48	(74)
North 0.9	x 1	x	0.97	x	34.53	x	0.9	x	0.9	=	122.09	(74)
North 0.9	x 1	x	0.79	x	34.53	x	0.9	x	0.9	=	59.66	(74)
North 0.9	x 1	x	2.8	×	34.53	x	0.9	x	0.9	=	70.48	(74)
North 0.9	x 1	x	0.97	x	55.46	x	0.9	x	0.9	=	196.1	(74)
North 0.9	x 1	x	0.79	x	55.46	x	0.9	x	0.9	=	95.83	(74)
North 0.9	x 1	x	2.8	x	55.46	x	0.9	x	0.9	=	113.21	(74)
North 0.9	x 1	x	0.97	x	74.72	x	0.9	x	0.9	=	264.17	(74)
North 0.9	x 1	x	0.79	x	74.72	x	0.9	x	0.9	=	129.09	(74)
North 0.9	x 1	x	2.8	x	74.72	x	0.9	x	0.9	=	152.51	(74)
North 0.9	x 1	x	0.97	×	79.99	х	0.9	X	0.9	=	282.8	(74)
North 0.9	x 1	x	0.79	х	79.99	x	0.9	x	0.9	=	138.19	(74)
North 0.9	x 1	x	2.8	х	79.99	×	0.9	х	0.9	=	163.27	(74)
North 0.9	x 1	x	0.97	x	74.68	×	0.9	x	0.9	=	2 <mark>64.03</mark>	(74)
North 0.9	x 1	x	0.79	×	74.68	х	0.9	x	0.9	=	129.02	(74)
North 0.9	x 1	x	2.8	x	74.68	х	0.9	х	0.9	=	152.43	(74)
North 0.9	x 1	x	0.97	×	59.25	x	0.9	x	0.9	=	209.47	(74)
North 0.9	× 1	x	0.79	×	59.25	x	0.9	x	0.9	=	102.36	(74)
North 0.9	· · · · · · · · · · · · · · · · · · ·	x	2.8	x	59.25	x	0.9	x	0.9	=	120.93	(74)
North 0.9		x	0.97	x	41.52	x	0.9	x	0.9	=	146.79	(74)
North 0.9		x	0.79	x	41.52	x	0.9	x	0.9	=	71.73	(74)
North 0.9		x	2.8	x	41.52	x	0.9	x	0.9	=	84.74	(74)
North 0.9		X	0.97	×	24.19	x	0.9	X	0.9	=	85.53	(74)
North 0.9		X	0.79	X	24.19	х	0.9	X	0.9	=	41.79	(74)
North 0.9		X	2.8	×	24.19	X	0.9	X	0.9	=	49.38	(74)
North 0.9		X	0.97	X	13.12	х	0.9	X	0.9	=	46.38	(74)
North 0.9		X	0.79	X	13.12	х	0.9	X	0.9	=	22.66	(74)
North 0.9		X	2.8	×	13.12	x	0.9	X	0.9	=	26.78	(74)
North 0.9		X	0.97	×	8.86	x	0.9	X	0.9	=	31.34	(74)
North 0.9		X	0.79	×	8.86	X	0.9	x	0.9	=	15.32	(74)
North 0.9		X	2.8	×	8.86	X	0.9	X	0.9	=	18.09	(74)
East 0.9		X	2.8	×	19.64	X	0.9	X	0.9	=	80.18	(76)
East 0.9		X	2.5	×	19.64	x	0.9	x	0.9	=	71.59	(76)
East 0.9	x 2	x	2.8	x	38.42	x	0.9	x	0.9	=	156.85	(76)

East	0.9x	0	v	0.5		20.40		0.0	v	0.0		140.04	(76)
East		2	X	2.5	X	38.42	X	0.9	x	0.9	=	140.04	
East	0.9x	2	X	2.8	X	63.27	X	0.9	x	0.9	=	258.31	(76)
East	0.9x	2	X	2.5	X	63.27	X	0.9	x	0.9	=	230.63	(76)
	0.9x	2	x	2.8	X	92.28	X	0.9	x	0.9	=	376.72	(76)
East	0.9x	2	X	2.5	X	92.28	X	0.9	x	0.9	=	336.36	(76)
East	0.9x	2	X	2.8	X	113.09	X	0.9	x	0.9	=	461.69	(76)
East	0.9x	2	X	2.5	X	113.09	X	0.9	X	0.9	=	412.22	(76)
East	0.9x	2	X	2.8	x	115.77	X	0.9	X	0.9	=	472.62	(76)
East	0.9x	2	X	2.5	x	115.77	X	0.9	x	0.9	=	421.98	(76)
East	0.9x	2	X	2.8	X	110.22	X	0.9	x	0.9	=	449.95	(76)
East	0.9x	2	x	2.5	x	110.22	x	0.9	x	0.9	=	401.75	(76)
East	0.9x	2	x	2.8	x	94.68	x	0.9	X	0.9	=	386.5	(76)
East	0.9x	2	x	2.5	x	94.68	x	0.9	x	0.9	=	345.09	(76)
East	0.9x	2	x	2.8	x	73.59	x	0.9	x	0.9	=	300.42	(76)
East	0.9x	2	x	2.5	x	73.59	x	0.9	x	0.9	=	268.23	(76)
East	0.9x	2	x	2.8	x	45.59	x	0.9	x	0.9	=	186.11	(76)
East	0.9x	2	x	2.5	x	45.59	x	0.9	x	0.9	=	166.17	(76)
East	0.9x	2	x	2.8	X	24.49	х	0.9	х	0.9	=	99.97	(76)
East	0.9x	2	x	2.5	х	24.49	x	0.9	x	0.9	=	89.26	(76)
East	0.9x	2	x	2.8	x	16.15	×	0.9	x	0.9	=	65.94	(76)
East	0.9x	2	x	2.5	x	16.15	x	0.9	x	0.9	=	58.87	(76)
South	0.9x	1	x	0.91	x	46.7 <mark>5</mark>	х	0.9	x	0.9	=	62.03	(78)
South	0.9x	1	x	0.78	x	46 <mark>.75</mark>	x	0.9	x	0.9	=	53.17	(78)
South	0.9x	1	x	2.8	x	46.75	x	0.9	x	0.9	=	1 <mark>90.86</mark>	(78)
South	0.9x	1	x	0.91	x	76.57	x	0.9	x	0.9	=	101.59	(78)
South	0.9x	1	x	0.78	x	76.57	x	0.9	x	0.9	=	87.08	(78)
South	0.9x	1	x	2.8	x	76.57	x	0.9	x	0.9	=	312.58	(78)
South	0.9x	1	x	0.91	x	97.53	x	0.9	x	0.9	=	129.41	(78)
South	0.9x	1	x	0.78	x	97.53	x	0.9	x	0.9	=	110.92	(78)
South	0.9x	1	x	2.8	x	97.53	x	0.9	x	0.9	=	398.17	(78)
South	0.9x	1	x	0.91	x	110.23	x	0.9	x	0.9	=	146.26	(78)
South	0.9x	1	x	0.78	x	110.23	x	0.9	x	0.9	=	125.36	(78)
South	0.9x	1	x	2.8	x	110.23	x	0.9	x	0.9	=	450.02	(78)
South	0.9x	1	x	0.91	x	114.87	x	0.9	x	0.9	=	152.41	(78)
South	0.9x	1	x	0.78	x	114.87	x	0.9	x	0.9	=	130.64	(78)
South	0.9x	1	x	2.8	x	114.87	x	0.9	x	0.9	=	468.95	(78)
South	0.9x	1	x	0.91	x	110.55	x	0.9	x	0.9	=	146.67	(78)
South	0.9x	1	x	0.78	x	110.55	x	0.9	x	0.9	=	125.72	(78)
South	0.9x	1	x	2.8	x	110.55	x	0.9	x	0.9	=	451.3	(78)
South	0.9x	1	x	0.91	x	108.01	x	0.9	x	0.9	=	143.31	(78)
South	0.9x	1	x	0.78	x	108.01	x	0.9	x	0.9	=	122.84	(78)

South	0.9x	1	x	2.8	x	108.01	x	0.9	x	0.9	=	440.95	(78)
South	0.9x	1	x	0.91	x	104.89	x	0.9	x	0.9	=	139.17	(78)
South	0.9x	1	x	0.78	x	104.89	x	0.9	x	0.9	=	119.29	(78)
South	0.9x	1	×	2.8	×	104.89	x	0.9	x	0.9	=	428.22	(78)
South	0.9x	1	x	0.91	x	101.89	x	0.9	x	0.9	=	135.18	(78)
South	0.9x	1	x	0.78	x	101.89	x	0.9	x	0.9	=	115.87	(78)
South	0.9x	1	x	2.8	x	101.89	x	0.9	x	0.9	=	415.94	(78)
South	0.9x	1	x	0.91	x	82.59	x	0.9	x	0.9	=	109.57	(78)
South	0.9x	1	x	0.78	x	82.59	x	0.9	x	0.9	=	93.92	(78)
South	0.9x	1	x	2.8	x	82.59	x	0.9	x	0.9	=	337.15	(78)
South	0.9x	1	x	0.91	x	55.42	x	0.9	x	0.9	=	73.53	(78)
South	0.9x	1	x	0.78	x	55.42	x	0.9	x	0.9	=	63.02	(78)
South	0.9x	1	x	2.8	x	55.42	x	0.9	x	0.9	=	226.23	(78)
South	0.9x	1	x	0.91	x	40.4	x	0.9	x	0.9	=	53.6	(78)
South	0.9x	1	x	0.78	x	40.4	x	0.9	x	0.9	=	45.94	(78)
South	0.9x	1	×	2.8	×	40.4	x	0.9	x	0.9	=	164.92	(78)
	-		-		-		-						-

Sola <mark>r g</mark>	jains in	watts, ca	alculated	for eac	h month			(83)m = <mark>S</mark>	um(74)m .	<mark>(8</mark> 2)m				
(83)m=	535.5	946.57	1379.66	1839.87	2171.67	<mark>22</mark> 02.56	2104.27	1851.05	1538.9	10 <mark>69.62</mark>	647.84	454.02		(83)
Tota <mark>l g</mark>	ains – ii	nternal a	ind solar	⁻ (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	<mark>13</mark> 51.95	1757. <mark>3</mark>	2158.8	2569.44	2849.38	2834.59	2710.14	2467.02	2183.86	17 <mark>64.37</mark>	1398.01	1247.2		(84)
7 . Me	an inter	nal temp	oerature	(heating	season)								
		during h					from Tab	ole 9 Th	1 (°C)				21	(85)
		tor for g	0.			Ŭ			. ()			l	2.	()
Ounse	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(96)m	0.99	0.97	0.9	0.74	0.54	0.37	0.27	0.31	0.52	0.85	0.98	1		(86)
(86)m=	0.99	0.97	0.9	0.74	0.54	0.37	0.27	0.31	0.52	0.85	0.96	I		(00)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	20.17	20.43	20.72	20.93	20.99	21	21	21	20.99	20.87	20.47	20.12		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	20.12	20.12	20.12	20.13	20.13	20.14	20.14	20.14	20.14	20.13	20.13	20.12		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	0.99	0.96	0.88	0.7	0.49	0.32	0.22	0.25	0.46	0.81	0.97	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	19.02	19.4	19.79	20.06	20.12	20.14	20.14	20.14	20.13	20	19.46	18.96		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.42	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.5	19.83	20.18	20.42	20.49	20.5	20.5	20.5	20.49	20.36	19.88	19.44		(92)
Apply	adjustn	nent to tl	he mear	internal	tempera	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.5	19.83	20.18	20.42	20.49	20.5	20.5	20.5	20.49	20.36	19.88	19.44		(93)
8. Sp	ace hea	ting requ	uirement											
					re obtain	ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
		factor fo					•		-	. (,			
the ut	liisalion		Ji yanis		ible 9a									

Utilisa	ation fac	tor for a	ains, hm	n:										
(94)m=	0.99	0.96	0.88	0.71	0.51	0.34	0.24	0.27	0.48	0.82	0.97	0.99		(94)
Usefu	l gains,	hmGm	, W = (9	۱ 4)m x (8	ـــــــــــــــــــــــــــــــــــــ			1	1				1	
			1908.36	<u>, </u>	, 1457.85	976.35	646.14	677.85	1056.32	1448.83	1357.43	1238.1		(95)
Month	nly avera	age exte	ernal terr	perature	e from Ta	able 8							1	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an interr	nal tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	•		I	
(97)m=	2601.75	2547.71	2327.81	1935.45	1472.3	977.46	646.23	678.06	1063.92	1635.75	2152.59	2580.67		(97)
Space	e heatin	g requir	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	-	-	
(98)m=	940.71	576.81	312.07	75.13	10.75	0	0	0	0	139.07	572.51	998.87		
								Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	3625.93	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								20.37	(99)
8c. Sp	bace co	oling rea	quiremer	nt										
Calcu	lated fo	r June, .	July and	August.	See Ta	ble 10b	i				i			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rate	e Lm (ca	alculated	using 2	5°C inter	nal tem	perature	and exte	ernal ten	nperatur	e from T	able 10)	1	
(100)m=	0	0	0	0	0	1557.3	1225.96	1256.41	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	oss hm											
(101)m=		0	0	0	0	0.99	1	0.99	0	0	0	0		(101)
		mLm (V	Vatts) =	(100)m >	(101) <mark>m</mark>								1	
(102)m=		0	0	0	0	1537.4	1220.07	1245.44	0	0	0	0		(102)
			1	for appli	icable w	1			10)					
(103)m=		0	0	0	0		2710.14	2467.02	0	0	0	0		(103)
-		/		r month, < 3 × (98		dwelling,	continue	ous (kN	h) = 0.0	24 x [(10)3)m – (102)m]:	x (41)m	
(104)m=		0	0	0	0	933.98	1108.61	908.85	0	0	0	0		
I			Į	I					Tota	= Sum(104)	=	2951.44	(104)
Coolec	fraction	า							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)	i		i				i			
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
									Tota	l = Sum((104)	=	0	(106)
			ment for	month =	= (104)m	1	i	1		i	i	i	1	
(107)m=	0	0	0	0	0	233.49	277.15	227.21	0	0	0	0		_
									Tota	= Sum((107)	=	737.86	(107)
Space	cooling	require	ment in l	«Wh/m²/	year				(107)) ÷ (4) =			4.15	(108)
9b. En	ergy rec	luiremer	nts – Co	mmunity	heating	scheme	;							
											unity sch	neme.		_
Fractio	n of spa	ace heat	from se	condary	/suppler	nentary l	heating ((Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	v system	1 – (30	1) =						1	(302)
The com	nmunity so	heme ma	y obtain h	eat from se	everal sou	rces. The p	procedure	allows for	CHP and	up to four	other heat	sources; t	he latter	
			-	mal and wa		rom powe	r stations.	See Appel	ndix C.					
Fractio	n of hea	at from C	Commun	ity boile	rs								1	(303a)

Fraction of total space heat from Community boilers

1

	nergy Emission facto Wh/year kg CO2/kWh	r Emissions kg CO2/year	
12b. CO2 Emissions – Community heating scheme			
SAP rating (section12)		87.65	(358)
Energy cost factor (ECF) [(355) x (356)] ÷ [(4) + 45.0] =		0.89	(357)
Energy cost deflator (Table 12)		0.42	(356)
11b. SAP rating - Community heating scheme			
Total energy cost = (340a)(342e) + (345)(354) =		470.07	(355)
Additional standing charges (Table 12)		120	(351)
Energy for lighting (332)	13.19 × 0.01 =	72.61	(350)
Pumps and fans (331)	13.19 × 0.01 =	= 0	(349)
Space cooling (community cooling system) (315)	Fuel Price 13.19 × 0.01 =	= 28.84	(348)
Water heating from CHP (310a) x	4.24 × 0.01 =	87.2	(342a)
Space heating from CHP (307a) x	4.24 × 0.01 =		(340a)
Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	_
10b. Fuel costs – Community heating scheme			
Energy for lighting (calculated in Appendix L)		550.46	(332)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	0	(331)
pump for solar water heating		0	(330g)
warm air heating system fans		0	(330b)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outsid	e	0	(330a)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	218.63	(315)
Cooling System Energy Efficiency Ratio		3.38	(314)
Electricity used for heat distribution 0.0	01 × [(307a)(307e) + (310a)(310e)] =	= 58.64	(313)
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	2056.62	(310a)
Water heating Annual water heating requirement		1958.69	7
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Efficiency of secondary/supplementary heating system in % (from Tab	le 4a or Appendix E)	0	(308
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	3807.23	(307a)
Annual space heating requirement		3625.93	
Space heating		kWh/year	
Distribution loss factor (Table 12c) for community heating system		1.05	`´´´](306)
Factor for control and charging method (Table 4c(3)) for community he	eating system	1	(305)

CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)	t CHP) CHP using two fuels repeat (363) to (366) for the seco	ond fuel	95	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0] = [1333.25	(367)
Electrical energy for heat distribution	[(313) x	0.52] = [30.43	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	= [1363.69	(373)
CO2 associated with space heating (secondary)	(309) x	0] = [0	(374)
CO2 associated with water from immersion heater or ins	stantaneous heater (312) x	0.52] = [0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			1363.69	(376)
CO2 associated with space cooling	(315) x	0.52] = [113.47	(377)
CO2 associated with electricity for pumps and fans withi	in dwelling (331)) x	0.52] = [0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52] = [285.69	(379)
Total CO2, kg/year sum of (376)(382	2) =			1762.84	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				9.9	(384)
El rating (section 14)				89.41	(385)
13b. Primary Energy – Community heating scheme					
	Energy	Primary	P.	Enerav	
Energy from other sources of space and water heating (Efficiency of heat source 1 (%)	Energy kWh/year (not CHP) CHP using two fuels repeat (363) to (Primary factor 366) for the seco	kV	Energy Vh/year	(367a)
	kWh/year	factor	kV	Vh/year](367a)](367)
Efficiency of heat source 1 (%) If there is a	kWh/year not CHP) CHP using two fuels repeat (363) to (factor 366) for the seco	kV and fuel	95	
Efficiency of heat source 1 (%) If there is a Energy associated with heat source 1	kWh/year (not CHP) CHP using two fuels repeat (363) to ([(307b)+(310b)] x 100 ÷ (367b) x	factor 366) for the seco	kV and fuel [] = [95 7530.42	(367)
Efficiency of heat source 1 (%) If there is a Energy associated with heat source 1 Electrical energy for heat distribution	kWh/year (not CHP) CHP using two fuels repeat (363) to ([(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372)	factor (366) for the second (0)	kV ond fuel = = =	Vh/year 95 7530.42 180.02	(367) (372)
Efficiency of heat source 1 (%) If there is a Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems	kWh/year (not CHP) CHP using two fuels repeat (363) to ([(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372)	factor (366) for the second (0)	kV ond fuel = = =	Vh/year 95 7530.42 180.02 7710.44	(367) (372) (373)
Efficiency of heat source 1 (%) If there is a Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified othe</i>	kWh/year (not CHP) CHP using two fuels tepeat (363) to ([(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) prwise, see C7 in Appendix C, (309) x	factor 366) for the seco	kV ond fuel [] = [] = [Vh/year 95 7530.42 180.02 7710.44 7710.44	(367) (372) (373) (373)
Efficiency of heat source 1 (%) If there is a Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified othe</i> Energy associated with space heating (secondary)	kWh/year (not CHP) CHP using two fuels tepeat (363) to ([(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) prwise, see C7 in Appendix C, (309) x	factor 366) for the seco	who fuel Image: Image of the second secon	Vh/year 95 7530.42 180.02 7710.44 7710.44 0	(367) (372) (373) (373) (373) (374)
Efficiency of heat source 1 (%) If there is a Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified othe</i> Energy associated with space heating (secondary) Energy associated with water from immersion heater or	kWh/year (not CHP) CHP using two fuels repeat (363) to ([(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (363)(366) + (368)(372) (309) x instantaneous heater(312) x	factor 366) for the seco	who fuel Image: Image of the second secon	Vh/year 95 7530.42 180.02 7710.44 7710.44 0 0	(367) (372) (373) (373) (373) (374) (375)
Efficiency of heat source 1 (%) If there is a Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified othe</i> Energy associated with space heating (secondary) Energy associated with water from immersion heater or Total Energy associated with space and water heating	kWh/year (not CHP) CHP using two fuels tepeat (363) to ($[(307b)+(310b)] \times 100 \div (367b) \times$ $[(313) \times$ (363)(366) + (368)(372) (363)(366) + (368)(372) (309) \times instantaneous heater(312) \times (373) + (374) + (375) = $(315) \times$	factor 366) for the seco 0 0 3.07	who fuel [Vh/year 95 7530.42 180.02 7710.44 7710.44 0 0 0 7710.44	(367) (372) (373) (373) (373) (374) (375) (376)
Efficiency of heat source 1 (%) If there is a Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified othe</i> Energy associated with space heating (secondary) Energy associated with water from immersion heater or Total Energy associated with space and water heating Energy associated with space cooling	kWh/year (not CHP) CHP using two fuels repeat (363) to ([(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (363)(366) + (368)(372) (309) x instantaneous heater(312) x (373) + (374) + (375) = (315) x	factor 366) for the seco 0 0 3.07 3.07	kV and fuel	Vh/year 95 7530.42 180.02 7710.44 7710.44 0 0 7710.44 671.18	(367) (372) (373) (373) (373) (374) (375) (376) (377)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP			Stroma Softwa Address:	re Ver			Versio	on: 1.0.3.11	
	28 Redington F			Address.	Flat 5					
Address : 1. Overall dwelling dime	•	(uau, 111757)	ΧD							
Ground floor					(1a) x		ight(m) 2.9	(2a) =	Volume(m³) 437.9	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d))+(1e)+(1n	n) -	151	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	437.9	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	main heating	secondar heating + 0 + 0	у] + [_] + [_	0 0] = [] = [total 0 0		40 = 20 =	m ³ per hour	(6a) (6b)
		0		0	JĽ					
Number of intermittent fa					Ļ	5		10 =	50	(7a)
Number of passive vents						0	X 7	10 =	0	(7b)
Number of flueless gas fi						0	X 4	40 = Air ch	o nanges per ho	(7c) ur
Infiltration due to chimne					en linue fu	50		÷ (5) =	0.11	(8)
If a pressurisation test has to Number of storeys in the Additional infiltration Structural infiltration: 0	he dw <mark>elling</mark> (ns)							-1]x0.1 =	0	(9) (10) (11)
if both types of wall are p deducting areas of openii If suspended wooden t	resent, use the value ngs); if equal user 0.3	corresponding to 5	the greate	er wall area	a (after					_
If no draught lobby, en		,	i (Scale	u), cisc					0	(12) (13)
Percentage of window									0	(13) (14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in	n cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	4.5	(17)
If based on air permeabil	lity value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.34	(18)
Air permeability value applie		est has been don	e or a deg	ree air pei	meability	is being u	sed			_
Number of sides sheltere	ed			(20) = 1 - [0 075 v (1	0)1			1	(19)
Shelter factor	ting aboltor factor			(20) = (18)		9)] =			0.92	(20)
Infiltration rate incorporat	0	nood		(21) = (10)	x (20) -				0.31	(21)
Infiltration rate modified f		Vay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		- 1	•••					- • •		
(22)m= 5.1 5	- i i i	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
		1					I	1	I	
Wind Factor $(22a)m = (2)$ (22a)m 1.27 1.25	<u> </u>	.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
		0.00	0.00	0.02	•				l	

, lajaot	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.4	0.39	0.38	0.35	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37		
	ate effecte echanica		-	rate for t	he appli	cable ca	se							(220)
	aust air he			endix N. (2	3b) = (23a) x Fmv (e	auation (N5)), other	wise (23b) = (23a)				
	anced with) (200)				
			-	-	-					2b)m + (2	23h) x ['	1 – (23c)		(230)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0]	(24a)
		d mecha	ı anical ve	ntilation	without	heat rec	overv (ľ	MV) (24b)m = (22	2b)m + (2	23b)	1	J	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	ouse ex	tract ver	tilation of	or positiv	e input v	ventilatio	on from c	outside				4	
i	if (22b)rr	า < 0.5 ×	(23b), t	hen (24	c) = (23b); otherv	vise (24	c) = (22b	o) m + 0.	.5 × (23b)	-	_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,	natural v if (22b)m									0.5]				
(24d)m=	r Ó T	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57]	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (240	c) or (24	d) in boy	(25)				-	
(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
3 He	at losses	s and he	at loss i	naramete	ər:									
		Gros		Openin		Net Ar	ea	U-valı	Je	AXU		k-value	<u> </u>	AXk
		area	(m²)	m	12	A ,n		W/m2		(VV/ł	<)	kJ/m ² ·		kJ/K
Doors		area	(m²)	m	12						<)			
	ws Type		(m²)	m	12	A ,n	n ² x	W/m2	K	(VV/ł	<)			kJ/K
Windo	ws Type ws Type	1	(m²)	m	12	A ,n 2.1	n ² x	W/m2	K = 0.04] =	(W/ł 1.68	<) 			kJ/K (26)
Windo Windo		e 1 e 2	(m²)	m	2	A ,n 2.1 0.91	n ² x x x1 x1	W/m2 0.8 /[1/(1.2)+	K 0.04] = 0.04] =	(W/H 1.68 1.04				kJ/K (26) (27)
Windo Windo Windo	ws Type	2 2 3	(m²)	'n	2	A ,n 2.1 0.91 1.54	n ² x x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] = 0.04] =	(W/H 1.68 1.04 1.76				kJ/K (26) (27) (27)
Windo Windo Windo	ws Type ws Type ws Type	2 2 3		m 0	2	A ,n 2.1 0.91 1.54 0.96	n ² x x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] = 0.04] =	(W/ł 1.68 1.04 1.76 1.1				kJ/K (26) (27) (27) (27)
Windo Windo Windo Windo	ws Type ws Type ws Type Type1	1 2 3 4	13		2	A ,n 2.1 0.91 1.54 0.96 2.76	n ² x x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K = 0.04] = 0.04] = 0.04] = 0.04] =	(W/ł 1.68 1.04 1.76 1.1 3.16				kJ/K (26) (27) (27) (27) (27)
Windo Windo Windo Windo Walls	ws Type ws Type ws Type Type1 Type2	2 3 4 34.3	13 3	0		A ,n 2.1 0.91 1.54 0.96 2.76 34.33	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12	K 0.04] = 0.04] = 0.04] = 0.04] = =	(W/k 1.68 1.04 1.76 1.1 3.16 4.12				kJ/K (26) (27) (27) (27) (27) (29)
Windo Windo Windo Windo Walls	ws Type ws Type ws Type Type1 Type2 Type3	1 2 3 4 34.3 34.3	13 3 3	0		A ,n 2.1 0.91 1.54 0.96 2.76 34.33 34.3	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12	K = 0.04] = 0.04] = 0.04] = 0.04] = = =	(W/k 1.68 1.04 1.76 1.1 3.16 4.12 4.12				kJ/K (26) (27) (27) (27) (27) (27) (29) (29)
Windo Windo Windo Windo Walls ⁻ Walls ⁻	ws Type ws Type ws Type Type1 Type2 Type3 Type4	2 2 3 4 34.3 34.3 78.3	13 3 3 14	0 0 2.76		A ,n 2.1 0.91 1.54 0.96 2.76 34.33 34.3 75.54	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12 0.12	K = 0.04] = 0.04] = 0.04] = = = = = =	(W/k 1.68 1.04 1.76 1.1 3.16 4.12 4.12 9.06				kJ/K (26) (27) (27) (27) (27) (29) (29) (29)
Windo Windo Windo Walls ⁻ Walls ⁻ Walls ⁻	ws Type ws Type ws Type Type1 Type2 Type3 Type4 Type5	2 2 3 4 34.3 34.3 78.3 13.3	33 3 34 88	0 0 2.76		A ,n 2.1 0.91 1.54 0.96 2.76 34.33 34.3 34.3 75.54 13.34	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ (1/(1.2)+ 0.12 0.12 0.12 0.12	K 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/k 1.68 1.04 1.76 1.1 3.16 4.12 4.12 9.06 1.6				kJ/K (26) (27) (27) (27) (27) (29) (29) (29) (29) (29)
Windo Windo Windo Walls ⁻ Walls ⁻ Walls ⁻ Walls ⁻	ws Type ws Type Type1 Type2 Type3 Type4 Type5 Type6	1 2 3 4 34.3 34.3 78.3 13.3 20.8	13 3 3 14 18 14	0 0 2.76 0		A ,n 2.1 0.91 1.54 0.96 2.76 34.33 34.3 34.3 75.54 13.34	n ² x x1 x1 x1 x1 x1 x1 x1 x x x x x x x x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12 0.12 0.12 0.12 0.12	K 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W/k 1.68 1.04 1.76 1.1 3.16 4.12 4.12 9.06 1.6 2.26				kJ/K (26) (27) (27) (27) (27) (29) (29) (29) (29) (29) (29) (29) (29
Windo Windo Windo Walls Walls Walls Walls Walls	ws Type ws Type Type1 Type2 Type3 Type4 Type5 Type6	 1 2 3 4 34.3 34.3 78.3 13.3 20.8 13.5 13.3 	13 3 3 14 14 18 14 14 14	0 0 2.76 0 0 0		A ,n 2.1 0.91 1.54 0.96 2.76 34.33 34.3 75.54 13.34 20.88 13.54	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x x x x x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12 0.12 0.12 0.12 0.11	K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W/k 1.68 1.04 1.76 1.76 1.76 1.76 1.76 4.12 4.12 9.06 1.6 2.26 1.47				kJ/K (26) (27) (27) (27) (29) (29) (29) (29) (29) (29) (29) (29

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	41.61	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	0	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: Medium	250	(35)
For design assessments where the details of the construction are not known p can be used instead of a detailed calculation.	recisely the indicative values of TMP in Table 1f		-

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

if details of thermal bridging are not known (36) = $0.15 \times (31)$			_
Total fabric heat loss (33) + (36) =		74.8	(37)
Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$			
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec		
(38)m= 83.82 83.37 82.93 80.86 80.47 78.67 78.67 78.34 79.37 80.47 81.25	82.07		(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m			
(39)m= 158.61 158.16 157.72 155.65 155.27 153.47 153.47 153.13 154.16 155.27 156.05	156.87		
Average = Sum(39)1.Heat loss parameter (HLP), W/m²K $(40)m = (39)m \div (4)$	12 /12=	155.65	(39)
(40)m= 1.05 1.05 1.04 1.03 1.03 1.02 1.02 1.01 1.02 1.03 1.03	1.04		
Average = Sum(40). Number of days in month (Table 1a)	12 /12=	1.03	(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 30	31		(41)
4. Water heating energy requirement:	kWh/ye	ear:	
	.94		(42)
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)	3.92		(43)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec		
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	-		
(44)m= 114.32 110.16 106 101.85 97.69 93.53 93.53 97.69 101.85 106 110.16	114.32		_
$Total = Sum(44)_{112} = Sum$		1 <mark>247.09</mark>	(44)
(45)m= 169.53 148.27 153 133.39 127.99 110.45 102.34 117.44 118.84 138.5 151.19	164.18		
Total = $Sum(45)_{112}$ = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	=	1635.13	(45)
(46)m= 25.43 22.24 22.95 20.01 19.2 16.57 15.35 17.62 17.83 20.78 22.68	24.63		(46)
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel	1		(47)
If community heating and no tank in dwelling, enter 110 litres in (47)			
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss:			
a) If manufacturer's declared loss factor is known (kWh/day):	0		(48)
Temperature factor from Table 2b	0		(49)
Energy lost from water storage, kWh/year (48) x (49) = b) If manufacturer's declared cylinder loss factor is not known:	1		(50)
Hot water storage loss factor from Table 2 (kWh/litre/day) 0. If community heating see section 4.3 0.	.03		(51)
	.93	,	(52)
Temperature factor from Table 2b	.6		(53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$).1		(54)

Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)
If cylinder 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 Append	lix H	
(57)m= 3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03]	(57)
Primary circuit	loss (an	inual) fro	om Table	e 3							0]	(58)
Primary circuit	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor fr	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)		_	
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss cal	culated	for each	month (61)m =	(60) ÷ 36	65 × (41))m	-				_	
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat requ	ired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 195.82	172.02	179.29	158.83	154.28	135.89	128.64	143.73	144.29	164.79	176.63	190.47		(62)
Solar DHW input c	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	-	
(add additional	lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (G)		_	_	_	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa	ater hea	ter										-	
(64)m= 195.82	172.02	179.29	158.83	154.28	135.89	128.64	143.73	144.29	164.79	176.63	190.47		
••							Outp	out from wa	ater heate	r (annual)₁	12	1944.7	(64)
Hea <mark>t gains fron</mark>	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 >	(<mark>46)m</mark>	+ (57)m	+ (59)m	1	
(65)m= 74.98	66.11	69.48	62.36	61.17	<mark>5</mark> 4.73	52.64	57.66	57.53	64.66	68.28	73.2		(65)
in <mark>clude</mark> (57)n	n in c <mark>alc</mark>	culation o	of (65)m	only if c	ylinder is	s in t <mark>he c</mark>	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	neating	
	_				ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Internal ga	ins (see	Table 5	and 5a		ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
	ins (see	Table 5	and 5a		ylinder is Jun	s in the o Jul	dwelling Aug	or hot w Sep	ater is fr Oct	om com	munity h	neating	
5. Internal ga Metabolic gains	ins (see s (Table	Table 5 5), Wat	and 5a):								neating	(66)
5. Internal ga Metabolic gains Jan	ins (see s (Table Feb 176.14	5), Wat Mar 176.14	ts Apr 176.14): May 176.14	Jun 176.14	Jul 176.14	Aug 176.14	Sep 176.14	Oct	Nov	Dec	neating	(66)
5. Internal ga Metabolic gains Jan (66)m= 176.14	ins (see s (Table Feb 176.14	5), Wat Mar 176.14	ts Apr 176.14): May 176.14	Jun 176.14	Jul 176.14	Aug 176.14	Sep 176.14	Oct	Nov	Dec	neating	(66)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65	ins (see s (Table Feb 176.14 (calculat 68.08	5), Wat Mar 176.14 ted in Ap 55.37	ts Apr 176.14 opendix 41.92	: 176.14 L, equati 31.33	Jun 176.14 ion L9 or 26.45	Jul 176.14 r L9a), a 28.58	Aug 176.14 Iso see 37.15	Sep 176.14 Table 5 49.87	Oct 176.14 63.32	Nov 176.14	Dec 176.14	neating	
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains (ins (see s (Table Feb 176.14 (calculat 68.08	5), Wat Mar 176.14 ted in Ap 55.37	ts Apr 176.14 opendix 41.92	: 176.14 L, equati 31.33	Jun 176.14 ion L9 or 26.45	Jul 176.14 r L9a), a 28.58	Aug 176.14 Iso see 37.15	Sep 176.14 Table 5 49.87	Oct 176.14 63.32	Nov 176.14	Dec 176.14	neating	
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44	and 5a ts Apr 176.14 opendix 41.92 Append 445.72): 176.14 L, equati 31.33 dix L, eq 411.99	Jun 176.14 ion L9 of 26.45 uation L 380.29	Jul 176.14 r L9a), a 28.58 13 or L1 359.11	Aug 176.14 Iso see 37.15 3a), also 354.12	Sep 176.14 Table 5 49.87 see Ta 366.68	Oct 176.14 63.32 ble 5 393.4	Nov 176.14 73.9	Dec 176.14 78.78	neating	(67)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44	and 5a ts Apr 176.14 opendix 41.92 Append 445.72): 176.14 L, equati 31.33 dix L, eq 411.99	Jun 176.14 ion L9 of 26.45 uation L 380.29	Jul 176.14 r L9a), a 28.58 13 or L1 359.11	Aug 176.14 Iso see 37.15 3a), also 354.12	Sep 176.14 Table 5 49.87 see Ta 366.68	Oct 176.14 63.32 ble 5 393.4	Nov 176.14 73.9	Dec 176.14 78.78	neating	(67)
5. Internal ga Metabolic gains (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calculat 55.55	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in A 55.55	and 5a ts Apr 176.14 opendix 41.92 Append 445.72 opendix 55.55): 176.14 L, equati 31.33 dix L, equ 411.99 L, equat	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a)	Aug 176.14 Iso see 37.15 3a), also 354.12 , also se	Sep 176.14 Table 5 49.87 5 see Ta 366.68 5 e Table	Oct 176.14 63.32 ble 5 393.4 5	Nov 176.14 73.9 427.13	Dec 176.14 78.78 458.83	heating	(67) (68)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calculat 55.55	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in A 55.55	and 5a ts Apr 176.14 opendix 41.92 Append 445.72 opendix 55.55): 176.14 L, equati 31.33 dix L, equ 411.99 L, equat	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a)	Aug 176.14 Iso see 37.15 3a), also 354.12 , also se	Sep 176.14 Table 5 49.87 5 see Ta 366.68 5 e Table	Oct 176.14 63.32 ble 5 393.4 5	Nov 176.14 73.9 427.13	Dec 176.14 78.78 458.83	neating	(67) (68)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calculat 55.55 s gains 0	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0): 176.14 L, equati 31.33 dix L, equ 411.99 L, equat 55.55	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55	Aug 176.14 Iso see 37.15 3a), also 354.12), also se 55.55	Sep 176.14 Table 5 49.87 5 see Ta 366.68 20 Table 55.55	Oct 176.14 63.32 ble 5 393.4 5 55.55	Nov 176.14 73.9 427.13 55.55	Dec 176.14 78.78 458.83 55.55	heating	(67) (68) (69)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva	ins (see s (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calcula 55.55 s gains 0 aporatio	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5)	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55	Aug 176.14 Iso see 37.15 3a), also 354.12 55.55 0	Sep 176.14 Table 5 49.87 5 see Ta 366.68 55.55 0	Oct 176.14 63.32 ble 5 393.4 5 55.55 0	Nov 176.14 73.9 427.13 55.55	Dec 176.14 78.78 458.83 55.55	heating	(67) (68) (69)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva (71)m= -117.43	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calcula 55.55 s gains 0 aporatio -117.43	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat -117.43	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5)	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55	Aug 176.14 Iso see 37.15 3a), also 354.12), also se 55.55	Sep 176.14 Table 5 49.87 5 see Ta 366.68 55.55 0	Oct 176.14 63.32 ble 5 393.4 5 55.55	Nov 176.14 73.9 427.13 55.55	Dec 176.14 78.78 458.83 55.55	heating	(67) (68) (69) (70)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva (71)m= -117.43 Water heating g	ins (see s (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calcula 55.55 s gains 0 aporatio -117.43 gains (T	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat -117.43	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu -117.43): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab -117.43	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5) -117.43	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55 0 -117.43	Aug 176.14 Iso see 37.15 3a), also 354.12), also se 55.55 0 -117.43	Sep 176.14 Table 5 49.87 5 see Ta 366.68 ee Table 55.55 0 -117.43	Oct 176.14 63.32 ble 5 393.4 5 55.55 0 -117.43	Nov 176.14 73.9 427.13 55.55 0 -117.43	Dec 176.14 78.78 458.83 55.55 0	heating	(67) (68) (69) (70)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva (71)m= -117.43 Water heating gains (72)m= 100.78	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calcula 55.55 s gains 0 aporatio -117.43 gains (T 98.38	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat -117.43 rable 5) 93.39	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5) -117.43 76.02	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55 0 -117.43 70.75	Aug 176.14 Iso see 37.15 3a), also 354.12 0, also se 55.55 0 -117.43	Sep 176.14 Table 5 49.87 5 see Ta 366.68 2 Table 55.55 0 -117.43 79.9	Oct 176.14 63.32 ble 5 393.4 5 55.55 0 -117.43 86.91	Nov 176.14 73.9 427.13 55.55 0 -117.43 94.83	Dec 176.14 78.78 458.83 55.55 0 -117.43 98.39	heating	 (67) (68) (69) (70) (71)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva (71)m= -117.43 Water heating g (72)m= 100.78	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calcula 55.55 s gains 0 aporatio -117.43 gains (T 98.38 gains =	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat -117.43 Table 5) 93.39	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu -117.43 86.61): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab -117.43 82.21	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5) -117.43 76.02 (66)	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55 0 -117.43 70.75 m + (67)m	Aug 176.14 Iso see - 37.15 3a), also 354.12), also se 55.55 0 -117.43 77.5 + (68)m -	Sep 176.14 Table 5 49.87 5 see Ta 366.68 55.55 0 -117.43 79.9 + (69)m + (69)m + (69)m + (69)m + (61)	Oct 176.14 63.32 ble 5 393.4 5 55.55 0 -117.43 86.91 70)m + (7	Nov 176.14 73.9 427.13 55.55 0 -117.43 94.83 1)m + (72)	Dec 176.14 78.78 458.83 55.55 0 -117.43 98.39	heating	 (67) (68) (69) (70) (71) (72)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva (71)m= -117.43 Water heating gains (72)m= 100.78	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calculat 55.55 s gains 0 aporatio -117.43 gains (T 98.38 gains = 765.72	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat -117.43 Table 5) 93.39	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu -117.43): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab -117.43	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5) -117.43 76.02	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55 0 -117.43 70.75	Aug 176.14 Iso see 37.15 3a), also 354.12 0, also se 55.55 0 -117.43	Sep 176.14 Table 5 49.87 5 see Ta 366.68 2 Table 55.55 0 -117.43 79.9	Oct 176.14 63.32 ble 5 393.4 5 55.55 0 -117.43 86.91	Nov 176.14 73.9 427.13 55.55 0 -117.43 94.83	Dec 176.14 78.78 458.83 55.55 0 -117.43 98.39	heating	 (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	or	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.	9x 1	×	1.54	×	10.63	x	0.9	x	0.9	=	35.81	(74)
North 0.	9x 1	x	0.96	x	10.63	x	0.9	x	0.9	=	14.88	(74)
North 0.	9x 1	x	1.54	x	20.32	x	0.9	x	0.9	=	68.44	(74)
North 0	9x 1	x	0.96	x	20.32	x	0.9	x	0.9	=	28.44	(74)
North 0.	9x 1	x	1.54	x	34.53	x	0.9	x	0.9	=	116.3	(74)
North 0.	9x 1	x	0.96	x	34.53	x	0.9	x	0.9	=	48.33	(74)
North 0.	9x 1	x	1.54	x	55.46	x	0.9	x	0.9	=	186.8	(74)
North 0.	9x 1	x	0.96	x	55.46	x	0.9	x	0.9	=	77.63	(74)
North 0.	9x 1	x	1.54	x	74.72	x	0.9	x	0.9	=	251.64	(74)
North 0	9x 1	x	0.96	x	74.72	x	0.9	x	0.9	=	104.58	(74)
North 0	9x 1	x	1.54	x	79.99	x	0.9	x	0.9	=	269.39	(74)
North 0	9x 1	x	0.96	x	79.99	x	0.9	x	0.9	=	111.95	(74)
North 0.	9x 1	x	1.54	x	74.68	x	0.9	x	0.9	=	251.51	(74)
North 0.	9x 1	x	0.96	x	74.68	x	0.9	x	0.9	=	104.52	(74)
North 0.	9x 1	x	1.54	x	59.25	x	0.9	x	0.9	=	199.54	(74)
North 0.	9x 1	x	0.96	×	59.25	x	0.9	X	0.9	=	82.93	(74)
North 0	9x 1	x	1.54	х	41.52	x	0.9	x	0.9	=	139.83	(74)
	9x 1	x	0.96	х	41.52	×	0.9	x	0.9	=	58.11	(74)
	9x 1	x	1.54	x	24.19	x	0.9	x	0.9	=	81.47	(74)
North 0	9x 1	x	0.96	x	24.19	х	0.9	x	0.9	=	<mark>3</mark> 3.86	(74)
North 0.	9x 1	x	1.54	x	13.12	х	0.9	x	0.9	=	44.18	(74)
	9x 1	x	0.96	×	13.12	x	0.9	x	0.9	=	18.36	(74)
	9x 1	x	1.54	x	8.86	x	0.9	x	0.9	=	29.86	(74)
	9x 1	x	0.96	x	8.86	x	0.9	x	0.9	=	12.41	(74)
	9x 1	x	0.91	×	46.75	x	0.9	x	0.9	=	155.07	(78)
	9x 1	x	0.91	×	76.57	x	0.9	x	0.9	=	253.97	(78)
	9x 1	x	0.91	×	97.53	x	0.9	x	0.9	=	323.51	(78)
	9x 1	x	0.91	×	110.23	x	0.9	x	0.9	=	365.64	(78)
	9x 1	X	0.91	×	114.87	x	0.9	x	0.9	=	381.02	(78)
	9x 1	x	0.91	x	110.55	x	0.9	x	0.9	=	366.68	(78)
	9x 1	x	0.91	x	108.01	x	0.9	x	0.9	=	358.27	(78)
- · ·	9x 1	x	0.91	x	104.89	x	0.9	x	0.9	=	347.93	(78)
	9x 1	X	0.91	×	101.89	x	0.9	x	0.9	=	337.95	(78)
	9x 1	X	0.91	×	82.59	x	0.9	x	0.9	=	273.93	(78)
	9x 1	x	0.91	x	55.42	x	0.9	x	0.9	=	183.82	(78)
	9x 1	x	0.91	x	40.4	x	0.9	x	0.9	=	134	(78)
	9x 1	×	2.76	×	19.64	x	0.9	x	0.9	=	39.52	(80)
	9x 1	×	2.76	x	38.42	x	0.9	x	0.9	=	77.3	(80)
West 0.	9x 1	x	2.76	x	63.27	X	0.9	x	0.9	=	127.31	(80)

						_										
West	0.9x	1	x	2.7	6	x	9	2.28	x		0.9	x	0.9	=	185.67	(80)
West	0.9x	1	x	2.7	6	x	1	13.09	x		0.9	x	0.9	=	227.55	(80)
West	0.9x	1	x	2.7	6	x	1	15.77	x		0.9	x	0.9	=	232.93	(80)
West	0.9x	1	x	2.7	6	x	1	10.22	x		0.9	_ x [0.9	=	221.76	(80)
West	0.9x	1	x	2.7	6	x [9	4.68	x		0.9	x	0.9	=	190.49	(80)
West	0.9x	1	x	2.7	6	x	7	3.59	x		0.9	x	0.9	=	148.06	(80)
West	0.9x	1	x	2.7	6	x [4	5.59	x		0.9	x	0.9	=	91.73	(80)
West	0.9x	1	x	2.7	6	x [2	4.49	x		0.9	x	0.9	=	49.27	(80)
West	0.9x	1	x	2.7	6	x	1	6.15	x		0.9	x	0.9	=	32.5	(80)
Solar g	gains in y	watts, ca	alculated	for eac	n month				(83)m	n = Su	um(74)m .	(82)m	_			
(83)m=	245.29	428.16	615.45	815.75	964.79	98	30.96	936.07	820	.89	683.95	480.99	295.63	208.76		(83)
Total g	jains – ir	nternal a	ind solar	r (84)m =	= (73)m	+ (8	33)m	, watts								
(84)m=	1016.99	1193.88	1350.92	1504.26	1604.59	15	77.98	1508.77	1403	3.93	1294.66	1138.88	1005.76	959.03		(84)
7. Me	an interr	nal temp	erature	(heating	season	ı)										
Temp	erature	during h	eating p	eriods ir	n the livi	ng a	area f	from Tab	ole 9,	, Th1	1 (°C)				21	(85)
Utilisa	ation fact	tor for g	ains for	living are	ea, h1,m	n (se	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May	Ì,	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.92	0.8		0.6	0.44	0.5	-	0.75	0.95	0.99	1		(86)
Moan	internal	temper	ature in	living ar	aa T1 (f		w sta	ns 3 to 7		able	90)					
(87)m=	19.96	20.14	20.39	20.69	20.9	1	0.98	21	2		20.94	20.66	20.26	19.93		(87)
· · /						<u> </u>										(-)
	erature					T	-			-		00.00	00.00	00.05		(88)
(88)m=	2 <mark>0.04</mark>	20.04	20.05	20.06	20.06		0.07	20.07	20.	07	20.07	20.06	20.06	20.05		(00)
Util <mark>isa</mark>	ation fact	tor for g	ains for	1	welling,	h2,	m (se	e Table	9a)							
(89)m=	1	0.99	0.97	0.9	0.74	C).52	0.35	0.4	4	0.68	0.93	0.99	1		(89)
Mean	internal	temper	ature in	the rest	of dwell	ing	T2 (fe	ollow ste	eps 3	to 7	' in Tabl	e 9c)				
(90)m=	18.66	18.92	19.28	19.7	19.96	2	0.06	20.07	20.	07	20.02	19.68	19.1	18.63		(90)
											f	LA = Livir	ng area ÷ (4	4) =	0.33	(91)
Mean	internal	temper	ature (fo	or the wh	ole dwe	llino	a) = fl	_A × T1	+ (1	– fL	A) × T2					
(92)m=	19.09	19.32	19.64	20.03	20.27	—	0.36	20.38	20.3	- 1	20.33	20.01	19.48	19.06		(92)
Apply	adjustm	nent to th	he mear	internal	temper	atu	re fro	m Table	4e, '	whe	re appro	priate	1			
(93)m=	19.09	19.32	19.64	20.03	20.27	-	0.36	20.38	20.3	-	20.33	20.01	19.48	19.06		(93)
8. Sp	ace heat	ting requ	uirement			1			L							
Set T	i to the n	nean int	ernal ter	mperatui	e obtair	ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									-	I	
	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
	ation fact			r		-			1				,	1	I	
(94)m=	0.99	0.99	0.96	0.9	0.76	C	0.55	0.38	0.4	13	0.7	0.93	0.99	1		(94)
	I gains,		<u> </u>	<u> </u>	, 										l	(05)
(95)m=				1352.13			68.68	577.77	605	.56	904.91	1059.23	992.09	954.58		(95)
	hly avera	-		r i		1		40.0	40		44.4	40.0	74	4.0	l	(06)
(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		(96)
	loss rate			· · · ·		-		- /	<u> </u>	<u> </u>	. ,	-	1000.00	0004.40		(07)
(97)m-	2346.59	2280.68	2073.04	1731.98	1331.04	1 88	34.65	579.53	608	.88	960.2	1460.32	1932.28	2331.13		(97)

Space	e heatin	ig requir	ement fo	or each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95	5)m] x (4	1)m		_	
(98)m=	993.91	741.97	573.77	273.49	85.82	0	0	0	0	298.41	676.94	1024.16		
								Tota	al per year	(kWh/yea	r) = Sum(9	8)15,912 =	4668.47	(98)
Space	e heatin	ıg requir	ement ir	n kWh/m²	²/year								30.92	(99)
8c. S	pace co	oling rea	quireme	nt										
Calcu	lated fo	r June,	July and	August.	See Tal	ple 10b							•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		r È	1	l using 2	1	· · ·		i	1	r –	1	1)	
(100)m=	0	0	0	0	0	1442.6	1135.66	1163.82	0	0	0	0		(100)
	r	ctor for lo	1		<u> </u>				<u> </u>	<u> </u>	<u> </u>	<u> </u>	1	(101)
(101)m=		0	0	0	0	0.88	0.94	0.91	0	0	0	0		(101)
	· · · · · · · · · · · · · · · · · · ·	r È	1	(100)m >	r`								1	(400)
(102)m=		0	0	0	0	1273.45			-	0	0	0		(102)
	<u> </u>	ř – –	1	for appli	1	i	1 <u> </u>	1	<u>i</u>				1	(402)
(103)m=		0	0	0	0		1508.77			0	0	0		(103)
				or month, < 3 × (98		iwelling,	continue	ous (KN	h) = 0.0)24 x [(10	03)m – (102)m j	x (41)m	
(104)m=	0	0	0	0	0	219.26	328.64	252.28	0	0	0	0		
										I = Sum(=	800.18	(104)
	d fractio								f C =	co <mark>oled</mark>	area ÷ (4	4) =	1	(105)
		· · ·	able 10b	í						-		1	,	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
Crease	a a a line			wa o w th	(101)			~	lota	I = Sum	104)	=	0	(106)
(107)m=				month =	= (104)m	× (105) 54.82	× (106)r 82.16	63.07	0	0	0	0	1	
(107)11-			0		0	34.02	02.10	03.07		I = Sum(<u> </u>	=	200.05	(107)
Space	cooling	require	ment in l	kWh/m²/	vear					$) \div (4) =$	1.0081	_	1.32	(108)
•	-	•		mmunity	•	scheme	9		(101	, . (. ,				
				ating, spa				ting prov	vided by	a comm	unity scl	neme.		
Fractic	on of spa	ace hea	t from se	condary	/supplen	nentary l	heating ((Table 1	1) '0' if n	one			0	(301)
Fractio	on of spa	ace heat	t from co	ommunity	v system	1 – (30	1) =						1	(302)
	-		-	eat from se						up to four	other heat	sources;	the latter	
			-	<i>mal and w</i> anity boile		rom powe	r stations.	See Appe	ndix C.				1	(303a)
				om Comr		nilore				(3	02) x (303	(a) -	1	(304a)
		•		g methoc	-		rcommi	unity hor	oting eve		02) x (000	(d) –		(305)
									ating sys				1	
			(Table	12c) for (commun	ity neati	ng syste	m					1.05	(306)
-	heatin	-	requirer	nent									kWh/ye 4668.47	ar
	•	•	munity b						(98) x (3	04a) x (30	5) x (306)	=	4901.89	(307a)
				ementary	heating	system	in % (fro	om Table					0	(308
	•			m secor	•	•				01) x 100 ·			0	(309)
Space	nearing	, icquile		35001	iaai y/sup	picitien	itary syst		(00) ^ (0	017X 100 ·	. (000) –			(000)

Water heating Annual water heating requirement				1944.7	1
If DHW from community scheme:				1341.1	_
Water heat from Community boilers		(64) x (303a) x (305) x	(306) =	2041.93	(310a)
Electricity used for heat distribution	0.01	× [(307a)(307e) + (3	10a)(310e)] =	69.44	(313)
Cooling System Energy Efficiency Ratio				3.38	(314)
Space cooling (if there is a fixed cooling system,	if not enter 0)	= (107) ÷ (314) =		59.27	(315)
Electricity for pumps and fans within dwelling (Ta mechanical ventilation - balanced, extract or position - balanced, extract or positive structure of the stru	,			0	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (33	30g) =	0	(331)
Energy for lighting (calculated in Appendix L)				541.48	(332)
10b. Fuel costs – Community heating scheme					-
	Fuel kWh/year	Fuel Pric (Table 12		Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24	x 0.01 =	207.84	(340a)
Water heating from CHP	(310a) x	4.24	x 0.01 =	86.58	(342a)
	(245)	Fuel Price			-
Space cooling (community cooling system)	(315)	13.19	x 0.01 =	7.82	(348)
Pumps and fans	(331)	13.19	x 0.01 =	0	(349)
Energy for lighting	(332)	13.19	x 0.01 =	71.42	(350)
Additional standing charges (Table 12)				120	(351)
Total energy cost = (340a)	.(342e) + (345)(354) =			493.66	(355)
11b. SAP rating - Community heating scheme					
Energy cost deflator (Table 12)				0.42	(356)
Energy cost factor (ECF) [(355) x (3	856)] ÷ [(4) + 45.0] =			1.06	(357)
SAP rating (section12)				85.24	(358)
12b. CO2 Emissions – Community heating schen				F i.e	
		0,	ssion factor CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	ing (not CHP) there is CHP using two fuels	s repeat (363) to (366) f	or the second fuel	95	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x ²	100 ÷ (367b) x	0 =	1578.81	(367)
Electrical energy for heat distribution	[(313) x		0.52 =] (372)
Total CO2 associated with community systems		66) + (368)(372)	=		(373)
CO2 associated with space heating (secondary)	(309) x		0 =		(374)
CO2 associated with water from immersion heater	er or instantaneous hea	ater (312) x	0.52 =	0	(375)

Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			1614.84	(376)
CO2 associated with space cooling		(315) x	0.52	=	30.76	(377)
CO2 associated with electricity for pump	os and fans withir	n dwelling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	=	281.03	(379)
Total CO2, kg/year	sum of (376)(382) =			1926.64	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.76	(384)
El rating (section 14)					86.83	(385)
13b. Primary Energy – Community heat	ing scheme					
		Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)		not CHP) CHP using two fuels repeat (363)	to (366) for the second	d fuel	95	(367a)
Energy associated with heat source 1		[(307b)+(310b)] x 100 ÷ (367b) x	0	=	8917.33	(367)
Electrical energy for heat distribution		[(313) x		=	213.18	(372)
Total Energy associated with community	y systems	(363)(366) + (368)(3	372)	=	9130.5	(373)
if it is negative set (373) to zero (unle	ss specified othe	rwise, see C7 in Appendix	C)		9130.5	(373)
Energy associated with space heating (s	secondary)	(309) x	0	=	0	(374 <mark>)</mark>
Energy associated with water from imme	ersion heater or i	instantaneous heater(312) x	3.07	=	0	(375)
Total Energy associated with space and	water heating	(373) + (374) + (375) =			9130.5	(376)
Energy associated with space cooling		(315) x	3.07	=	181.97	(377)
Energy associated with electricity for pu	mps and fans wit	thin dwelling (331))	3.07	=	0	(378)
Energy associated with electricity for light	hting	(332))) x	3.07	=	1662.35	(379)
Total Primary Energy, kWh/yea	r sum o	of (376)(382) =			10974.82	(383)

			User D	etails:						
Assessor Name: Software Name:	Stroma FS		Property	Stroma Softwa	are Ver			Versio	on: 1.0.3.11	
	28 Podinate	on Road, NW3		Address.	Fial 0					
Address : 1. Overall dwelling dim		on Road, NVVS								
Ground floor				a(m²) 167	(1a) x		ight(m) 2.9	(2a) =	Volume(m³ 484.3) (3a)
Total floor area TFA = (1a)+(1b)+(1c)+	(1d)+(1e)+(′	ln)	167	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	l)+(3e)+	.(3n) =	484.3	(5)
2. Ventilation rate:	-									
Number of chimneys	main heating	seconda heating	_ + _	0 0] = [total 0		40 =	m ³ per hou	r (6a)
Number of open flues	0	+ 0	+	0	=	0	X	20 =	0	(6b)
Number of intermittent f	ans					4	x ′	10 =	40	(7a)
Number of passive vent	S				Γ	0	x ′	10 =	0	(7b)
Number of flueless gas	fires				Ē	0	X 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimn If a pressurisation test has					continue fr	40 om (9) to (÷ (5) =	0.08	(8)
Number of storeys in Additional infiltration								-1]x0.1 =	0	(9) (10)
Structural infiltration: if both types of wall are					•	uction			0	(11)
deducting areas of oper					a lanci					
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
lf no draught lobby, e	nter 0.05, else	enter 0							0	(13)
Percentage of window	ws and doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2		1			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value	· · · ·		•	•	•	etre of e	envelope	area	4.5	(17)
If based on air permeab Air permeability value appl	•					ia haina u	and		0.31	(18)
Number of sides shelter				giee all pei	meaning	is being u	seu		1	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorpora	ating shelter fac	ctor		(21) = (18)) x (20) =				0.28	(21)
Infiltration rate modified	for monthly wir	nd speed								
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Tab	le 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									
(22a)m= 1.27 1.25	1.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	= (21a) x	(22a)m	-			_	
	0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.28	0.31	0.32	0.33		
		c <i>tive air (</i> al ventila	-	rate for t	he applic	cable ca	se							(220)
				endix N (2	3b) = (23a) x Fmv (e	equation (N5)) , othe	rwise (23h) = (23a)			(
								n Table 4h) = (20u)				
			-	-	-			HR) (24a		2b)m i ('	22b) v [·	1 (22a)	() (23c)
(24a)m=								0	a = (2)			$\frac{1-(230)}{0}$	 	(24a)
	-	-	÷		-	-	Ŧ	MV) (24b	$\frac{1}{1}$		23h)	Ů	J	
(24b)m=	0			0	0	0					0	0]	(24b)
	whole h			tilation of	or positiv			on from c	Jutside				J	
,					•	•		lc) = (22k		.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input v	ventilati	on from l	oft					
i	f (22b)n	n = 1, th	en (24d)	m = (22k	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	J	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (240	c) or (24	1d) in boy	k (25)				1	
(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
	- C. Denerger													
3. He	at losse	s and he	eat loss i	paramete	er:									
3. He		Gros	s	oaramete Openin	gs	Net Ar		U-vali		AXU		k-value		A X k
ELEN			s		gs	A ,n	n²	W/m2	2K	(VV/ł	<)	k-value kJ/m²-l		kJ/K
ELEN Doors	IENT	Gros area	s	Openin	gs	A ,n 2.1	n² X	W/m2	2K	(W/H 1.68	<)			kJ/K (26)
ELEN Doors Windov	IENT ws Type	Gros area	s	Openin	gs	A ,n 2.1 3.43	n ² x	W/m2 0.8	2K = 0.04] =	(W/H 1.68 3.93	<)			kJ/K (26) (27)
ELEN Doors Windov Windov	NENT ws Type ws Type	Gros area 9 1 9 2	s	Openin	gs	A ,n 2.1 3.43 1.54	n ² x x x1 x1	W/m2 0.8 //[1/(1.2)+ //[1/(1.2)+	2K = 0.04] = 0.04] =	(W/H 1.68 3.93 1.76				kJ/K (26) (27) (27)
ELEN Doors Windov Windov Windov	NT NS Type NS Type NS Type	Gros area e 1 e 2 e 3	s	Openin	gs	A ,n 2.1 3.43 1.54 2.8	n ² x x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2:K 0.04] = 0.04] = 0.04] =	(W/H 1.68 3.93 1.76 3.21	<)			kJ/K (26) (27) (27) (27)
ELEN Doors Windov Windov Windov	NT ws Type ws Type ws Type ws Type	Gros area e 1 e 2 e 3 e 4	s	Openin	gs	A ,n 2.1 3.43 1.54 2.8 0.91	n ² × 1 × 1 × 1 × 1 × 1 × 1 × 1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K = 0.04] = 0.04] = 0.04] = 0.04] =	(W/k 1.68 3.93 1.76 3.21 1.04				kJ/K (26) (27) (27) (27) (27)
ELEN Doors Windo Windo Windo Windo	NT NS Type NS Type NS Type NS Type NS Type	Gros area 4 5	s	Openin	gs	A ,n 2.1 3.43 1.54 2.8	n ² x x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1	W/m2 0.8 /[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] =	(W/H 1.68 3.93 1.76 3.21				kJ/K (26) (27) (27) (27)
ELEN Doors Windo Windo Windo Windo	NT NS Type NS Type NS Type NS Type NS Type NS Type	Gros area 9 1 9 2 9 3 9 4 9 5 9 6	s	Openin	gs	A ,n 2.1 3.43 1.54 2.8 0.91	n ² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[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] =	(W/k 1.68 3.93 1.76 3.21 1.04				kJ/K (26) (27) (27) (27) (27)
ELEN Doors Windo Windo Windo Windo	NT NS Type NS Type NS Type NS Type NS Type	Gros area 9 1 9 2 9 3 9 4 9 5 9 6	s	Openin	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8	n ² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[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] =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21				kJ/K (26) (27) (27) (27) (27) (27)
ELEN Doors Windo Windo Windo Windo	NT NS Type NS Type NS Type NS Type NS Type NS Type NS Type	Gros area 9 1 9 2 9 3 9 4 9 5 9 6	55 (m²)	Openin	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26	n ² × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 ×	W/m2 0.8 /[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] =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21 1.44				kJ/K (26) (27) (27) (27) (27) (27)
ELEN Doors Windoo Windoo Windoo Windoo Windoo	NT NS Type WS Type WS Type WS Type WS Type WS Type Type1	Gros area 4 5 6 7	3 3	Openin	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26 2.8	n ² × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 ×	W/m2 0.8 /[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] =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21 1.44 3.21				kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEN Doors Windov Windov Windov Windov Windov Windov	NENT ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2	Gros area 2 1 2 2 2 3 2 4 2 5 2 6 2 7 28.1	3 3 3	Openin m	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26 2.8 2.8 2.8	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21 1.44 3.21 3.38				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (29)
ELEN Doors Windor Windor Windor Windor Windor Windor Windor Walls	NT NS Type NS Type NS Type NS Type Type Type Type Type S Type Type S Type Type S Type Type S Type Type S Type S Type S Type S Type Type S Type S Type Type Type Type Type Type Type Type	Gros area 2 1 2 2 2 3 4 4 2 5 2 6 2 7 28.1 63.4	3 3 46	Openin m 0 4.9	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26 2.8 2.8 2.8 2.8 3.8 9 2.8 3.8 9 2.8 3.8 9 2.8 3.8 9 2.8 3.8 9 2.8 3.8 9 2.8 3.8 9 2.8 3.8 3.8 3.8 3.8 3.8 3.8 3.8 3.8 3.8 3	n ² x x x x x x x x x x x x x x x x x x x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12	2K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = 0.04] = = = = 0.04] = = = = = = = = = =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21 1.44 3.21 3.38 7.07				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEN Doors Windoo Windoo Windoo Windoo Windoo Windoo Windoo Windoo	NT NS Type NS Type NS Type NS Type Type Type Type Type S Type Type S Type Type S Type Type S Type Type S Type S Type S Type S Type Type S Type S Type Type Type Type Type Type Type Type	Gros area 2 3 4 5 6 7 28.1 63.1 21.4	3 (m ²) 3 8 46 3	Openin m 0 4.9 0	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26 2.8 2.8 2.8 2.8 2.8 3.6 2.8 2.8 2.8 2.8 2.8 2.1 3 6 5 8.9 21.46	n ² x x x x x x x x x x x x x x x x x x x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12 0.11	2K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/A 1.68 3.93 1.76 3.21 1.04 3.21 1.44 3.21 3.38 7.07 2.32				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)
ELEN Doors Windov Windov Windov Windov Windov Walls ⁻ Walls ⁻ Walls ⁻ Roof	NENT ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3 Type4	Gros area 2 1 2 2 3 3 4 4 5 5 6 6 7 7 28.1 63.4 21.4 28.1	3 (m ²) 3 8 46 3	Openin m 0 4.9 0 0	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26 2.8 2.8 28.13 58.9 21.46 28.13	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 0.8 //[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12 0.11 0.12	2K = 0.04] = = = = = = = = = = =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21 1.44 3.21 3.38 7.07 2.32 3.38				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	61.4
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	648
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: Medium	250

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

(33) (34) (35)

can be l	used inste	ad of a de	tailed calc	ulation.										
Therm	tt transfer coefficient, W/K (39)m = (37) + (38)m m= 187.45 187.04 186.64 184.76 184.41 182.77 182.77 182.47 183.4 184.41 185.12 185.86 Average = Sum(39)2/12= 184.76 (39) tt loss parameter (HLP), W/m ² K (40)m = (39)m ÷ (4) m= 1.12 1.12 1.12 1.11 1.1 1.09 1.09 1.09 1.1 1.1 1.11 1.1													
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			97.02	(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=	90.43	90.02	89.62	87.74	87.39	85.75	85.75	85.44	86.38	87.39	88.1	88.84		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	187.45	187.04	186.64	184.76	184.41	182.77	182.77	182.47	183.4	184.41	185.12	185.86		
Heat lo	oss para	meter (F	HLP). W	/m²K						-		.12 /12=	184.76	(39)
(40)m=	· · ·	· · ·	,		1.1	1.09	1.09	1.09				1.11		
(-)													1.11	(40)
Numb	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)
													1	
4 \N/2	ater hea	tina ener	av reau	irement [.]								k\//h/\/	ear:	
			gyroqu								-			
Assumed occupancy, N 2.96 (42) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)														
	if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)													
			ater usag	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		104	1.47		(43)
						-	7	to achieve	a water us	se target o				. ,
not mor	e that 125	litres per j	person pe	r day (all w	ater use, l	not and co	ld)							
								Ŭ,	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	114.91	110.73	106.55	102.38	98.2	94.02	94.02	98.2	102.38	106.55	110.73	114.91		
-		. .			antha A	400 · · //d /		T (2000					1253.58	(44)
			-		-	r					-		1	
(45)m=	170.41	149.04	153.8	134.09	128.66	111.02	102.88	118.05						_
lf instan	taneous w	vater heatii	na at noint	of use (no	hot water	storage)	enter∩in	hoxes (46)		Total = Su	m(45) ₁₁₂ =	:	1643.65	(45)
						·				00.00		04.70	1	(46)
(46)m= Water			23.07	20.11	19.3	16.65	15.43	17.71	17.92	20.88	22.8	24.76		(40)
	-		includir	ng any so	olar or W	/WHRS	storage	within sa	me ves	sel		1		(47)
-		. ,					-						I	
	•	•			•			mbi boil	ers) ente	ər '0' in (47)			
Water	storage	loss:												
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				(0		(48)
Tempe	erature f	actor fro	m Table	2b							()		(49)
Energ	y lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=			1		(50)
,				cylinder l									1	
		-		om Tabl	e 2 (kW	h/litre/da	ay)				0.	03		(51)
	•	leating s from Tal		on 4.3									1	
		actor fro		2h								93 .6		(52) (53)
, on po												.0]	(00)

		om water (54) in (5	-	e, kWh/yo	ear			(47) x (51)) x (52) x (53) =		.1		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	e 3			-	-			0		(58)
	•	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	, cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	196.7	172.79	180.09	159.53	154.95	136.47	129.17	144.35	144.91	165.52	177.42	191.33		(62)
Solar D	-IW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)	-	-			
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	196.7	172.79	180.09	159.53	154.95	136.47	129.17	144.35	144.91	165.52	177.42	191.33		
								Outp	out from wa	ater heate	r (annual)₁	12	1953.22	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	1 + (61)m	1 <mark>] +</mark> 0.8 >	(<mark>46)m</mark> (+ (57)m	+ (<mark>59)</mark> m]	
(65)m=	75.27	66.37	69.75	62.59	61.39	54.92	52 .82	57.86	57.73	64.9	68.54	7 <mark>3.48</mark>		(65)
inclu	ide (57)	m in cale	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	<u>olic gair</u>	is (Table	<u>e 5), Wat</u>	ts				-				-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	177.51	177.51	177.51	177.51	177.51	177.51	177.51	177.51	177.51	177.51	177.51	177.51		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5	-	-	-		
(67)m=	75.44	67	54.49	41.25	30.84	26.03	28.13	36.57	49.08	62.32	72.73	77.54		(67)
Applia	nces ga	ins (calc	ulated ir	n Appeno	dix L, eq	uation L	13 or L1	3a), also	o see Ta	ble 5				
(68)m=	505.19	510.43	497.22	469.1	433.6	400.23	377.94	372.7	385.91	414.03	449.53	482.9		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	ion L15	or L15a)), also se	ee Table	5	-			
(69)m=	55.71	55.71	55.71	55.71	55.71	55.71	55.71	55.71	55.71	55.71	55.71	55.71		(69)
Pumps	s and fa	ns gains	(Table &	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. e\	vaporatio	on (nega	tive valu	es) (Tab	le 5)							-	
(71)m=	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34		(71)
Water	heating	gains (1	able 5)										-	
(72)m=	101.17	98.76	93.75	86.93	82.51	76.28	70.99	77.77	80.18	87.23	95.2	98.77		(72)
Total i	nternal	gains =				(66))m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	m	-	
(73)m=	796.68	791.08	760.34	712.17	661.83	617.43	591.94	601.92	630.05	678.46	732.34	774.08		(73)
6. So	lar gain:	5:												

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	< <u>1</u>	x	1.54	x	10.63	x	0.9	x	0.9	=	35.81	(74)
North 0.9	(1	x	1.26	x	10.63	x	0.9	x	0.9	=	29.3	(74)
North 0.9	(1	x	2.8	x	10.63	x	0.9	x	0.9	=	65.11	(74)
North 0.9	< <u>1</u>	x	1.54	x	20.32	x	0.9	x	0.9	=	68.44	(74)
North 0.9	۲ (x	1.26	x	20.32	x	0.9	x	0.9	=	56	(74)
North 0.9	۲ (x	2.8	x	20.32	x	0.9	x	0.9	=	124.44	(74)
North 0.9	(1	x	1.54	x	34.53	x	0.9	x	0.9	=	116.3	(74)
North 0.9	(1	x	1.26	x	34.53	x	0.9	x	0.9	=	95.15	(74)
North 0.9	(1	x	2.8	x	34.53	x	0.9	x	0.9	=	211.45	(74)
North 0.9	(1	x	1.54	x	55.46	x	0.9	x	0.9	=	186.8	(74)
North 0.9	(1	x	1.26	x	55.46	x	0.9	x	0.9	=	152.84	(74)
North 0.9	(1	x	2.8	x	55.46	x	0.9	x	0.9	=	339.64	(74)
North 0.9	(1	x	1.54	x	74.72	x	0.9	x	0.9	=	251.64	(74)
North 0.9	(1	x	1.26	x	74.72	x	0.9	x	0.9	=	205.89	(74)
North 0.9	(1	x	2.8	x	74.72	x	0.9	x	0.9	=	457.53	(74)
North 0.9	(1	x	1.54	x	79.99	х	0.9	Х	0.9	=	269.39	(74)
North 0.9	r 1	x	1.26	х	79.99	x	0.9	x	0.9	=	220.41	(74)
North 0.9	(1	x	2.8	х	79.99	×	0.9	x	0.9	=	489.8	(74)
North 0.9	(1	x	1.54	x	74.68	x	0.9	x	0.9	=	2 <mark>51.51</mark>	(74)
North 0.9	< <u>1</u>	x	1.26	x	74.68	x	0.9	x	0.9	=	2 <mark>05.78</mark>	(74)
North 0.9	(1	x	2.8	x	74.68	×	0.9	x	0.9	=	4 <mark>57.29</mark>	(74)
North 0.9	< 1	x	1.54	x	59.25	x	0.9	x	0.9	=	199.54	(74)
North 0.9	۲ (x	1.26	x	59.25	x	0.9	x	0.9	=	163.26	(74)
North 0.9	(1	x	2.8	x	59.25	x	0.9	x	0.9	=	362.8	(74)
North 0.9	(1	x	1.54	x	41.52	x	0.9	x	0.9	=	139.83	(74)
North 0.9	(1	x	1.26	x	41.52	x	0.9	x	0.9	=	114.4	(74)
North 0.9	(1	x	2.8	x	41.52	x	0.9	x	0.9	=	254.23	(74)
North 0.9	(1	x	1.54	x	24.19	x	0.9	x	0.9	=	81.47	(74)
North 0.9	(1	x	1.26	x	24.19	x	0.9	x	0.9	=	66.66	(74)
North 0.9	(1	x	2.8	x	24.19	x	0.9	x	0.9	=	148.13	(74)
North 0.9	(1	x	1.54	x	13.12	x	0.9	x	0.9	=	44.18	(74)
North 0.9	(1	x	1.26	x	13.12	x	0.9	x	0.9	=	36.15	(74)
North 0.9	۲ (x	2.8	x	13.12	x	0.9	x	0.9	=	80.33	(74)
North 0.9	(1	x	1.54	x	8.86	x	0.9	x	0.9	=	29.86	(74)
North 0.9	(1	x	1.26	x	8.86	x	0.9	x	0.9	=	24.43	(74)
North 0.9	(1	x	2.8	x	8.86	x	0.9	x	0.9	=	54.28	(74)
East 0.9	(1	x	2.8	x	19.64	x	0.9	x	0.9	=	40.09	(76)
East 0.9	(1	x	2.8	x	38.42	x	0.9	x	0.9	=	78.42	(76)
East 0.9	(1	x	2.8	x	63.27	x	0.9	x	0.9	=	129.15	(76)

East	0.9x	1	x	2.8	x	92.28	x	0.9	x	0.9] =	188.36	(76)
East	0.9x	1	x	2.8	x	113.09	x	0.9	x	0.9] =	230.84	(76)
East	0.9x	1	x	2.8	x x	115.77	x	0.9	x	0.9] =	236.31	(76)
East	0.9x	1	x	2.8	x	110.22	x	0.9	x	0.9]] =	224.98	(76)
East	0.9x	1	x	2.8	x	94.68	x	0.9	x	0.9]] =	193.25	(76)
East	0.9x	1	x	2.8	x x	73.59	x	0.9	x	0.9] =	150.21	(76)
East	0.9x	1	x	2.8	x	45.59	x	0.9	x	0.9]] =	93.06	(76)
East	0.9x	1	x	2.8	l x	24.49	x	0.9	x	0.9]] _	49.99	(76)
East	0.9x	1	x	2.8	x	16.15	x	0.9	x	0.9	=	32.97](76)
South	0.9x	1	x	3.43	x	46.75	x	0.9	x	0.9] =	116.9](78)
South	0.9x	1	x	0.91	x	46.75	x	0.9	x	0.9	=	31.01	(78)
South	0.9x	1	x	2.8	x	46.75	x	0.9	x	0.9	=	95.43	(78)
South	0.9x	1	x	3.43	x	76.57	x	0.9	x	0.9	i =	191.46	 (78)
South	0.9x	1	x	0.91	x	76.57	x	0.9	x	0.9	=	50.79	(78)
South	0.9x	1	x	2.8	x	76.57	x	0.9	x	0.9	i =	156.29	(78)
South	0.9x	1	x	3.43	x	97.53	x	0.9	x	0.9	i =	243.88	(78)
South	0.9x	1	x	0.91	x	97.53	x	0.9	x	0.9	=	64.7	(78)
South	0.9x	1	x	2.8	x	97.53	х	0.9	х	0.9	-	199.09	(78)
South	0.9x	1	x	3.43	x	110.23	x	0.9	x	0.9	-	275.64	(78)
South	0.9x	1	x	0.91	x	110.23	×	0.9	×	0.9	=	73.13	(78)
South	0.9x	1	x	2.8	x	110.23	x	0.9	x	0.9	=	2 <mark>25.01</mark>	(78)
South	0.9x	1	x	3.43	x	114.87	х	0.9	x	0.9	=	2 <mark>87.23</mark>	(78)
South	0.9x	1	x	0.91	x	114.87	×	0.9	x	0.9] =	76.2	(78)
South	0.9x	1	x	2.8	×	114.87	x	0.9	x	0.9	=	2 <mark>34.47</mark>	(78)
South	0.9x	1	x	3.43	x	110.55	x	0.9	x	0.9	=	276.42	(78)
South	0.9x	1	x	0.91	x	110.55	x	0.9	x	0.9	=	73.34	(78)
South	0.9x	1	x	2.8	×	110.55	x	0.9	x	0.9] =	225.65	(78)
South	0.9x	1	x	3.43	x	108.01	x	0.9	x	0.9	=	270.08	(78)
South	0.9x	1	x	0.91	x	108.01	x	0.9	x	0.9	=	71.65	(78)
South	0.9x	1	x	2.8	x	108.01	x	0.9	x	0.9	=	220.47	(78)
South	0.9x	1	x	3.43	x	104.89	x	0.9	x	0.9	=	262.29	(78)
South	0.9x	1	x	0.91	×	104.89	x	0.9	x	0.9	=	69.59	(78)
South	0.9x	1	x	2.8	x	104.89	x	0.9	x	0.9	=	214.11	(78)
South	0.9x	1	x	3.43	x	101.89	x	0.9	x	0.9	=	254.76	(78)
South	0.9x	1	x	0.91	x	101.89	x	0.9	x	0.9	=	67.59	(78)
South	0.9x	1	x	2.8	X	101.89	x	0.9	x	0.9	=	207.97	(78)
South	0.9x	1	X	3.43	×	82.59	x	0.9	x	0.9	=	206.5	(78)
South	0.9x	1	X	0.91	×	82.59	x	0.9	x	0.9	=	54.79	(78)
South	0.9x	1	X	2.8	×	82.59	X	0.9	x	0.9	=	168.57	(78)
South	0.9x	1	X	3.43	×	55.42	x	0.9	X	0.9	=	138.57	(78)
South	0.9x	1	X	0.91	x	55.42	x	0.9	x	0.9	=	36.76	(78)

	_							- —							
South	0.9x	1	x	2.8	8	x	55.42	x	0.9	×	0.9	=	113.12	(78)	
South	0.9x	1	x	3.4	3	x	40.4	x	0.9	×	0.9	=	101.01	(78)	
South	0.9x	1	x	0.9	91	x	40.4	x	0.9	x	0.9	=	26.8	(78)	
South	0.9x	1	x	2.	8	x	40.4	x	0.9	x	0.9	=	82.46	(78)	
Τ	1			for eac		1		r i i i	um(74)m .	<u> </u>			ı		
` '	413.67	725.84		1441.42			1701.76	1464.84	1188.99	819.17	499.09	351.81		(83)	
- -				r (84)m =	· ,	· ,		i		i	·		1		
(84)m= `	1210.35	1516.91	1820.06	2153.59	2405.64	2408.75	2293.71	2066.75	1819.04	1497.64	1231.43	1125.89		(84)	
7. Mea	an interi	nal temp	erature	(heating	season)									
Tempe	erature	during h	eating p	eriods ir	n the livi	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)	
Utilisat	tion fac	tor for g	ains for	living are	ea, h1,m	(see Ta	able 9a)	-		_	-				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(86)m=	1	0.99	0.95	0.85	0.67	0.48	0.35	0.4	0.66	0.92	0.99	1		(86)	
Mean i	internal	temper	ature in	living are	ea T1 (fo	ollow ste	eps 3 to	7 in Tabl	e 9c)	-					
(87)m=	19.91	20.14	20.45	20.77	20.95	20.99	21	21	20.96	20.7	20.23	19.87		(87)	
Tompo		during h				dwalling	I from To		الے ایک (۵۵)				1		
(88)m=	19.98	19.98	19.99	eriods ir	20	20.01	20.01	20.01	20	20	19.99	19.99		(88)	
									20	20	19.99	13.33		(00)	
	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)														
(89)m=															
Me <mark>an i</mark>	Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)														
(90)m=	90)m= 18.54 18.88 19.32 19.75 19.95 20 20 20.01 19.98 19.67 19.02 18.49 (90)														
									ſ	f <mark>LA =</mark> Livin	g area ÷ (4	4) =	0.43	(91)	
Me <mark>an i</mark>	Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (91)														
(92)m=	19.13	19.42	19.8	20.19	20.38	20.43	20.43	20.43	20.4	20.11	19.54	19.08		(92)	
Apply a	adjustm	nent to th	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate			•		
(93)m=	19.13	19.42	19.8	20.19	20.38	20.43	20.43	20.43	20.4	20.11	19.54	19.08		(93)	
8. Spa	ce heat	ting requ	uiremen	t				-							
						ned at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate		
the util				using Ta			i	i	i				1		
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ł		
			ains, hm	r i									1	(04)	
(94)m=	0.99	0.98	0.94	0.82	0.64	0.44	0.3	0.35	0.61	0.9	0.98	0.99	l	(94)	
	<u> </u>		· · ·	4)m x (84	· · · · · · · · · · · · · · · · · · ·	4050 50	600.00	700 54	4440.40	4040.40	4000 50	4440.4		(05)	
· · /		1482.28		1776.13		1056.52	699.32	733.51	1113.46	1343.16	1208.52	1119.4	l	(95)	
(96)m=	4.3	age exte 4.9	6.5	perature 8.9	11.7	able 8 14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)	
Ľ											7.1	4.2	Į	(90)	
(97)m=				2086.37		Lm , VV : 1064.88	1 /	x [(93)m 735.63	– (96)m	1753.67	2302 75	2765.46		(97)	
Ľ)m – (95			2100.40		(0))	
· -	1175.13	<u> </u>	579.21	223.37	52.16		11 = 0.02	24 X [(97)m – (95 0	305.42	787.84	1224.67			
		320.10	0.0.21		02.10	L	Ľ		l per year				5176.94	(98)	
6	h							i Uld	i per yedi	(iterinyea)	, – Gum(9	U J15,912 =			
Space	neating	g require	ement in	kWh/m ²	year								31	(99)	

8c. Sp	ace co	oling rec	quiremer	nt										
Calcu	ated fo	r June, J	July and	August.	See Ta	ble 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	oss rate	e Lm (ca	lculated	using 2	5°C inter	i · · · ·	i	and exte	ernal ten	nperatur	re from T	able 10)		
(100)m=	0	0	0	0	0	1718.02	1352.49	1386.74	0	0	0	0		(100)
г		tor for lo	r	i		i		i					1	(1.5.1)
(101)m=	0	0	0	0	0	0.94	0.97	0.96	0	0	0	0		(101)
		i i	<u> </u>	(100)m >	r`	i	l						1	(400)
(102)m=	0	0	0	0	0	1622.23		1325.18		0	0	0		(102)
. г.			1	1	1	i i	i	e Table					1	(102)
(103)m=	0	0	0	0	0	2408.75		2066.75		0	0	0	(11)	(103)
•				< 3 × (98		iwening,	continu	ous (kW	(n) = 0.0	24 X [(1)	<i>03)m</i> – (102)m j.	x (41)m	
(104)m=	0	0	0	0	0	566.29	727.34	551.73	0	0	0	0		
									Total	l = Sum((104)	=	1845.37	(104)
Cooled	fractio	า									area ÷ (4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)					-					
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
									Tota	l = Sum	(104)	=	0	(106)
			r	1		× (105)	T		r		1	1	1	
(107)m=	0	0	0	0	0	141.57	181.83	137.93	0	0	0	0		7
										l = Sum((107)	=	461.34	(107)
Space	cooling	requirer	nent in l	«Wh/m²/	year				(107)) ÷ (4) =			2.76	(108)
9b. Ene	ergy red	quiremer	nts – Co	mmu <mark>nity</mark>	heating	scheme)							
				.		0		ting prov			unity sc	heme.		
Fractio	n or spa	ace neat	from se	condary	/suppler	nentary I	neating	(Table 1	1) 'U' IT N	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	v system	1 – (30	1) =						1	(302)
								allows for		up to four	other heat	sources; t	he latter	
			-			from powe	r stations.	See Appel	ndix C.					
				ity boile									1	(303a)
Fractio	n of tota	al space	heat fro	m Comr	nunity bo	oilers				(3	802) x (303	8a) =	1	(304a)
Factor	for con	rol and	charging	method	(Table	4c(3)) fo	or comm	unity hea	ating sys	tem			1	(305)
Distribu	ition los	ss factor	(Table 2	12c) for a	commun	ity heati	ng syste	m					1.05	(306)
Space	heating	g											kWh/yea	•
Annual	space	heating	requiren	nent									5176.94	
Space	heat fro	om Comr	munity b	oilers					(98) x (30	04a) x (30	5) x (306)	=	5435.79	(307a)
Efficien	cy of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	idary/suj	pplemen	itary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water	heating	1												
		neating r	equirem	ent									1953.22	7
		ommuni [:] m Comr							(64) × (2)	13a) v (30	5) x (306)	_	2050.88](310a)
		d for hea						0.01	× [(307a).				[(313)
LIECTIC	ity use			ulion				0.01	× [(307a).	(3078) -	- (STUA)	(310e)] =	74.87	(313)

Cooling System Energy Efficiency Ratio					3.38	(314)
Space cooling (if there is a fixed cooling system,	if not enter 0)	= (107) ÷ (314)	=		136.69	(315)
Electricity for pumps and fans within dwelling (Ta						- 1
mechanical ventilation - balanced, extract or posi	tive input from outsi	de		Ļ	0	(330a)
warm air heating system fans				Ļ	0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b)) + (330g) =		0	(331)
Energy for lighting (calculated in Appendix L)					532.91	(332)
10b. Fuel costs – Community heating scheme						
	Fuel kWh/year		l Price ble 12)		Fuel Cost £/year	
Space heating from CHP	(307a) x		4.24 × 0.0	01 =	230.48	(340a)
Water heating from CHP	(310a) x		4.24 × 0.0	- 10	86.96	(342a)
	(245)	Fue	Price	. –		-
Space cooling (community cooling system)	(315)		13.19 × 0.0		18.03	(348)
Pumps and fans	(331)		13.19 × 0.0		0	(349)
Energy for lighting	(332)		13.19 × 0.0		70.29	(350)
Additional standing charges (Table 12)					120	(351)
Total energy cost = (340a)	.(342e) + (345)(354) =				525.76	(355)
11b. SAP rating - Community heating scheme						
Energy cost deflator (Table 12)				Г	0.42	(356)
Energy cost factor (ECF) [(355) x (3	56)] ÷ [(4) + 45.0] =				1.04	(357)
SAP rating (section12)					85.47	(358)
12b. CO2 Emissions – Community heating schen						
		inergy Wh/year	Emission fac kg CO2/kWh		nissions J CO2/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%) If	ing (not CHP) there is CHP using two fu	uels repeat (363) to (366) for the secor	nd fuel	95	(367a)
CO2 associated with heat source 1	[(307b)+(310b)]	x 100 ÷ (367b) x	0	=	1702.23	(367)
Electrical energy for heat distribution	[(313) :	¢	0.52	=	38.86	(372)
Total CO2 associated with community systems	(363)	.(366) + (368)(372)	=	1741.09	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater	er or instantaneous h	neater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water heati	ng (373) +	(374) + (375) =			1741.09	(376)
CO2 associated with space cooling	(315) x		0.52	=	70.94	(377)
CO2 associated with electricity for pumps and far	ns within dwelling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	(332)))	x	0.52	=	276.58	(379)

Total CO2, kg/year	sum of (376)(382) =				2088.61	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.51	(384)
El rating (section 14)					86.8	(385)
13b. Primary Energy – Community heat	ing scheme					
		Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)) g two fuels repeat (363) to ((366) for the second	l fuel	95	(367a)
Energy associated with heat source 1	[(307b)+	(310b)] x 100 ÷ (367b) x	0	=	9614.45	(367)
Electrical energy for heat distribution		[(313) x		=	229.84	(372)
Total Energy associated with communit	y systems	(363)(366) + (368)(372)	=	9844.29	(373)
if it is negative set (373) to zero (unle	ss specified otherwise, s	see C7 in Appendix C)	[9844.29	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from imm	ersion heater or instanta	aneous heater(312) x	3.07	=	0	(375)
Total Energy associated with space and	l water heating	(373) + (374) + (375) =		[9844.29	(376)
Energy associated with space cooling		(315) x	3.07	=	419.65	(377)
Energy associated with electricity for pu	mps and fans within dw	elling (331)) x	3.07	=	0	(378 <mark>)</mark>
Energy associated with electricity for lig	hting	(33 2))) x	3.07	=	1636.03	(379)
Total Primary Energy, kWh/yea	r sum of (376)	.(382) =			11899.97	(383)

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 201			Strom Softwa	are Vei			Versic	on: 1.0.3.11	
					Address	: Flat 7					
Address :	28 Redingto	on Road,	NW3 7	RB							
1. Overall dwelling dimer	nsions:										
				Area	a(m²)		Av. He	ight(m)	-	Volume(m ³)
Ground floor					243	(1a) x	2	2.9	(2a) =	704.7	(3a)
First floor					28	(1b) x	2	.75	(2b) =	77	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+((1d)+(1e)+(1n	ı)	271	(4)			_		_
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	(3n) =	781.7	(5)
2. Ventilation rate:											
	main heating		econdar eating	у	other		total			m ³ per hou	r
Number of chimneys		"ז + ר	0	+	0] = [0	x	40 =	0	(6a)
Number of open flues	0	- +	0	- +	0	ī - Г	0	×	20 =	0	(6b)
Number of intermittent fan	is					- <u> </u>	5	x	10 =	50	(7a)
Number of passive vents							0	x	10 =	0	(7b)
Number of flueless gas fir	es					Ē	0	×	40 = Air ch	0 anges per ho	(7c)
Infiltration due to chimney	s, flues and fa	ans = (6;	a)+(6b)+(7	a)+(7b)+(7c) =	Г	50		÷ (5) =	0.06	(8)
If a pressurisation test has be						continue fr			. (-)	0.00	
Number of storeys in the	e dw <mark>elling</mark> (ne	5)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2							uction			0	(11)
if both types of wall are pre deducting areas of opening			oonding to	the great	er wall are	a (after					
If suspended wooden flo			ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else e	enter 0								0	(13)
Percentage of windows	and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	4.5	(17)
If based on air permeabilit	ty value, then	(18) = [(1	7) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.29	(18)
Air permeability value applies	s if a pressurisatio	on test has	been don	e or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides sheltered	b						0)1			1	(19)
Shelter factor					(20) = 1 -		9)] =			0.92	(20)
Infiltration rate incorporation	•				(21) = (18)) x (20) =				0.27	(21)
Infiltration rate modified fo								1	-	I	
Jan Feb I	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe										1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	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			
Adjuste	ed infiltra	ation rat	e (allow	ing for sł	nelter an	nd wind s	peed) =	: (21a) x	(22a)m						
	0.34	0.33	0.33	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31			
	ate effec echanica		-	rate for t	he appli	cable ca	se	-					- 		
				endix N, (2	3h) - (23:	a) v Emv (e	auation (N5)) other	wise (23h) - (23a)				0	(23a)
				ciency in %) – (23a)				0	(23b)
			-	-	-					26) m i (*	00h) [/	1 (000)		0	(23c)
a) II (24a)m=				entilation					0 $m = (2)$	20)m + (. 0	230) × [1 - (230)	- 100 <u> </u>]	(24a)
	-			_							-	Ū			(210)
(24b)m=				entilation					0 = (22)	0	230)	0	1		(24b)
) í	-						_		-	0	0	0	J		(210)
,				ntilation o then (24)	•	•				5 x (23b)				
(24c)m=	0	0	0		0				0		0	0	1		(24c)
	natural	ventilatio	n or wh	nole hous	e nositiv		ventilati						J		
,				m = (221)						0.5]					
(24d) <mark>m=</mark>	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55			(24d)
Effec	ctive air	change	rate - ei	nter (24a) or (2 <mark>4</mark> 1	o) or (24	c) or (24	ld) in boy	(25)						
(25)m=	0 .56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55			(25)
3 40	at losses	s and he	at loss	paramet	ar.								-		
ELEN		Gros		Openin		Net Ar	ea	U-valu	Je	AXU		k-value	÷		AXk
		area		m	-	A ,r		W/m2		(W/ł	<)	kJ/m²·l			kJ/K
Doo <mark>rs</mark>						2.1	x	0.8	=	1.68					(26)
Window	ws Type	1				0.98	x1	/[1/(1.2)+	0.04] =	1.12					(27)
Window	ws Type	2				4		/[1/(1.2)+	0.04] =	4.58					(27)
Window	ws Type	3				3.3		/[1/(1.2)+	0.04] =	3.78					(27)
Windov	ws Type	4				3.1		/[1/(1.2)+	0.04] =	3.55					(27)
Windov	ws Type	5				2.1		/[1/(1.2)+	0.04] =	2.4					(27)
Windo	ws Type	6				0.8		/[1/(1.2)+	0.04] =	0.92	\exists				(27)
	ws Type					1.54	=	/[1/(1.2)+		1.76					(27)
Rooflig						1		/[1/(1.3) +	0.04] =	1.3					(27b)
Walls 1		44.7	7	6.28		38.49		0.12		4.62	= r		7		(29)
Walls 1		69.0		2.1		66.92		0.12		8.03	╡┟		4		(29)
Walls 1									= 1		╡┟		\exists		
Walls 1		45.5		8.5		37.03		0.12		4.44	╡╏		\dashv		(29)
		13.3		0		13.34		0.11		1.44	╡╎				(29)
Walls T		21.4		2.94		18.52		0.11	=	2.01	╡╞				(29)
Walls T		69.0		4		65.02		0.12	=	7.8	⊣ ļ				(29)
Walls 7		9.8	6	0		9.86	×	0.11	=	1.07	_				(29)
Roof T	ype1	28		2		26	x	0.18	=	4.68				1	(30)

Average = Sum(39), $12/12=$ 276.44 (39) Heat loss parameter (HLP), W/m ² K (40)m = (39)m + (4) (40)m = 1.03 1.03 1.03 1.02 1.02 1.01 1.01 1.01 1.01 1.02 1.02	Roof ⁻	Type2	87	,	2		85	×	0.18	=	15.3				(30)		
** include the areas on both sides of internal walks and partitions Fabric heat loss, W/K = S (A × U) (21)(30) + (32) = 78.42 (33) Heat capacity (Cn = S(A × K) (22)(32) + (32)(32) = 0 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K Indicative values of TMP in Table 11 can be used instant to details of the construction are not known precisely the indicative values of TMP in Table 11 can be used instant of a detailed calculation. Thermal bridges : S (L × Y) calculated using Appendix K 57.9 (36) Table table instant bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 136.32 (37) Ventilation heat loss calculated monthly (39)m = 0.33 × (29)m x (5) Ventilation heat loss calculated monthly (39)m = 0.33 × (29)m x (5) Ventilation heat loss calculated monthly (39)m = 0.37 × (29)m x (5) Ventilation heat loss calculated monthly (39)m = 0.37 + (39)m (39)m = 280.28 279.59 279.12 276.45 275.94 273.61 273.61 273.61 274.51 275.94 276.96 276.02 American and the transfer coefficient, W/K (39)m = (37) + (39)m (39)m = 280.28 279.59 279.12 276.45 275.94 273.61 273.61 273.61 274.51 275.94 276.96 276.02 American and the table of the table table of the table table of the table table of table table table of table table of table table of table table of table tabl	Total a	area of e	lements	, m²			386								(31)		
$\begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} $								lated using	g formula 1	/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	n 3.2			
Thermal mass parameter (TMP = Cm = TFA) in kJ/m ² K Indicative Value: Medium 200 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 considered of detailed collustion. Thermal bridges : S (L x Y) calculated using Appendix K 57.9 (36) if details of thermal bridging are not known (39) = 0.15 x (31) Total fabric heat loss Ventilation heat loss calculated monthly (38) m = 0.33 x (25) m x (5) (38) m $133.8 + 143.8 + 143.8 + 140.1 + 139.65 + 137.3 + 137.3 + 138.2 + 139.63 + 140.64 + 141.7 (38) (39) m 2102.8 + 279.69 + 275.42 + 275.94 + 273.61 + 273.61 + 273.18 + 273.82 + 276.96 + 276.02 + 276.44 + 276.94$	Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				78.42	(33)		
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 are to used instand of a detailed calculation. Thermal bridging are not known (36) = 0.15 x (31) Total Tabric heat loss (33) + (36) = (13.36) 13.36 143.38 142.81 140.13 139.63 137.3 137.3 136.87 138.2 139.63 140.64 141.7 (39) m = 13.36 143.38 142.81 140.13 139.63 137.3 137.3 136.87 138.2 139.63 140.64 141.7 (39) m = 13.36 143.38 142.81 140.13 139.63 137.3 137.3 136.87 138.2 139.63 140.64 141.7 (39) m = 120.28 279.66 270.12 276.45 275.94 273.61 273.16 273.18 274.51 275.94 276.80 78.02 Nemper 2 (20.28 279.66 270.12 276.45 275.94 273.61 273.16 273.18 274.51 275.94 276.80 78.02 Nemper 0 floats in month (Table 1a) Heat loss parameter (HLP), W(m ² K (40) m = (103) 1.03 1.02 1.02 1.01 1.01 1.01 1.00 1.02 1.02	Heat c	apacity	Cm = S((A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)		
can be used instead of a detailed calculation. Thermal bridges : S (L × Y) calculated using Appendix K if details of thema hidging are not known (28) = 0.15 x (31) Total fabric heat loss (33) + (36) = (33) +	Therm	al mass	parame	eter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)		
if details of thermal bridging are not known (36) = $0.5 \times (31)$ Total fabric heat loss Ventilation heat loss calculated monthly (38) = $0.33 \times (25) \times (5)$ (39) = $0.33 \times (25) \times (5)$ Heat transfer coefficient, W/K (39) = $0.33 \times (25) \times (5)$ Heat transfer coefficient, W/K (39) = $0.33 \times (25) \times (5)$ Heat transfer coefficient, W/K (39) = $0.33 \times (25) \times (5)$ Heat transfer coefficient, W/K (39) = $0.33 \times (25) \times (5)$ Heat transfer coefficient, W/K (39) = $0.33 \times (25) \times (5)$ Heat loss parameter (HLP), W/m ² K (40) = $0.33 \times (1.02 \times 1.02 \times $		-				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f				
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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Ventila			1	monthl				<u> </u>	. ,				1			
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Energy content of hot water used - calculated monthly = $4.190 \times Vd, m \times nm \times DTm / 3600 \ kWh/month$ (see Tables 1b, 1c, 1d) (45)m= 175.67 153.64 158.54 138.22 132.63 114.45 106.05 121.7 123.15 143.52 156.66 170.13 Total = Sum(45)_{112} = 1694.35 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26.35 23.05 23.78 20.73 19.89 17.17 15.91 18.25 18.47 21.53 23.5 25.52 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 1 (47) If community heating and no tank in dwelling, enter 110 litres in (47)	(44)m=	118.46	114.15	109.84	105.53	101.23	96.92	96.92	101.23	105.53	109.84	114.15	118.46				
$ \begin{array}{c} (45)m = & 175.67 & 153.64 & 158.54 & 138.22 & 132.63 & 114.45 & 106.05 & 121.7 & 123.15 & 143.52 & 156.66 & 170.13 \\ \hline \\ total = & Sum(45)_{112} = & 1694.35 & (45) \\ total = & Sum(45)_{112} = & 1694.35 & (45) \\ \hline \\ (46)m = & 26.35 & 23.05 & 23.78 & 20.73 & 19.89 & 17.17 & 15.91 & 18.25 & 18.47 & 21.53 & 23.5 & 25.52 \\ \hline \\ Water storage loss: \\ Storage volume (litres) including any solar or WWHRS storage within same vessel & 1 & (47) \\ \hline \\ If community heating and no tank in dwelling, enter 110 litres in (47) \\ \end{array} $	_													1292.26	(44)		
$Total = Sum(45)_{112} = 1694.35$ (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26.35 23.05 23.78 20.73 19.89 17.17 15.91 18.25 18.47 21.53 23.5 25.52 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 1 (47) If community heating and no tank in dwelling, enter 110 litres in (47)	Energy	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,i I	m x nm x L	JTM / 3600) KWh/mor I	nth (see Ta	ables 1b, 1	c, 1a)	1			
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26.35 23.05 23.78 20.73 19.89 17.17 15.91 18.25 18.47 21.53 23.5 25.52 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 1 (47) If community heating and no tank in dwelling, enter 110 litres in (47) (47)	(45)m=	175.67	153.64	158.54	138.22	132.63	114.45	106.05	121.7	123.15	143.52	156.66	170.13				
Water storage loss:	lf instan	itaneous w	ater heati	ng at point	of use (no	hot wate	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ :	=	1694.35	(45)		
Storage volume (litres) including any solar or WWHRS storage within same vessel 1 (47) If community heating and no tank in dwelling, enter 110 litres in (47) (47)	1 (L			23.78	20.73	19.89	17.17	15.91	18.25	18.47	21.53	23.5	25.52		(46)		
If community heating and no tank in dwelling, enter 110 litres in (47)		-						- 1 -						-			
			,		0 ,			•		ame ves	sei		1		(47)		
		-	-			-				ers) ent	or '()' in (47)					

Water storage loss:

a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	$\begin{array}{c} \begin{array}{c} \begin{array}{c} 0 \\ \hline 0$													
•••			-					(48) x (49) =			1		(50)
,													I	
		•				n/iitie/ua	ay)				0.	.03		(51)
	•	-									4.	.93		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/ye	ear			(47) x (51) x (52) x (53) =	0	0.1		(54)
	、 ,	. , .	,								0	.1		(55)
Water	storage	loss cal	culated	for each	month	•	•	((56)m = (55) × (41)ı	n				
(56)m=														(56)
If cylinde	er contain:	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – ((H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
	•						. ,	• • •						
(mo	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)		I	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Tota <mark>l h</mark>	n <mark>ea</mark> t requ	uired for	water h	eating ca	alculated	for eac	h mo <mark>nth</mark>	(62)m =	0.85 × (45) <mark>m +</mark>	(46)m +	(57)m +	(59)m + (6 ⁻	l)m
(62)m=	201.96	177.3 <mark>9</mark>	18 <mark>4.84</mark>	163.67	158.92	139.89	132.34	147.99	148.59	169.81	182.11	196.42		(62)
Solar Di	HW input o	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, <mark>see</mark> Ap	pendix (<u>3)</u>			-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter					-						
(64)m=	201.96	177.39	184.84	163.67	158.92	139.89	132.34	147.99	148.59	169.81	182.11	196.42		
								Out	out from wa	ater heatei	(annual)₁	12	2003.92	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	77.02	67.89	71.33	63.97	62.71	56.06	53.87	59.07	58.96	66.33	70.1	75.18		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gain	s (Table	e 5), Wat	ts				-						
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	185.65	185.65	185.65	185.65	185.65	185.65	185.65	185.65	185.65	185.65	185.65	185.65		(66)
Lightin	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	105.02	93.28	75.86	57.43	42.93	36.24	39.16	50.9	68.32	86.75	101.25	107.94		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ole 5	_	-		
(68)m=	648.26	654.99	638.03	601.95	556.39	513.58	484.97	478.25	495.2	531.29	576.84	619.66		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	tion L15	or L15a)), also se	e Table	5				
(69)m=	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66		(69)
Pumps	s and fai	ns gains	(Table s	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)

Losses	s e.g. ev	vaporatio	n (nega	tive valu	ues) (Ta	able	5)										
(71)m=	-123.77	-123.77	-123.77	-123.77	-123.7	7 -1	23.77	-123.77	-123	.77 -123.77	-123.	77	-123.77	-123.77			(71)
Water	heating	, gains (T	able 5)			•				•	•						
(72)m=	103.52	101.03	95.87	88.84	84.29	7	77.87	72.41	79	.4 81.88	89.1	15	97.36	101.04			(72)
Total i	nterna	l gains =		-			(66)r	m + (67)m	1 + (68	3)m + (69)m +	(70)m	+ (7	1)m + (72)n	n			
(73)m=	975.34	967.84	928.3	866.77	802.15	5 7	46.23	715.09	727	7.1 763.95	825.	74	894	947.18			(73)
6. So	lar gain	s:															
-			•	ar flux fron	n Table 6	a and			tions	to convert to th	ne appl	icab		on.			
Orienta		Access F Table 6d	actor	Area m ²	a		Flux Tab	k le 6a		g_ Table 6b		Т	FF able 6c		(Gains (W)	
N la utila	r					1					_	_					٦
North	0.9x	1	X		.8	X		0.63	X	0.9	_ ×		0.9	=		24.81	(74)
North	0.9x	1	×		54	X		0.63	X	0.9	×	-	0.9	=		23.88	(74)
North	0.9x	1	X		.8	X		0.32	X	0.9	×	Ļ	0.9	=		47.4	(74)
North	0.9x	1	X	1.	54	x	20	0.32	X	0.9	×	Ļ	0.9	=		45.63	(74)
North	0.9x	1	×		.8	X		4.53	X	0.9	×	Ļ	0.9	=		80.55	(74)
North	0.9x	1	X	1.	54	X	34	4.53	X	0.9	×	Ļ	0.9	=		77.53	(74)
North	0.9x	1	×		.8	×	<u> </u>	5.46	X	0.9	×		0.9			129.39	(74)
North	0.9x	1	×		54	Х	—	5.46	X	0.9	X		0.9	=		124.54	(74)
North	0.9x	1	×	0	.8	Х	<u> </u>	4.72	X	0.9	X		0.9	_ =		174.3	(74)
North	0.9x	1	×		54	X		4.72	X	0.9	×	Ļ	0.9	=		167.76	(74)
North	0.9x	1	×		.8	x		9.99	X	0.9	X	Ļ	0.9	_ =		186.59	(74)
North	0.9x	1	×	1.	54	X		9.99	Х	0.9	×	Ļ	0.9	_ =		179.59	(74)
North	0.9x	1	×	0	.8	×	74	4.68	X	0.9	X		0.9	_ =		174.21	(74)
North	0.9x	1	×	1.	54	x	74	4.68	X	0.9	×	Ļ	0.9	=		167.67	(74)
North	0.9x	1	X	0	.8	x	59	9.25	X	0.9	×	Ļ	0.9	_ =		138.21	(74)
North	0.9x	1	×		54	x		9.25	X	0.9	×	Ļ	0.9	_ =		133.03	(74)
North	0.9x	1	×	0	.8	x	4'	1.52	X	0.9	×	Ļ	0.9	=		96.85	(74)
North	0.9x	1	×	1.	54	x	4'	1.52	x	0.9	×	Ļ	0.9	=		93.22	(74)
North	0.9x	1	×	0	.8	x	24	4.19	x	0.9	×		0.9	=		56.43	(74)
North	0.9x	1	×	1.	54	x	24	4.19	x	0.9	×		0.9	=		54.31	(74)
North	0.9x	1	×	0	.8	x	1:	3.12	x	0.9	×	Ļ	0.9	=		30.6	(74)
North	0.9x	1	×	1.	54	x	1:	3.12	x	0.9	×	L	0.9	_ =		29.45	(74)
North	0.9x	1	×	0	.8	x	8	.86	x	0.9	×		0.9	_ =		20.68	(74)
North	0.9x	1	x	1.	54	x	8	.86	x	0.9	×	L	0.9	=		19.9	(74)
East	0.9x	1	x		4	x	19	9.64	x	0.9	x	L	0.9	=		57.27	(76)
East	0.9x	1	x		4	x	38	3.42	x	0.9	x		0.9	=		112.03	(76)
East	0.9x	1	x		4	x	63	3.27	x	0.9	x	L	0.9	=		184.5	(76)
East	0.9x	1	×		4	x	92	2.28	x	0.9	x		0.9	=		269.09	(76)
East	0.9x	1	×		4	x	11	3.09	x	0.9	×		0.9	=		329.78	(76)
East	0.9x	1	X		4	x	11	5.77	x	0.9	x		0.9	=		337.59	(76)

East	0.9x	1	x	4	x	110.22	x	0.9	x	0.9] =	321.4	(76)
East	0.9x	1	x	4	x	94.68	x	0.9	x	0.9	=	276.07](76)
East	0.9x	1	x	4	x	73.59	x	0.9	x	0.9	=	214.59](76)
East	0.9x	1	x	4	x	45.59	x	0.9	x	0.9	=	132.94](76)
East	0.9x	1	x	4	x	24.49	x	0.9	x	0.9	=	71.41	(76)
East	0.9x	1	x	4	x	16.15	x	0.9	x	0.9	=	47.1	(76)
South	0.9x	1	x	3.3	x	46.75	x	0.9	x	0.9	=	112.47	(78)
South	0.9x	1	x	3.1	x	46.75	x	0.9	x	0.9	=	105.65	(78)
South	0.9x	1	x	2.1	x	46.75	x	0.9	x	0.9	=	71.57	(78)
South	0.9x	1	x	3.3	x	76.57	x	0.9	x	0.9	=	184.2	(78)
South	0.9x	1	x	3.1	x	76.57	x	0.9	x	0.9	=	173.04	(78)
South	0.9x	1	x	2.1	x	76.57	x	0.9	x	0.9	=	117.22	(78)
South	0.9x	1	x	3.3	x	97.53	x	0.9	x	0.9	=	234.64	(78)
South	0.9x	1	x	3.1	x	97.53	x	0.9	x	0.9	=	220.42	(78)
South	0.9x	1	x	2.1	x	97.53	x	0.9	x	0.9	=	149.31	(78)
South	0.9x	1	x	3.3	x	110.23	x	0.9	x	0.9	=	265.19	(78)
South	0.9x	1	x	3.1	x	110.23	x	0.9	x	0.9	=	249.12	(78)
South	0.9x	1	x	2.1	×	110.23	x	0.9	x	0.9	=	168.76	(78)
South	0.9x	1	x	3.3	x	114.87	x	0.9	x	0.9	=	276.35	(78)
South	0.9x	1	x	3.1	x	114.87	×	0.9	x	0.9	=	259.6	(78)
South	0.9x	1	x	2.1	x	114.87	x	0.9	x	0.9	=	175.86	(78)
South	0.9x	1	x	3.3	x	110. <mark>5</mark> 5	х	0.9	x	0.9	=	2 <mark>65.94</mark>	(78)
South	0.9x	1	x	3.1	x	110.55	x	0.9	x	0.9	=	2 <mark>49.83</mark>	(78)
South	0.9x	1	x	2.1	x	110.55	x	0.9	x	0.9	=	1 <mark>69.24</mark>	(78)
South	0.9x	1	x	3.3	x	108.01	x	0.9	x	0.9	=	259.84	(78)
South	0.9x	1	x	3.1	x	108.01	x	0.9	x	0.9	=	244.1	(78)
South	0.9x	1	x	2.1	x	108.01	x	0.9	x	0.9	=	165.36	(78)
South	0.9x	1	x	3.3	x	104.89	x	0.9	x	0.9	=	252.34	(78)
South	0.9x	1	x	3.1	x	104.89	x	0.9	x	0.9	=	237.05	(78)
South	0.9x	1	x	2.1	x	104.89	x	0.9	x	0.9	=	160.58	(78)
South	0.9x	1	x	3.3	x	101.89	x	0.9	x	0.9	=	245.11	(78)
South	0.9x	1	x	3.1	x	101.89	x	0.9	x	0.9	=	230.25	(78)
South	0.9x	1	X	2.1	X	101.89	X	0.9	x	0.9	=	155.98	(78)
South	0.9x	1	x	3.3	x	82.59	x	0.9	x	0.9	=	198.68	(78)
South	0.9x	1	X	3.1	X	82.59	X	0.9	x	0.9	=	186.64	(78)
South	0.9x	1	x	2.1	x	82.59	x	0.9	x	0.9	=	126.43	(78)
South	0.9x	1	X	3.3	x	55.42	x	0.9	x	0.9	=	133.32	(78)
South	0.9x	1	X	3.1	x	55.42	X	0.9	X	0.9	=	125.24	(78)
South	0.9x	1	X	2.1	X	55.42	X	0.9	x	0.9	=	84.84	(78)
South	0.9x	1	x	3.3	×	40.4	x	0.9	x	0.9	=	97.19	(78)
South	0.9x	1	X	3.1	X	40.4	x	0.9	x	0.9	=	91.3	(78)

	_								_								
South	0.9x	1		x	2.1	×		40.4	X	0.9	2	×	0.9		=	61.85	(78)
West	0.9x	1		x	0.98	X		19.64	x	0.9	2	× [0.9		=	42.09	(80)
West	0.9x	1		x	0.98	X		38.42	x	0.9	,	× [0.9		=	82.35	(80)
West	0.9x	1		x	0.98	×		63.27	x	0.9	,	× [0.9		=	135.61	(80)
West	0.9x	1		x	0.98	×		92.28	x	0.9	;	× [0.9		=	197.78	(80)
West	0.9x	1		x	0.98	x		113.09	x	0.9	;	× [0.9		=	242.39	(80)
West	0.9x	1		x	0.98	×		115.77	x	0.9	;	× [0.9		=	248.13	(80)
West	0.9x	1		x	0.98	×	· ·	110.22	x	0.9	;	× [0.9		=	236.23	(80)
West	0.9x	1		x	0.98	×		94.68	x	0.9	;	× [0.9		=	202.91	(80)
West	0.9x	1		x	0.98	×		73.59	x	0.9	;	× [0.9		=	157.72	(80)
West	0.9x	1		x	0.98	×		45.59	×	0.9	;	× [0.9		=	97.71	(80)
West	0.9x	1		x	0.98	×		24.49	x	0.9	;	× [0.9		=	52.49	(80)
West	0.9x	1		x	0.98	×		16.15	x	0.9	;	× [0.9		=	34.62	(80)
Rooflig	hts 0.9x	1		x	1	×		26	X	0.7	,	× [0.7		=	22.93	(82)
Rooflig	hts <mark>0.9x</mark>	1		x	1	×		54	x	0.7	;	× [0.7		=	47.63	(82)
Rooflig	hts <mark>0.9x</mark>	1		x	1	×		96	x	0.7	;	× [0.7		=	84.67	(82)
Rooflig	hts 0.9x	1		x	1	×		150	x	0.7	;	× [0.7	Ī	=	132.3	(82)
Rooflig	hts 0.9x	1		x	1	×		192	x	0.7)	x	0.7		=	169.34	(82)
Roof <mark>lig</mark>	hts <mark>0.9x</mark>	1		x	1	×		200	x	0.7	;	x [0.7		-	176.4	(82)
Roof <mark>lig</mark>	hts 0.9x	1		x	1	₹ ×		189	i 🖈	0.7	,	x [0.7	٦	=	166.7	(82)
Roof <mark>lig</mark>	hts 0.9x	1		x	1	X		157	x	0.7	,	×	0.7		=	138.47	(82)
Roof <mark>lig</mark>	hts 0.9x	1		x	1	×		115	x	0.7	;	× [0.7		=	101.43	(82)
Roof <mark>lig</mark>	hts 0.9x	1		x	1	T ×		66	×	0.7)	× [0.7		=	58.21	(82)
Roof <mark>lig</mark>	hts 0.9x	1		x	1	×		33] ×	0.7	;	x [0.7		=	29.11	(82)
Rooflig	hts 0.9x	1		x	1			21] ×	0.7],	× [0.7	۲	=	18.52	(82)
	-								3			Ŀ					
Solar g	gains in	watts, ca	alculat	ed	for each m	onth			(83)m	n = Sum(74)m	(82))m					
(83)m=	460.68	809.49	1167.2	24	1536.16 179	5.37	1813.31	1735.49	153	3.68 1295.14	911	.34	556.45	391.	.14		(83)
Total g	gains – i	nternal a	ind so	lar	(84)m = (73	3)m +	(83)m	, watts								-	
(84)m=	1436.02	1777.33	2095.5	54	2402.92 259	7.52	2559.53	8 2450.58	226	5.78 2059.09	173	7.0	8 1450.45	1338	3.33		(84)
7. Me	an inter	nal temp	eratur	·е (heating sea	ison)											
Temp	perature	during h	eating	j pe	eriods in the	livin	g area	from Tal	ble 9	, Th1 (°C)						21	(85)
Utilisa	ation fac	ctor for ga	ains fo	or li	ving area, ł	n1,m (see T	able 9a)									
	Jan	Feb	Ма	_		1ay	Jun	Jul	A	ug Sep	0	Oct	Nov	De	ес		
(86)m=	1	1	0.99		0.95 0.	84	0.66	0.49	0.5	5 0.81	0.9	97	1	1			(86)
Mean	, interna	l temper	ature i	in li	iving area T	1 (fol	low ste	eps 3 to 7	7 in 7	able 9c)	•		!			•	
(87)m=	19.85	20.03	20.3	-		.87	20.97	21	20.	<u>′</u>	20.	.58	20.15	19.8	32]	(87)
			eating		eriods in res	t of d	wellin	a from Tr					- I - I			1	
(88)m=	20.05	20.06	20.06	<u> </u>		.07	20.08	20.08	20.		20.	.07	20.07	20.0	06]	(88)
		II														1	. /
	ation fac	tor for ga		-	0.93 0.	ng, h 79		1	T Ó	14 0.74	0.9	06		4		1	(89)
(89)m=			0.98		0.93 0.	19	0.57	0.39	0.4	0.74	0.9	30	1	1		J	(03)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m= 18.51 18.78 19.16 19.63 19.94 20.06 20.07 20.07 20.01 19.58 18.95 18.47	(90)
$fLA = Living area \div (4) = 0.31$	
$fLA = Living area \div (4) = 0.31$	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 18.92 19.16 19.51 19.93 20.23 20.34 20.36 20.36 20.29 19.89 19.32 18.88	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	
(93)m= 18.92 19.16 19.51 19.93 20.23 20.34 20.36 20.36 20.29 19.89 19.32 18.88	(93)
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate	
the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.93 0.8 0.6 0.42 0.47 0.76 0.96 0.99 1	(94)
Useful gains, hmGm , W = (94) m x (84) m	(04)
	(95)
Monthly average external temperature from Table 8	(00)
(96)m = 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , $W = [(39)m \times [(93)m - (96)m]$	()
	(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$	(-)
$(98)m = 1983.26 \ 1494.48 \ 1176.54 \ 590.07 \ 199.7 \ 0 \ 0 \ 0 \ 0 \ 666.93 \ 1398 \ 2043.06$	
	(98)
Space heating requirement in kWh/m²/year 35.25	(99)
8c. Space cooling requirement	
Calculated for June, July and August. See Table 10b	
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)	(100)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 2571.96 2024.73 2076.17 0 0 0 0	(100)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 0 0 0 0 0 0 0 0 (100)m= 0 0 0 0 2571.96 2024.73 2076.17 0 0 0 0 Utilisation factor for loss hm Image: Color of the co	. ,
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rateLm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m=$ 00002571.962024.732076.170000Utilisation factor for loss hm $(101)m=$ 0000.850.920.880000	(100) (101)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m = 0$ 0002571.962024.732076.17000Utilisation factor for loss hm $(101)m = 0$ 0000.850.920.88000Useful loss, hmLm (Watts) = (100)m x (101)m	(101)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m=$ 00002571.962024.732076.170000Utilisation factor for loss hm $(101)m=$ 0000.850.920.880000Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m=$ 0002176.11855.421832.830000	. ,
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m = 0$ 0002571.962024.732076.17000Utilisation factor for loss hm $(101)m = 0$ 0000.850.920.88000Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m = 0$ 0002176.11855.421832.83000Gains (solar gains calculated for applicable weather region, see Table 10)	(101) (102)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m=$ 0002571.962024.732076.17000 $(101)m=$ 00000.850.920.88000Utilisation factor for loss hm $(101)m=$ 0000.850.920.88000Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m=$ 0002176.11855.421832.83000Gains (solar gains calculated for applicable weather region, see Table 10) $(103)m=$ 0002559.542450.582265.78000	(101)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m = 0$ 0002571.962024.732076.17000Utilisation factor for loss hm $(101)m = 0$ 0000.850.920.88000Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m = 0$ 0002176.11855.421832.83000Gains (solar gains calculated for applicable weather region, see Table 10)	(101) (102)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rateLm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m=$ 0002571.962024.732076.17000 $(101)m=$ 00000.850.920.88000Utilisation factor for loss hm $(101)m=$ 0000.850.920.88000Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m=$ 0002176.11855.421832.83000Gains (solar gains calculated for applicable weather region, see Table 10) $(103)m=$ 0002559.542450.582265.780000Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m	(101) (102)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rateLm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m = 0$ 0002571.962024.732076.17000 $(100)m = 0$ 0000.850.920.880000Utilisation factor for loss hm $(101)m = 0$ 0000.850.920.880000Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m = 0$ 0002176.11855.421832.830000Gains (solar gains calculated for applicable weather region, see Table 10) $(103)m = 0$ 0002559.542450.582265.780000Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ set (104)m to zero if (104)m < 3 \times (98)m $(104)m = 0$ 000276.07442.8322.11000	(101) (102)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rateLm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m = 0$ 0002571.962024.732076.17000 $(100)m = 0$ 0000.850.920.880000Utilisation factor for loss hm $(101)m = 0$ 0000.850.920.880000Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m = 0$ 0002176.11855.421832.830000Gains (solar gains calculated for applicable weather region, see Table 10) $(103)m = 0$ 0002559.542450.582265.780000Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)mset (104)m to zero if (104)m < 3 x (98)m	(101) (102) (103)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m=$ 00002571.962024.732076.17000 $(100)m=$ 00002571.962024.732076.170000Utilisation factor for loss hm $(101)m=$ 0000.850.920.880000Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m=$ 0002176.11855.421832.830000Gains (solar gains calculated for applicable weather region, see Table 10) $(103)m=$ 0002559.542450.582265.780000Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)mset (104)m to zero if (104)m < 3 × (98)m	(101) (102) (103) (104)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 0 0 2571.96 2024.73 2076.17 0 0 0 0 (100)m= 0 0 0 0 0.85 0.92 0.88 0 0 0 0 Utilisation factor for loss hm	(101) (102) (103) (104)
Calculated for June, July and August. See Table 10b. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 0 0 0 0 0 0 0 0 0 (100)m= 0 0 0 0 0 0 0 0 0 0 0 0 Utilisation factor for loss hm (101)m= 0	(101) (102) (103) (104)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 2571.96 2024.73 2076.17 0 0 0 0 Utilisation factor for loss hm (101)m= 0 0 0 0 0 0 0.85 0.92 0.88 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 0 2176.1 1855.42 1832.83 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 0 2559.54 2450.58 2265.78 0 0 0 0 Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m (104)m= 0 0 0 0 0 276.07 442.8 322.11 0 0 0 0 Total = Sum(10.4) = 1040.99 Cooled fraction f C = cooled area \div (4) = 1 Intermittency factor (Table 10b) (106)m= 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 0 Space cooling requirement for month = (104)m x (105) x (106)m	 (101) (102) (103) (104) (105)
Calculated for June, July and August. See Table 10b. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td> (101) (102) (103) (104) (105) (106) </td>	 (101) (102) (103) (104) (105) (106)
Calculated for June, July and August. See Table 10b. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td> (101) (102) (103) (104) (105) </td>	 (101) (102) (103) (104) (105)

9b. Energy requirements – Community heating scl	neme										
This part is used for space heating, space cooling or water heating provided by a community scheme.											
Fraction of space heat from secondary/supplement			0	(301)							
Fraction of space heat from community system 1 -	- (301) =		1	(302)							
The community scheme may obtain heat from several sources includes boilers, heat pumps, geothermal and waste heat from			the latter								
Fraction of heat from Community boilers			1	(303a)							
Fraction of total space heat from Community boile	rs	(302) x (303a) =	1	(304a)							
Factor for control and charging method (Table 4c(3)) for community h	neating system	1	(305)							
Distribution loss factor (Table 12c) for community	heating system		1.05	(306)							
Space heating			kWh/year	_							
Annual space heating requirement			9552.04								
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	10029.65	(307a)							
Efficiency of secondary/supplementary heating sys	stem in % (from Ta	ble 4a or Appendix E)	0	(308							
Space heating requirement from secondary/supple	ementary system	(98) x (301) x 100 ÷ (308) =	0	(309)							
Water heating				-							
Annual water heating requirement If DHW from community scheme:			2003.92								
Water heat from Community boilers	2104.12	(310a)									
Electricity used for heat distribution	121.34	(313)									
Cooling System Energy Efficiency Ratio			3.38	(314)							
Space cooling (if there is a fixed cooling system, if	not enter 0)	= (107) ÷ (314) =	77.11	(315)							
Electricity for pumps and fans within dwelling (Tab mechanical ventilation - balanced, extract or positi		de	0	(330a)							
warm air heating system fans			0	(330b)							
pump for solar water heating			0	(330g)							
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	0	(331)							
Energy for lighting (calculated in Appendix L)			741.87	(332)							
10b. Fuel costs – Community heating scheme											
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year								
Space heating from CHP	(307a) x	4.24 × 0.01 =	425.26	(340a)							
Water heating from CHP	(310a) x	4.24 x 0.01 =	89.21	(342a)							
Change cooling (community cooling system)	(315)	Fuel Price									
Space cooling (community cooling system)		13.19 × 0.01 =	10.17	(348)							
Pumps and fans	(331)	13.19 × 0.01 =	0	(349)							
Energy for lighting	(332)	13.19 × 0.01 =	97.85	(350)							
Additional standing charges (Table 12)			120	(351)							

Total energy cost	= (340a)(342e) + (345).	(354) =			742.49	(355)
11b. SAP rating - Community heating	scheme					
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.	0] =			0.99	(357)
SAP rating (section12)					86.23	(358)
12b. CO2 Emissions – Community hea	ting scheme					
		Energy kWh/year	Emission fact kg CO2/kWh		nissions J CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)		?) ing two fuels repeat (363) to	(366) for the second	l fuel	95	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0	=	2758.83	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	62.97	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	2)	=	2821.81	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immer	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	vater heating	(373) + (374) + (375) =			2821.81	(376)
CO2 associated with space cooling		(315) x	0.52	=	40.02	(377)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	385.03	(379)
Total CO2, kg/year	sum of (376)(382) =			Γ	3246.86	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				11.98	(384)
El rating (section 14)					86.23	(385)
13b. Primary Energy – Community hea	ting scheme					
		Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)		-			-	
		• • • • • •		=	95	(367a)
Energy associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0		15582.31	(367)
Electrical energy for heat distribution		[(313) x		=	372.51	(372)
Total Energy associated with communit		(363)(366) + (368)(372		=	15954.81	(373)
if it is negative set (373) to zero (unle			;) 		15954.81	(373)
Energy associated with space heating ((309) x	0	=	0	(374)
Energy associated with water from imm		ntaneous heater(312) x	3.07	=	0	(375)
Total Energy associated with space and	d water heating	(373) + (374) + (375) =			15954.81	(376)
Energy associated with space cooling		(315) x	3.07	=	236.73	(377)
Energy associated with electricity for pu	Imps and fans within d	welling (331)) x	3.07	=	0	(378)
Energy associated with electricity for lig	hting	(332))) x	3.07	=	2277.53	(379)

Total Primary Energy, kWh/year

sum of (376)...(382) =

18469.07 (383)

User Details:												
Assessor Name: Software Name:	Stroma I				Strom Softwa	are Vei			Versio	n: 1.0.3.11		
					Address	: Flat 8						
Address :		gton Road	, NW3 7I	RB								
1. Overall dwelling dime	ensions:				()							
Crown of floor					a(m²)		Av. Hei			Volume(m ³)	_	
Ground floor					19	(1a) x	2	2.9	(2a) =	55.1	(3a)	
First floor					134	(1b) x	2	2.9	(2b) =	388.6	(3b)	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1r	n) 🔤	153	(4)						
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	443.7	(5)	
2. Ventilation rate:									-		_	
	main heatin		econdar neating	у	other		total			m ³ per hou	•	
Number of chimneys	0	(6a)										
Number of open flues			0	」 」 + 厂	0	」] = 「	0	x	20 =	0	(6b)	
·							-		10 =	30	(7a)	
	Number of intermittent fans $3 \times 10 =$											
Number of passive vents							0			0	(7b) (7c)	
Number of flueless gas fires 0 $x 40 = 0$ Air changes per Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 30$ $\div (5) = 0.07$												
If a pressurisation test has b	been ca <mark>rried o</mark> u	t or is intende				continue fr	30 om (9) to (÷ (5) =	0.07	(8)	
Number of storeys in t	he dw <mark>elling</mark>	(ns)								0	(9)	
Additional infiltration				0.05.6				[(9)·	-1]x0.1 =	0	(10)	
Structural infiltration: C if both types of wall are p deducting areas of openi	present, use the	value corres					uction			0	(11)	
If suspended wooden	floor, enter ().2 (unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)	
If no draught lobby, en										0	(13)	
Percentage of window	s and doors	draught st	ripped							0	(14)	
Window infiltration					0.25 - [0.2					0	(15)	
Infiltration rate					(8) + (10)					0	(16)	
Air permeability value,				•	•	•	etre of e	nvelope	area	4.5	(17)	
If based on air permeabi	-							1		0.29	(18)	
Air permeability value applie Number of sides sheltere		ation test has	s been aon	e or a deg	gree air pe	rmeability	is being us	sea		4	(19)	
											(19)	
Infiltration rate incorpora	ting shelter t	actor			(21) = (18) x (20) =				0.27	(21)	
Infiltration rate modified	-		ł							0.27	_, , ,	
Jan Feb	Mar Ap	· · ·	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Monthly average wind sr	Anothly average wind speed from Table 7											
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7			

Wind F	actor (2	22a)m =	(22)m ÷	- 4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltra	ation rat	e (allow	ing for sł	nelter ar	nd wind s	speed) =	: (21a) x	(22a)m					
-	0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.3	0.32		
			-	rate for t	he appl	icable ca	ise				!	ـــــــــــــــــــــــــــــــــــــ		
		al ventila		andix NL (2	12h) (22	а) н. Г ани (и	aquation (muiaa (22h	() () () () ()		l	0	(23a)
				endix N, (2) = (23a)		l	0	(23b)
			-	ciency in %	-					Ol-)	(00k)	 1 (00-)	0	(23c)
a) II (24a)m=								$\frac{1}{1}$ (24a)	$\frac{a}{b} = \frac{2}{c}$	$\frac{2}{0}$ $\frac{1}{10}$	230) × [¹	1 – (23c)	÷ 100]	(24a)
· · ·	-			I ^o entilation	-	-	-				-	Ů		(240)
(24b)m=								0			230)	0		(24b)
) í	-			ntilation of				-				Ů		(,
,				then (24	•	•				.5 × (23t))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilati	on or wh	nole hous	se positi	ve input	ventilati	on from	oft	!	I	·		
í	f (22b)n	n = 1, th	en (24d))m = (22l	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d)
Effec	<mark>ctiv</mark> e air	change	rate - e	nter (<mark>24a</mark>) or (2 <mark>4</mark>	b) or (24	c) or (24	ld) in bo	k (25)					
(25)m=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
3. Hea	at losse	s and he	eat l <mark>oss</mark>	paramet	er: <									
ELEN		Gros		Openin		Net Ar	rea	U-val	ue	AXU		k-value	,	AXk
		area	(m²)	r	1 ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²∙ŀ	(kJ/K
Doo <mark>rs</mark>						1.68		0.8	=	1.344				(26)
	ws Type					3.43	x1	/[1/(1.2)+	0.04] =	3.93				(27)
Window	ws Type	2				3.3	x1	/[1/(1.2)+	0.04] =	3.78				(27)
Window	ws Type	93				1.84	. x1	/[1/(1.2)+	0.04] =	2.11				(27)
Window	ws Type	9 4				1.4	x1	/[1/(1.2)+	0.04] =	1.6				(27)
Rooflig	hts Typ	e 1				1	x1	/[1/(1.3) +	0.04] =	1.3				(27b)
Rooflig	hts Typ	e 2				1	x1	/[1/(1.3) +	0.04] =	1.3				(27b)
Walls 7	Гуре1	36.	7	0		36.7	×	0.12	=	4.4				(29)
Walls T	Гуре2	9.5	7	0		9.57	×	0.12	=	1.15	ו ר		7	(29)
Walls T	ГуреЗ	36.7	77	0		36.77	7 X	0.12	=	4.41	ז ר		┐	(29)
Walls 1	Гуре4	53.3	36	1.68	3	51.68	в x	0.12		6.2	ז ד		i –	(29)
Walls T	Гуре5	98.	6	0		98.6	x	0.12		11.83	F i			(29)
Walls 1	Гуре6	53.3		0		53.36	6 X	0.12	=	6.4	-		i F	(29)
Walls 1		9.5		4.2		5.37		0.12		0.64	= i		i –	(29)
Walls 1		9.8		0		9.86		0.12		1.18	≓ ¦		i –	(29)
Roof		14		7		140		0.12		16.8	╡╏		╡	(30)
	rea of e	lements		L']	466.7			1		L			(31)
•			, -			-00.7	~							(0.)

	ndows and de the area						lated using	formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2				
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				81.57	(33)			
Heat o	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)			
Therm	al mass	parame	ter (TMF	⊃ = Cm ÷	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)			
	ign assess used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f					
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	K						70.02	(36)			
if details	s of therma	l bridging	are not kn	own (36) =	= 0.15 x (3	1)											
Total f	abric he	at loss							(33) +	(36) =			151.59	(37)			
Ventila	ation hea	t loss ca	alculated	monthl	у				(38)m	= 0.33 × (25)m x (5)						
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
(38)m=	81.93	81.59	81.26	79.7	79.41	78.05	78.05	77.8	78.57	79.41	80	80.62		(38)			
Heat t	ransfer o	oefficier	nt, W/K						(39)m	= (37) + (3	38)m						
(39)m=	233.52	233.18	232.85	231.29	231	229.64	229.64	229.39	230.17	231	231.59	232.21					
							ı	•	,	Average =	Sum(39)1	12 /12=	231.29	(39)			
Heat l	oss para	meter (H	HLP), W	/m²K	-	-			(40)m	= (39)m ÷	- (4)						
(40)m=	1.53	1.52	1.52	1.51	1.51	1.5	1.5	1.5	1.5	1.51	1.51	1.52					
Nhunsels	an af day		ath (Tah						,	Average =	Sum(40)1	12 /12=	1.51	(40)			
amuni	er of day		· ·	·					0		N 1.	D					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(11)			
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)			
4. Wa	ater heat	ing ener	rgy <mark>req</mark> u	irement:								kWh/ye	ear:				
Assun	ned occu	pancy I	N								2	94		(42)			
if TF), N = 1		[<mark>1 -</mark> exp	(-0.0003	349 x (TF	-13.9)2)] + 0.0	00 <mark>13 x (</mark>	TF <mark>A -13</mark> .		54		(12)			
								(25 x N)				04		(43)			
	the annua e that 125							to achieve	a water us	se target o	f						
1101 11101							· ·					_					
Hot wat	Jan	Feb	Mar day for or	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec					
			-				,	. ,					I				
(44)m=	114.4	110.24	106.08	101.92	97.76	93.6	93.6	97.76	101.92	106.08	110.24	114.4					
Energy	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,ı	m x nm x D)))))))))))))))))))			m(44) ₁₁₂ = ables 1b, 1		1247.95	(44)			
(45)m=	169.65	148.37	153.11	133.48	128.08	110.52	102.42	117.52	118.93	138.6	151.29	164.29					
										Total = Su	m(45) ₁₁₂ =	-	1636.26	(45)			
lf instar	taneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)	-							
(46)m=	25.45	22.26	22.97	20.02	19.21	16.58	15.36	17.63	17.84	20.79	22.69	24.64		(46)			
	storage																
-		. ,		• •			•	within sa	ame ves	sel		1		(47)			
	•	-			-) litres in	. ,		or (0) := (47)						
			not wate	er (anis in	iciuaes l	nsiantar	ieous co	ombi boil	ers) ente	er u In (47)						
	•		eclared I	oss facto	or is kno	wn (kWł	Water storage loss: a) If manufacturer's declared loss factor is known (kWb/day):										
a) If manufacturer's declared loss factor is known (kWh/day): 0 0 Temperature factor from Table 2b 0												0					
-														(48) (49)			

Energy lost from water storage, kWh/year(48) x (49) =1b) If manufacturer's declared cylinder loss factor is not known:0.03Hot water storage loss factor from Table 2 (kWh/litre/day)0.03											1		(50)	
		-			e 2 (kW	h/litre/da	iy)				0.	.03		(51)
	•	eating s from Ta		on 4.3							4	02	I	(52)
		actor fro		2b								.93 .6		(52)
•				, kWh/ye	ear			(47) x (51)) x (52) x (53) =		.1	1	(54)
•••		(54) in (5	-	,, ,, , .				()()	,(,(/		.1		(55)
	. ,	. , .		for each	month			((56)m = (55) × (41)	m			1	
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03	1	(56)
												m Append	i lix H	()
(57)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03	1	(57)
			I			2.00	0.00	0.00	2.00	0.00				
	•	•	,	om Table		50)						0	l I	(58)
					•	59)m = (solar wat	. ,	. ,		r thormo	etat)			
(110) (59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	1	(59)
									22.01	23.20	22.01	23.20	İ	(00)
			i	r	,	(60) ÷ 36	, <i>,</i>		i				I	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45) <mark>m +</mark>	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.94	172.12	179.4	158.93	154.37	135.97	128.71	143.82	144.37	164.89	176.74	190.58		(62)
						H (negativ				r contribut	on to wate	er heating)		
(add a	ddi <mark>tiona</mark>	l lines <mark>if</mark>	FGHRS	and/or \	WWHRS	applies.	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from wa	ater hea	ter											
(64)m=	195.94	172.12	179.4	158.93	154.37	135.97	128.71	143.82	144.37	164.89	176.74	190.58		_
								Outp	out from w	ater heate	r (annual)₁	12	1945.83	(64)
Heat g	ains froi	m water	heating	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	۲ ((46)m	+ (57)m	+ (59)m]	
(65)m=	75.02	66.14	69.52	62.39	61.2	54.76	52.66	57.69	57.55	64.69	68.31	73.24		(65)
inclu	ıde (57)ı	m in calo	culation	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	Table 5	5 and 5a):									
		s (Table												
Wietab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	176.33	176.33	176.33	176.33	176.33	176.33	176.33	176.33	176.33	176.33	176.33	176.33		(66)
Liahtin	a gains	(calcula	ted in Ar	n Dendix	L equati	ion L9 oi	r 19a) a	lso see "	r Table 5	I			1	
(67)m=	72.19	64.12	52.15	39.48	29.51	24.91	26.92	34.99	46.97	59.64	69.6	74.2	1	(67)
						L uation L ²				l ble 5			i	
(68)m=		488.25	475.61	448.71	414.75	382.84	361.52	356.5	369.14	396.04	430	461.91	1	(68)
											100	401.01		(00)
	<u> </u>	55.57	1		· ·	ion L15	,	1	1	r	55 57	55.57	I	(69)
(69)m=	55.57		55.57	55.57	55.57	55.57	55.57	55.57	55.57	55.57	55.57	55.57		(00)
		ns gains	r`	<u> </u>					-		-		I	$(\mathbf{T}\mathbf{C})$
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
		· · · · · · · · · · · · · · · · · · ·	· •	i	es) (Tab	· · · · ·		·	·				I	
(71)m=	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55		(71)

Water heating gains (Table 5)							
(72)m= 100.83 98.43 93.44	86.66 82.25	76.05 70.78	77.54 79.93	86.95 94.88	98.44		(72)
Total internal gains =	• •	(66)m + (67)m	ı + (68)m + (69)m + (70)m + (71)m + (72)	m		
(73)m= 770.61 765.15 735.55	689.19 640.87	598.15 573.57	583.38 610.39	656.98 708.83	748.9		(73)
6. Solar gains:							
Solar gains are calculated using solar	flux from Table 6a ar	d associated equa	tions to convert to the	e applicable orientati	ion.		
Orientation: Access Factor	Area	Flux		FF		Gains	
Table 6d	m²	Table 6a	Table 6b	Table 6c		(W)	
North 0.9x 1 x	3.3 ×	10.63	× 0.9	× 0.9	=	25.58	(74)
North 0.9x 1 x	1.84 ×	10.63	× 0.9	× 0.9	=	14.26	(74)
North 0.9x 1 x	3.3 ×	20.32	x 0.9	× 0.9	=	48.89	(74)
North 0.9x 1 x	1.84 ×	20.32	× 0.9	× 0.9	=	27.26	(74)
North 0.9x 1 x	3.3 ×	34.53	× 0.9	× 0.9	=	83.07	(74)
North 0.9x 1 x	1.84 ×	34.53	x 0.9	× 0.9	=	46.32	(74)
North 0.9x 1 X	3.3 ×	55.46	× 0.9	× 0.9	=	133.43	(74)
North 0.9x 1 X	1.84 ×	55.46	× 0.9	× 0.9	=	74.4	(74)
North 0.9x 1 x	3.3 ×	74.72	× 0.9	x 0.9		179.74	(74)
North 0.9x 1 X	1.84 ×	74.72	× 0.9	× 0.9	=	100.22	(74)
North 0.9x 1 x	3.3 ×	79.99	× 0.9	× 0.9	=	192.42	(74)
North 0.9x 1 x	1.84 ×	79.99	× 0.9	x 0.9	=	107.29	(74)
North 0.9x 1 x	3.3 ×	74.68	× 0.9	× 0.9	=	179.65	(74)
North 0.9x 1 x	1.84 ×	74.68	x 0.9	× 0.9	=	100.17	(74)
North 0.9x 1 x	3.3 ×	59.25	x 0.9	x 0.9	=	142.53	(74)
North 0.9x 1 x	1.84 ×	59.25	× 0.9	× 0.9	=	79.47	(74)
North 0.9x 1 X	3.3 ×	41.52	× 0.9	× 0.9	=	99.88	(74)
North 0.9x 1 x	1.84 ×	41.52	× 0.9	× 0.9	=	55.69	(74)
North 0.9x 1 x	3.3 ×	24.19	× 0.9	× 0.9	=	58.19	(74)
North 0.9x 1 X	1.84 ×	24.19	× 0.9	× 0.9	=	32.45	(74)
North 0.9x 1 x	3.3 ×	13.12	× 0.9	× 0.9	=	31.56	(74)
North 0.9x 1 x	1.84 ×	13.12	× 0.9	× 0.9	=	17.6	(74)
North 0.9x 1 x	3.3 ×	8.86	× 0.9	× 0.9	=	21.33	(74)
North 0.9x 1 x	1.84 ×	8.86	x 0.9	x 0.9	=	11.89	(74)
East 0.9x 3 x	1.4 ×	19.64	x 0.9	× 0.9	=	60.13	(76)
East 0.9x 3 x	1.4 ×	38.42	x 0.9	× 0.9	=	117.64	(76)
East 0.9x 3 x	1.4 ×	63.27	x 0.9	× 0.9	=	193.73	(76)
East 0.9x 3 x	1.4 ×	92.28	x 0.9	× 0.9	=	282.54	(76)
East 0.9x 3 x	1.4 ×	113.09	× 0.9	× 0.9	=	346.27	(76)
East 0.9x 3 x	1.4 ×	115.77	x 0.9	× 0.9	=	354.47	(76)
East 0.9x 3 x	1.4 ×	110.22	× 0.9	× 0.9	=	337.47	(76)
East 0.9x 3 x	1.4 ×	94.68	× 0.9	× 0.9	=	289.88	(76)

East 0.9x	3	x	1.4	x	73.59	x	0.9	x	0.9	=	225.32	(76)
East 0.9x	3	x	1.4	x	45.59	x	0.9	x	0.9	=	139.58	(76)
East 0.9x	3	x	1.4	x	24.49	x	0.9	x	0.9	=	74.98	(76)
East 0.9x	3	x	1.4	x	16.15	x	0.9	x	0.9	_	49.45	(76)
South 0.9x	1	x				x		x		=		_(78)
South 0.9x		x	3.43	x	46.75	x	0.9	x	0.9	-	233.8	(78)
South 0.9x	1	x	3.43 3.43	x x	76.57	x	0.9	x	0.9	-	382.91	_(78)
South 0.9x	1	x	3.43	x	97.53 110.23	x	0.9	x	0.9	-	487.76 551.28	_(78)
South 0.9x	1	x	3.43	×	114.87	x	0.9	x	0.9	-	574.46	(78)
South 0.9x	1	x	3.43	x	114.67	x	0.9	x	0.9	-	552.84	_(78)
South 0.9x		x		x		x		x		=		(78)
South 0.9x	1	x	3.43 3.43	×	108.01 104.89	x	0.9	x	0.9	-	540.16 524.57	(78)
South 0.9x	1	x	3.43	x	104.89	x	0.9	x	0.9	-	509.52	_(78)
South 0.9x		x										(78)
South 0.9x	1		3.43	x	82.59	x	0.9	x	0.9	=	413.01	(78)
South 0.9x	1	X	3.43	X	55.42	X	0.9	x	0.9	=	277.14	4
Rooflights 0.9x	1	X	3.43	X	40.4	X	0.9	x	0.9	=	202.03	(78)
Rooflights 0.9x	1	X	1	X	26	X	0.7	X	0.7	=	22.93	(82)
Rooflights 0.9x	1	X	1		26	X	0.7	x	0.7	=	57.33	(82)
Rooflights 0.9x	1	X	1	X	54	×	0.7	X	0.7	=	47.63	(82)
Rooflights 0.9x	1	X	1	X	54	×	0.7	X	0.7	=	119.07	(82) (82)
Rooflights 0.9x	1	X	1		96	X	0.7	x	0.7	=	84.67	
Rooflights 0.9x		X	1	X	96	X	0.7	x	0.7	=	211.68	(82)
Rooflights 0.9x	1	x x	1	X	150	X	0.7	X	0.7	=	132.3	(82) (82)
Rooflights 0.9x	1		1	X	150	X	0.7	X	0.7	=	3 <mark>30.75</mark>	4
Rooflights 0.9x	1	x	1	x	192	X	0.7	x	0.7	=	169.34	(82) (82)
Rooflights 0.9x	1	x x	1	x	192	x x	0.7	x x	0.7	=	423.36	(82)
Rooflights 0.9x		x	1	x x	200	x	0.7	x	0.7	=	176.4	(82)
Rooflights 0.9x	1	x	1	x	200	x	0.7	x	0.7	=	441 166.7	(82)
Rooflights 0.9x	1	x	1	x	189 189	x	0.7	x	0.7	-	416.74	(82)
Rooflights 0.9x	1	x	1	x	157	x	0.7	x	0.7	=		(82)
Rooflights 0.9x		x		x		x	0.7	x	0.7	=	138.47	(82)
Rooflights 0.9x	1	x	1	x	157 115	x	0.7	x	0.7	-	346.18 101.43	(82)
Rooflights 0.9x	1	x	1	x	115	x	0.7	x	0.7	-	253.57	(82)
Rooflights 0.9x		x		x		x		x		=		(82)
Rooflights 0.9x	1	x	1	x	66 66	x	0.7	x	0.7	=	58.21 145.53	(82)
Rooflights 0.9x	1	x	1	x	33	x	0.7	x	0.7	=	29.11	(82)
Rooflights 0.9x		x		x	33	x	0.7	x	0.7	=		(82)
Rooflights 0.9x	1		1	x	21		0.7	x	0.7	=	72.76 18.52	(82)
Rooflights 0.9x	1	x x		x	21	x x		x	0.7	=		(82)
0.98	ſ	^	1	^	21	^	0.7	^	0.7	-	46.3	

Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m			_
(83)m=	414.04	743.39	1107.23	1504.7	1793.4	1824.42	1740.89	1521.11	1245.41	846.97	503.14	349.52	(83)

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Total g	ains – ir	nternal a	and solar	⁻ (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	1184.65	1508.53	1842.78	2193.89	2434.26	2422.57	2314.46	2104.49	1855.8	1503.95	1211.97	1098.42		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	neating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for a	ains for l	living are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.96	0.89	0.75	0.57	0.43	0.49	0.74	0.94	0.99	1		(86)
Mean	internal		ature in	living ar	a T1 (fr	llow ste	ns 3 to 7	r in Tabl	ـــــــــــــــــــــــــــــــــــــ					
(87)m=	19.44	19.7	20.07	20.51	20.81	20.95	20.99	20.98	20.87	20.43	19.84	19.38		(87)
1 emp (88)m=	erature 19.67	auring r 19.67	19.67	eriods ir 19.68	19.68	aweiling 19.69	19.69	19.69	n2 (°C) 19.68	19.68	19.68	19.67		(88)
` `									19.00	19.00	19.00	19.07		(00)
1			ains for I		<u> </u>			r í					l	(22)
(89)m=	0.99	0.98	0.94	0.85	0.68	0.47	0.3	0.35	0.64	0.91	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m=	17.64	18.01	18.55	19.15	19.52	19.66	19.68	19.68	19.6	19.07	18.23	17.57		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.39	(91)
Mean	internal	L temper	ature (fo	r the wh	ole dwel	lling) = fl	_A × T1	+ (1 – fL	A) × T2					
(92)m=	1 <mark>8.34</mark>	18.67	19.15	19. <mark>68</mark>	20.03	20.17	20.2	20.19	, 20.1	19.6	18.86	18.28		(92)
Apply	adjustn	nent to t	he mear	internal	tempera	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	1 <mark>8.34</mark>	18.67	19.15	19.68	20.03	20.17	20.2	20.19	20.1	19.6	18.86	18.28		(93)
8. Spa	ace hea	ting req	uire <mark>men</mark> t											
						ed at ste	ep 11 of	Table 9t	o <mark>, so th</mark> a	t Ti,m=(76)m an	d re-calc	ulate	
the ut			or gains											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		0.7	0.54	0.05		0.07	0.04	0.00	0.00		(04)
(94)m=	0.99	0.97	0.94	0.85	0.7	0.51	0.35	0.41	0.67	0.91	0.98	0.99		(94)
	<u> </u>		, W = (94 1728.43	, <u>`</u>	<i>,</i>	1000.0	047 70	055.0	1044.46	1005 64	1106.07	1000 50		(95)
(95)m=						1232.3	817.72	855.8	1244.16	1365.64	1186.37	1089.59		(33)
(96)m=	4.3	4.9	ernal tem 6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
` ´			an intern								7.1	7.2		(00)
(97)m=			2945.76	· · ·			825.64	869.73	1380.15		2722.9	3269.43		(97)
` ´			ement fo											
(98)m=		1170.64	905.69	452.46	165.39	0	0	0	0	530.78	1106.3	1621.8		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15.912} =	7520.83	(98)
Snac	- hoatin	a roquir	omont in	k\//b/m2	lucar				1 - 7	(.,	, (-	- ,		(99)
			ement in		year								49.16	(99)
			quiremen		<u> </u>									
Calcu			July and				11	۸	0.47	Oct	Maria	Det		
Heat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec able 10)		
(100)m=		0 LIII (Ca				· · ·	1699.35	i		iperatur 0				(100)
(100)11=	U	U		0	0	2100.04	1033.00	1140.01	U U	U	U	U		(100)

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Utilisa	ation fac	tor for lo	oss hm											
(101)m=	0	0	0	0	0	0.85	0.91	0.87	0	0	0	0]	(101)
Usefu	l loss, h	mLm (V	Vatts) =	(100)m >	(101)m							_	-	
(102)m=	0	0	0	0	0	1827.77	1537.92	1518.51	0	0	0	0		(102)
1		I	İ	I	i	1	i	e Table					1	(100)
(103)m=	0	0	0	0	0		2314.46		0	0	0	0		(103)
				r month, < 3 × (98		lwelling,	continue	ous (kW	(h) = 0.02	24 x [(10	03)m –	(102)m]:	x (41)m	
(104)m=	0	0	0	0	0	428.26	577.74	435.97	0	0	0	0]	
									Total	= Sum((104)	=	1441.97	(104)
	l fractio								f C =	cooled	area ÷	(4) =	1	(105)
		r È	able 10b	ŕ	0	0.05	0.05	0.05	0				1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0 Tota	0 1 = Sum	0	0	0	(106)
Space	coolina	reauire	ment for	month =	: (104)m	× (105)	× (106)r	n	TULA	i = Suiri	(16044)	=	0	(100)
(107)m=	0	0	0	0	0	107.06	144.44	108.99	0	0	0	0]	
I						1			Total	= Sum((107)	=	360.49	(107)
Space	cooling	require	ment in l	wh/m²/ر	/ear				(107)) ÷ (4) =			2.36	(108)
9b. Ene	ergy rea	quiremer	nts – Co	mmunity	heating	scheme)							
								ting prov	ided by	a c <mark>omm</mark>	unity so	cheme.		
Fractio	n of spa	ace heat	from se	condary	/supplen	nentary l	heating ((Table 1	1) '0' if n	one			0	(301)
Fractio	<mark>n o</mark> f spa	ace he <mark>at</mark>	from co	<mark>mmu</mark> nity	v system	1 - (301	1) =						1	(302)
The com	munity se	cheme ma	y obt <mark>ain h</mark>	eat from se	everal sou	ces. The p	procedure	allows for	CHP and u	up t <mark>o</mark> four	other hea	at sources; t	he latter	
			-			rom powel	r stations.	See Apper	ndix C.					
				ity boile									1	(303a)
				m Comr							802) x (30	3a) =	1	(304a)
Factor	for con	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ting syst	tem			1	(305)
Distribu	ution los	ss factor	(Table '	12c) for a	commun	ity heatii	ng syste	m					1.05	(306)
-	heating	-											kWh/yea	·
Annual	space	heating	requiren	nent									7520.83	
Space	heat fro	om Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306)) =	7896.87	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
	heating water	-	requirem	ent									1945.83	٦
		-	ty schen											
			nunity b						(64) x (30	03a) x (30	5) x (306)) =	2043.12	(310a)
Electric	city use	d for hea	at distrib	ution				0.01	× [(307a).	(307e) 	⊦ (310a)	.(310e)] =	99.4	(313)
Cooling	g Syste	m Energ	y Efficie	ncy Rati	0								3.38	(314)
Space	cooling	(if there	is a fixe	ed coolin	g systen	n, if not e	enter 0)		= (107) ÷	· (314) =			106.81	(315)
	-			within dv			,							
							,. put from	outside					0	(330a)

warm air heating system fans				Г	0	(330b)
pump for solar water heating				Γ	0	(330g)
Total electricity for the above, kWh/year		=(330a) + (33	0b) + (330g) =	Γ	0	(331)
Energy for lighting (calculated in Appendix L)				Ē	509.99	(332)
10b. Fuel costs – Community heating scheme						
	Fuel kWh/year		el Price able 12)		Fuel Cost £/year	
Space heating from CHP	(307a) x		4.24 ×	0.01 =	334.83	(340a)
Water heating from CHP	(310a) x		4.24 ×	0.01 =	86.63	(342a)
Space cooling (community cooling system)	(315)	Fu	el Price	0.01 =	14.09	(348)
Pumps and fans	(331)		13.19 ×	0.01 =	0	(349)
Energy for lighting	(332)		13.19 ×	0.01 =	67.27	(350)
Additional standing charges (Table 12)				Ē	120	(351)
Total energy cost = (340a)(3	342e) + (345)(354) =			Г	622.81	(355)
11b. SAP rating - Community heating scheme						
SAP rating (section12)	6)] ÷ [(4) + 45.0] =				0.42 1.32 81.57	(356) (357) (358)
12b. CO2 Emissions – Community heating scheme	E	nergy Wh/year	Emission f kg CO2/kW		miss <mark>ions</mark> g CO2/year	
CO2 from other sources of space and water heatin Efficiency of heat source 1 (%)	ng (not CHP) here is CHP using two fue	els repeat (363) to	o (366) for the sec	ond fuel	95	(367a)
CO2 associated with heat source 1	[(307b)+(310b)]	x 100 ÷ (367b) x	0	=	2260.04	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	51.59	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	72)	=	2311.63	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater	or instantaneous he	eater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	g (373) +	(374) + (375) =			2311.63	(376)
CO2 associated with space cooling	(315) x		0.52	=	55.44	(377)
CO2 associated with electricity for pumps and fans	s within dwelling (3	31)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	(332))) >	c	0.52	=	264.69	(379)
Total CO2, kg/year sum of (376)(382) =				2631.75	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =	=				17.2	(384)
El rating (section 14)					82.19	(385)
13b. Primary Energy – Community heating scheme	E	nergy Nh/year	Primary factor		.Energy Nh/year	

Energy from other sources of space and water Efficiency of heat source 1 (%)	heating (not Cl If there is CHP us	•	peat (363) to (3	366) for the seco	ond fuel	95	(367a)
Energy associated with heat source 1	[(307b)+(310b)] x 100	÷ (367b) x	0	=	12765.04	(367)
Electrical energy for heat distribution		[(313) x			=	305.16	(372)
Total Energy associated with community syste	ms	(363)(366)	+ (368)(372)		=	13070.2	(373)
if it is negative set (373) to zero (unless spe	cified otherwise	, see C7 in A	Appendix C)			13070.2	(373)
Energy associated with space heating (second	lary)	(309) x		0	=	0	(374)
Energy associated with water from immersion	heater or instar	ntaneous hea	ater(312) x	3.07	=	0	(375)
Total Energy associated with space and water	heating	(373) + (374)	+ (375) =			13070.2	(376)
Energy associated with space cooling		(315) x		3.07	=	327.91	(377)
Energy associated with electricity for pumps a	nd fans within d	welling	(331)) x	3.07	=	0	(378)
Energy associated with electricity for lighting		(332))) x		3.07	=	1565.67	(379)
Total Primary Energy, kWh/year	sum of (376)(382) =				14963.78	(383)





9.2. SAP Worksheets at BE GREEN stage

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energy

E: mail@syntegra-epc.co.uk VAT Registration No. 980016044





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Block Compliance WorkSheet: 28 Redington Road_Rev C

User Details											
Assessor Name: Software Name:	Stroma Number: Stroma FSAP Software Version: Version: 1.0.3.11 Calculation Details										
	Cald	culation Detail	S								
Dwelling		DER	TER	DFEE	TFEE	TFA					
Flat 1		11.3	24.43	47.6	58.7	144					
Flat 2		8.77	18.78	36.6	45.9	229					
Flat 3		7.97	17.74	34.7	46.1	243					
Flat 4		8.59	19.18	33.8	45.8	178					
Flat 5		10.69	22.77	43.8	53.7	151					
Flat 6		10.43	22.17	45.2	54.3	167					
Flat 7		9.76	20.22	46.1	53.4	271					
Flat 8		13.52	27.83	64.5	72.4	153					

Calculation Summary

Total Floor Area	1536.00
Average TER	21.11
Average DER	9.88
Average DFEE	43.10
Average TFEE	52.76
Compliance	Pass
% Improvement DER TER	53.2
% Improvement DFEE TFEE	18.31

User Details:												
Assessor Name: Software Name:	Stro	oma FS	AP 201	2		Strom Softwa				Versio	on: 1.0.3.11	
				Р	roperty .	Address	: Flat 1					
Address :		•	on Road,	NW3 71	RB							
1. Overall dwelling din	hension	s:										
					Area	a(m²)		Av. He	ight(m)	_	Volume(m ³)
Basement						75	(1a) x	2	2.8	(2a) =	210	(3a)
Ground floor						69	(1b) x	3	3.1	(2b) =	213.9	(3b)
Total floor area TFA = ((1a)+(1b	o)+(1c)+	(1d)+(1e)+(1n	ı)	144	(4)					
Dwelling volume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	423.9	(5)
2. Ventilation rate:												
		main neating		econdar leating	у	other		total			m ³ per hou	r
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	fans							4	X	10 =	40	(7a)
Number of passive ven	ts							0	×	10 =	0	(7b)
Number of flueless gas	fires							0	x	40 = Air ch	0 anges per ho	(7c)
Infiltration due to chimn	ieys, flu	es and fa	ans = (6	a)+(6b)+(7	<mark>a)+</mark> (7b)+(7c) =	Г	40		÷ (5) =	0.09	(8)
If a pressurisation test has				ed, proceed	d to (17), o	otherwise o	continue fr	om (9) to ((16)			_
Number of storeys in Additional infiltration	the dw	elling (ne	5)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration:	0.25 for	r steel oi	r timber f	frame or	0.35 fo	r masoni	v constr	uction	[(0)	1100.1 -	0	(11)
if both types of wall are deducting areas of ope	present, i	use the va	lue corres				•				Ŭ	
If suspended wooder	ו floor, e	enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	enter 0.0)5, else e	enter 0								0	(13)
Percentage of window	ws and	doors dr	aught st	ripped							0	(14)
Window infiltration						0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value	э, q50, е	expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	4.5	(17)
If based on air permeat	oility val	ue, then	(18) = [(1	7) ÷ 20]+(8	3), otherwi	se (18) = ((16)				0.32	(18)
Air permeability value app		ressurisatio	on test has	s been don	e or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides shelte	red					(20) 1	10 07E v (1	0)]			1	(19)
Shelter factor		. e				(20) = 1 -		9)] =			0.92	(20)
Infiltration rate incorporating shelter factor (21) = (18) x (20) =										0.3	(21)	
Infiltration rate modified			· · ·		Jul	Au.~	Son	Oct	Nov	Dec		
	Mar	Apr	May -	Jun	Jui	Aug	Sep	Oct		Dec		
Monthly average wind s (22)m= 5.1 5	4.9	om Tabl 4.4	e 7 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	l	
,				0.0	0.0	<u> </u>				L		

$\begin{array}{c c c c c c c c c c c c c c c c c c c $
0.38 0.37 0.36 0.32 0.32 0.28 0.27 0.3 0.32 0.33 0.35 Calculate effective air change rate for the applicable case If mechanical ventilation: if exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0 (23a) if balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c) a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] (24a)m = 0 0 0 0 0 0 0 0 0 0 (24a)m = 0 (24c)m + (23b) × [1 - (23c) ÷ 100] (24a)m = 0
Calculate effective air change rate for the applicable caseIf mechanical ventilation:if exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)if exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)if balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =if balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100](24a)m = 00 </td
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c) a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] (24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) 0 (23b) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c) a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × $[1 - (23c) \div 100]$ (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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) × $[1 - (23c) \div 100]$ (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
a) If balanced mechanical ventilation with heat recovery (MVHR) $(24a)m = (22b)m + (23b) \times [1 - (23c) \div 100]$ (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
d) If natural ventilation or whole house positive input ventilation from loft if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$ (24d)m = 0.57 0.57 0.57 0.55 0.55 0.54 0.54 0.54 0.54 0.55 0.56 0.56 (24d) Effective air change rate - enter $(24a)$ or $(24b)$ or $(24c)$ or $(24d)$ in box (25) (25)m = 0.57 0.57 0.57 0.55 0.55 0.54 0.54 0.54 0.54 0.55 0.56 0.56 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross Openings Net Area U-value A X U k-value kJ/m ² ·K KJ/K Doors 2.1 x $0.8 = 1.68$ (26)
if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$ (24d)m = 0.57 0.57 0.57 0.55 0.55 0.54 0.54 0.54 0.54 0.55 0.56 0.56 (24d) Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m = 0.57 0.57 0.57 0.55 0.55 0.54 0.54 0.54 0.54 0.55 0.56 0.56 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m ²) Doors beta Area and area area area area area area area are
$\begin{array}{cccccccccccccccccccccccccccccccccccc$
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.57 0.57 0.55 0.54 0.54 0.54 0.55 0.56 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m ²) Openings m ² Net Area A, m ² U-value W/m2K A X U K-value KJ/K A X k KJ/K Doors 2.1 x 0.8 = 1.68 (26)
(25)m= 0.57 0.57 0.55 0.54 0.54 0.54 0.55 0.56 0.56 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m ²) Openings m ² Net Area A, m ² U-value A X U (W/K) kJ/m ² ·K k-value kJ/K A X k kJ/K Doors 2.1 x 0.8 = 1.68 (26)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Doors Openings m² A, m² W/m2K W/m2K (W/K) k-value kJ/K K, V/m²-K K, V/m²-K Losses Losses <
ELEMENTGross area (m²)Openings m²Net Area A ,m²U-value W/m2KA X U (W/K)k-value kJ/m²-KA X k kJ/KDoors2.1x0.8=1.68(26)
area (m ²) m ² A ,m ² W/m2K (W/K) kJ/m ² ·K kJ/K Doors 1.68 (26)
Doors $2.1 \times 0.8 = 1.68$ (26)
Windows Type 1 1.085 $x^{1/[1/(1.2)+0.04]} = 1.24$ (27)
Windows Type 2 $1.02 \times 1/[1/(1.2) + 0.04] = 1.17$ (27)
Floor $75 \times 0.12 = 9$ (28)
Walls Type1 14 2.1 11.9 x 0.12 = 1.43 (29)
Walls Type 2 30.8 0 30.8 x 0.11 = 3.42 (29)
Walls Type3 20.44 0 20.44 x 0.11 = 2.27 (29)
Walls Type4 33.6 14.74 18.86 x 0.12 = 2.26 (29)
Walls Type5 8.4 0 8.4 x 0.11 = 0.91 (29)
Walls Type6 8.4 0 8.4 x 0.11 = 0.91 (29)
Walls Type7 5.88 0 5.88 x 0.11 = 0.65 (29)
Walls Type8 12.9 0 12.9 x 0.12 = 1.55 (29)
Walls Type9 17.36 0 17.36 x 0.11 = 1.88 (29)
Walls Type10 24.8 0 24.8 × 0.12 = 2.98 (29)
Walls Type11 30.69 0 30.69 × 0.11 = 3.32 (29)
Walls Type12 30.69 0 30.69 x 0.13 = 3.99 (29)
Total area of elements, m ² 312.96 (31)

				effective wi nternal wal			lated using	formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	n 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				53.12	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	eter (TMF	⁻ = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	-		ere the de tailed calc		construct	ion are no	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	K						46.94	(36)
			are not kn	own (36) =	= 0.15 x (3	1)								_
	abric he								(33) +	(36) =			100.06	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y		1		(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	79.87	79.48	79.1	77.33	77	75.45	75.45	75.17	76.05	77	77.67	78.37		(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	179.93	179.54	179.17	177.39	177.06	175.51	175.51	175.23	176.11	177.06	177.73	178.43		
											Sum(39)1.	12 /12=	177.39	(39)
	· · · · · · · · · · · · · · · · · · ·	· · · ·	HLP), W/	r						= (39)m ÷	r		1	
(40)m=	1.25	1.25	1.24	1.23	1.23	1.22	1.22	1.22	1.22	1.23	1.23	1.24		
Numbe	er of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1	12 /12=	1.23	(40)
- Norther	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)
(+1)11-		20							00				1	()
4. Wa	ater heat	ting ener	rgy requ	irement:								kWh/y	ear:	
Assum	ned occu	ipancy, I	N								2.	92		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	<mark>[1 - </mark> exp	(-0.0003	349 x (TF	- A -13.9)2)] + 0.(00 <mark>13 x (</mark>	TF <mark>A -13</mark> .	9)			
								(25 x N)				3.65		(43)
		-		usage by : r day (all w		-	-	to achieve	a water us	se target o	Ť			
		· ·		r		<u> </u>	, 	Aug	San	Oct	Nev	Dee	1	
Hot wat	Jan er usage i	Feb	Mar dav for ea	Apr ach month	May Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec	J	
	114.02	109.87	105.73	101.58	97.43	93.29	93.29	97.43	101.58	105.73	109.87	114.02	1	
(44)m=	114.02	109.07	103.73	101.50	37.43	33.23	93.29	37.43			m(44) ₁₁₂ =	-	1243.84	(44)
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,ı	m x nm x E) Tm / 3600			× /		1243.04	()
(45)m=	169.09	147.88	152.6	133.04	127.66	110.16	102.08	117.14	118.54	138.14	150.79	163.75]	
			ļ	Į	ļ		ļ	<u> </u>		I Total = Su	m(45) ₁₁₂ =		1630.87	(45)
lf instan	taneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46						
(46)m=	25.36	22.18	22.89	19.96	19.15	16.52	15.31	17.57	17.78	20.72	22.62	24.56		(46)
	storage						•						-	
-		. ,					-	within sa	ame ves	sel		1		(47)
	•	-		nk in dw	-			. ,						
			hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage nanufact		eclared I	oss facto	or is kno	wn (kWł	n/dav).					0	1	(48)
			m Table			(0]	(40)
. Suibe												0]	(-3)

		om water turer's de	-	•		or is not		(48) x (49)) =			1		(50)
		age loss		•							0.	03		(51)
	•	neating s		on 4.3										
		from Ta										93		(52)
•		actor fro									0	.6		(53)
		om water	-	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	0	.1		(54)
	. ,	(54) in (5	,								0	.1		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m	-			
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)
If cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(57)
Prima	v circuit	loss (ar	nual) fro	om Table	3		•	•				0		(58)
	•	loss (al	,			59)m = ((58) ÷ 36	65 x (41)	m			•		. ,
	•					•	. ,	, ,		r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi		l loulatad	for ooob	month	(61)m -	(60) · 20	$\frac{1}{25} \times (41)$							
(61)m=		Iculated			01)11 =	(00) - 30			0	0	0	0		(61)
	Ţ	_	-	-	-	÷	÷	_	-		-			(01)
	<u> </u>								1		. ,	<u> </u>	(59)m + (61)m	(00)
(62)m=	195.38	171.63	178.9	158.49	153.95	135.6	128.37	143.43	143.98	164.43	176.24	190.04		(62)
						-				r contributi	on to wate	er heating)		
(add a	dditiona	l lines <mark>if</mark>	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (<u>3)</u>					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	195.38	171.63	178.9	158.49	153.95	135.6	128.37	143.43	143.98	164.43	176.24	190.04		
								Outp	out from w	ater heater	r (annual)₁	12	1940.44	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	« [(46)m	+ (57)m	+ (59)m]	
(65)m=	74.83	65.98	69.35	62.25	61.06	54.64	52.55	57.56	57.42	64.54	68.15	73.06		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	vlinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
	. ,	ains (see		. ,	•	,		- J					J	
	Ŭ				/•									
wetab	Jan	is (Table Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	175.46	175.46	175.46	175.46	175.46	175.46	175.46	175.46	175.46	175.46	175.46	175.46		(66)
										173.40	170.40	170.40		(00)
•	73.13	(calcula 64.95	·	·	· ·		· · · ·			00.44	70.5	75.40		(67)
(67)m=	13.13													
•••			52.82	39.99	29.89	25.24	27.27	35.45	47.58	60.41	70.5	75.16		(67)
	nces ga	ins (calc	ulated in	n Append	dix L, eq	uation L	13 or L1	i 3a), also	see Ta	ble 5		I		
(68)m=	nces ga										416.91	447.86		(67)
	nces ga 468.53	ins (calc	ulated in 461.14	Append 435.06	dix L, eq 402.13	uation L 371.19	13 or L1 350.52	3a), also 345.65	see Ta 357.91	ble 5 383.99		I		(68)
	nces ga 468.53	ins (calc 473.39	ulated in 461.14	Append 435.06	dix L, eq 402.13	uation L 371.19	13 or L1 350.52	3a), also 345.65	see Ta 357.91	ble 5 383.99		I		
Cookir (69)m=	nces ga 468.53 ng gains 55.47	ins (calc 473.39 (calcula	ulated in 461.14 ated in A 55.47	Append 435.06 ppendix 55.47	dix L, eq 402.13 L, equat	uation L 371.19 ion L15	13 or L1 350.52 or L15a)	3a), also 345.65), also se	see Ta 357.91 ee Table	ble 5 383.99 5	416.91	447.86		(68)
Cookir (69)m=	nces ga 468.53 ng gains 55.47	ins (calc 473.39 (calcula 55.47	ulated in 461.14 ated in A 55.47	Append 435.06 ppendix 55.47	dix L, eq 402.13 L, equat	uation L 371.19 ion L15	13 or L1 350.52 or L15a)	3a), also 345.65), also se	see Ta 357.91 ee Table	ble 5 383.99 5	416.91	447.86		(68)
Cookir (69)m= Pumps (70)m=	nces ga 468.53 ng gains 55.47 s and fai	ins (calc 473.39 (calcula 55.47 ns gains	ulated ir 461.14 ited in A 55.47 (Table \$ 0	Append 435.06 ppendix 55.47 5a) 0	dix L, eq 402.13 L, equat 55.47	uation L 371.19 ion L15 55.47	13 or L1 350.52 or L15a) 55.47	3a), also 345.65), also se 55.47	55.47	ble 5 383.99 5 55.47	416.91 55.47	447.86 55.47		(68) (69)
Cookir (69)m= Pumps (70)m=	nces ga 468.53 ng gains 55.47 s and fai	ins (calc 473.39 (calcula 55.47 ns gains 0	ulated ir 461.14 ited in A 55.47 (Table \$ 0	Append 435.06 ppendix 55.47 5a) 0	dix L, eq 402.13 L, equat 55.47	uation L 371.19 ion L15 55.47	13 or L1 350.52 or L15a) 55.47	3a), also 345.65), also se 55.47	55.47	ble 5 383.99 5 55.47	416.91 55.47 0	447.86 55.47		(68) (69)

Water I	heating	gains (T	able 5)													
(72)m=	100.58	98.18	93.21	86.45	82.06	7	5.89	70.63	77.3	36	79.75	86.75	94.65	98.19]	(72)
Total i	nternal	gains =				-	(66)	m + (67)m	ı + (68	s)m + (6	59)m + (7	70)m + (71)m + (72)	m	1	
(73)m=	756.2	750.49	721.13	675.46	628.05	58	36.27	562.38	572.	.42 5	599.19	645.1	696.03	735.17]	(73)
	ar gain	s:				<u> </u>									<u> </u>	
			using sola	r flux from	Table 6a	and	associ	ated equa	tions t	o conv	ert to the	e applica	ble orientat	ion.		
Orienta	ation:	Access F	actor	Area			Flu	х		g	L_		FF		Gains	
	-	Table 6d		m²			Tab	ole 6a		Tab	ole 6b	-	Table 6c		(W)	
South	0.9x	1	x	1.0)9	x	4	6.75	x		0.9	x	0.9	=	258.85	(78)
South	0.9x	1	x	1.0)2	x	4	6.75	x		0.9	×	0.9	=	243.35	(78)
South	0.9x	1	x	1.()9	x	7	6.57	x		0.9	_ × [0.9	=	423.94	(78)
South	0.9x	1	x	1.0)2	x	7	6.57	x		0.9	_ x [0.9	=	398.54	(78)
South	0.9x	1	x	1.()9	x	9	7.53	x		0.9	_ x [0.9	=	540.02	(78)
South	0.9x	1	x	1.0)2	x	9	7.53	x		0.9	_ x [0.9	=	507.67	(78)
South	0.9x	1	x	1.0)9	x	11	10.23	x		0.9	×	0.9	=	610.34	(78)
South	0.9x	1	x	1.()2	x	11	10.23	x		0.9	_ × [0.9	=	573.78	(78)
South	0.9x	1	x	1.0)9	x	11	14.87	×		0.9	x	0.9	=	636.01	(78)
South	0.9x	1	x	1.0)2	x	11	14.87	x		0.9	x	0.9	_	5 <mark>97.91</mark>	(78)
South	0.9x	1	x	1.0)9	x	1'	10.55	×		0.9	x	0.9	=	612.08	(78)
South	0.9x	1	x	1.0)2	x	11	10.55	× [0.9	x	0.9	=	575.41	(78)
South	0.9x	1	x	1.0)9	x	1(08.01	×		0.9	× [0.9	=	5 <mark>98.04</mark>	(78)
Sout <mark>h</mark>	0.9x	1	x	1.0)2	x	1(08.01	x		0.9	x	0.9	=	5 <mark>62.21</mark>	(78)
Sout <mark>h</mark>	0.9x	1	x	1.0)9	x	1(04.89	x		0.9	x	0.9	=	5 <mark>80.78</mark>	(78)
South	0.9x	1	x	1.0)2	x	1(04.89	x		0.9	×	0.9	=	545.98	(78)
South	0.9x	1	x	1.0)9	x	1(01.89	x		0.9	_ x [0.9	=	564.12	(78)
South	0.9x	1	x	1.0)2	x	1(01.89	x		0.9	_ × [0.9	=	530.32	(78)
South	0.9x	1	x	1.0)9	x	8	2.59	x		0.9	×	0.9	=	457.26	(78)
South	0.9x	1	x	1.0)2	x	8	2.59	x		0.9	_ x [0.9	=	429.86	(78)
South	0.9x	1	x	1.0)9	x	5	5.42	x		0.9	_ × [0.9	=	306.83	(78)
South	0.9x	1	x	1.0)2	x	5	5.42	x		0.9	×	0.9	=	288.45	(78)
South	0.9x	1	x	1.0)9	x	2	10.4	x		0.9	_ x [0.9	=	223.67	(78)
South	0.9x	1	x	1.0)2	x	2	10.4	x		0.9	_ × [0.9	=	210.27	(78)
Solar g	ains in	watts, ca	alculated	for eac	h month	<u>۱</u>			(83)m	= Sum	n(74)m	.(82)m			•	
(83)m=	502.2	822.48		1184.12				1160.24	1126	6.76 1	094.44	887.12	595.28	433.95		(83)
-		nternal a		. ,	<u> </u>	<u> </u>							1		1	(- · · ·
(84)m=	1258.4	1572.96	1768.82	1859.58	1861.97	17	73.75	1722.62	1699	.18 1	693.63	1532.22	2 1291.31	1169.12	J	(84)
7. Me	an intei	rnal temp	erature	(heating	seasor	า)									-	
Temp	erature	during h	eating p	eriods ir	n the liv	ing	area f	rom Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ition fac	ctor for g	ains for l	iving are	ea, h1,n	n (se	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	лд	Sep	Oct	Nov	Dec	ļ	
(86)m=	0.99	0.97	0.94	0.88	0.77).61	0.44	0.4	7	0.67	0.89	0.98	0.99	J	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) $(87)m=$ 19.8720.1320.420.6720.8720.9720.9920.9920.9520.720.2219.82(87)Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) $(88)m=$ 19.8819.8819.8919.919.919.919.919.919.919.919.919.919.9Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) $(89)m=$ 0.990.970.920.850.710.510.340.360.580.850.970.99(89)Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)(90)(90)m=18.4218.7819.1719.5419.819.919.919.8719.5818.9318.35(90)Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2(92)m=18.9319.2519.619.9420.1620.2720.2920.2419.9719.3818.86(92)Apply adjustment to the mean internal temperature from Table 4e, where appropriate
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
fLA = Living area \div (4) = (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 18.93 19.25 19.6 19.94 20.16 20.27 20.29 20.24 19.97 19.38 18.86 (92)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m=18.9319.2519.619.9420.1620.2720.2920.2419.9719.3818.86(92)
(92)m= 18.93 19.25 19.6 19.94 20.16 20.27 20.29 20.29 20.24 19.97 19.38 18.86 (92)
(93)m= 18.93 19.25 19.6 19.94 20.16 20.27 20.29 20.29 20.24 19.97 19.38 18.86 (93)
8. Space heating requirement
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate
the utilisation factor for gains using Table 9a
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Utilisation factor for gains, hm:
(94)m= 0.98 0.96 0.92 0.85 0.73 0.54 0.37 0.4 0.61 0.86 0.96 0.99 (94)
Useful gains, hmGm , W = $(94)m \times (84)m$ (95)m= 1237.69 1509.38 1625.86 1574.83 1352.4 966.16 643.19 675.78 1032.66 1314.25 1245.56 1154.73 (95)
(95)m= 1237.69 1509.38 1625.86 1574.83 1352.4 966.16 643.19 675.78 1032.66 1314.25 1245.56 1154.73 (95) Monthly average external temperature from Table 8 643.19 675.78 1032.66 1314.25 1245.56 1154.73 (95)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]
(97)m= 2631.82 2577.3 2347.23 1957.71 1497.58 994.32 646.88 680.85 1082.19 1659.25 2183.37 2616.43 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m
(98)m= 1037.23 717.65 536.7 275.67 108.02 0 0 0 0 256.68 675.22 1087.51
Total per year (kWh/year) = Sum(98) _{15,912} = 4694.67 (98)
Space heating requirement in kWh/m²/year 32.6 (99)
8c. Space cooling requirement
Calculated for June, July and August. See Table 10b
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)
(100)m= 0 0 0 0 0 1649.84 1298.81 1331.74 0 0 0 0 (100
Utilisation factor for loss hm
(101)m= 0 0 0 0 0 0.86 0.92 0.91 0 0 0 0 (101
Useful loss, hmLm (Watts) = (100) m x (101)m
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 1773.75 1722.62 1699.18 0 0 0 (103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
space cooling requirement for month, whole dwelling, continuous (xwn) = 0.024 x [(103)m – (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m
(104)m= 0 0 0 0 0 0 260.19 391.44 361.17 0 0 0 0
Total = Sum(10.4) = 1012.8 (104)

Cooled fraction	l							f C =	cooled	area ÷ ((4) =	1	(105)
Intermittency fa	actor (Ta	able 10b)			-							
(106)m= 0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		-
Space cooling	requirer	nent for	month -	- (104)m	× (105)	× (106)	m	Total	= Sum((104)	=	0	(106)
(107)m= 0	0	0	0		65.05	97.86	90.29	0	0	0	0	7	
				Į		I	ļ	Total	= Sum(107)	=	253.2	(107)
Space cooling	requirer	ment in l	×Wh/m²/	year				(107)	÷ (4) =			1.76	(108)
9b. Energy req	uiremer	nts – Co	mmunity	heating	scheme	9							
This part is use Fraction of space			. .		-		• •	•		unity sc	heme.	0	(301)
Fraction of spa						•		,				1	(302)
The community scl				•			allows for	CHP and ι	ip to four	other hea	t sources;	the latter	J
includes boilers, he		-			rom powe	r stations.	See Apper	ndix C.					
Fraction of hea												1	(303a)
Fraction of tota	•				• •		·/ I			02) x (303	3a) =	1	(304a)
Factor for contr					,			iting syst	tem			1	(305)
Distribution loss		(Iable '	12c) for (commun	ity heati	ng syste	m					1.05	(306)
Space heating Annual space h		requiren	nent									kWh/year 4694.67	1
Space heat from				D				(98) x (30)4a) x (30	5) x (306)	=	4929.4	_](307a)
Efficiency of se					system	in % (fro	om Table					0] (308
Space heating)1) x 100 ·	,		0) (309)
				. a.a.i ji o al	-p.o.non				, i i i i i i i i i i i i i i i i i i i	(/			
Water heating Annual water h		equirem	nent							•		1940.44	7
If DHW from co													-
Water heat from				р)3a) x (30			2037.46	(310a)
Electricity used							0.01	× [(307a).	(307e) +	· (310a)	.(310e)] =	69.67	(313)
Cooling System												3.38	(314)
Space cooling				• •				= (107) ÷	(314) =			75.02	(315)
Electricity for po mechanical ver	•			U (,		outside					0	(330a)
warm air heatin			,			•						0	(330b)
pump for solar	water h	eating										0	_](330g)
Total electricity	for the	above,	kWh/yea	ır				=(330a) -	+ (330b) +	(330g) =		0	_](331)
Energy for light	ting (cal	culated	in Apper	ndix L)								516.59	(332)
10b. Fuel cost	ts – Cor	nmunity	heating	scheme									
			0		Fu kV	Vh/year			Fuel P (Table			Fuel Cost £/year	
Space heating	from CH	ΗP			(30	7a) x			4.2	24	x 0.01 =	209.01	(340a)

Water heating from CHP	(310a) x		4.24 x 0.01 =	86	6.39	(342a)
Space cooling (community cooling syster	n) (315)	Fue	13.19 x 0.01 =	=	9.9	(348)
Pumps and fans	(331)		13.19 × 0.01 =		0] (349)
Energy for lighting	(332)		13.19 × 0.01 =	= 68	3.14	(350)
Additional standing charges (Table 12)				1	20	(351)
Total energy cost	= (340a)(342e) + (345)(354)	=		49	3.43	(355)
11b. SAP rating - Community heating so	cheme					
Energy cost deflator (Table 12)				0	.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =			1	.1	(357)
SAP rating (section12)				8	4.7	(358)
12b. CO2 Emissions – Community heatir	ig scheme					
		Energy kWh/year	Emission factor kg CO2/kWh	r Emissi kg CO2		
CO2 from other sources of space and wa	ter heating (not CHP)				., , • • •	
Efficiency of heat source 1 (%)	If there is CHP using two	o fuels repeat (363) to	(366) for the second fu	lel	350	(367a)
CO2 associated with heat source 1	[(307b)+(310	b)] x 100 ÷ (367b) x	0	= 10	033.09	(367)
Electrical energy for heat distribution	[(31	3) x	0.52	=	36.16	(372)
Total CO2 associated with community sy	stems (363)(366) + (368)(372	2)	= 1	069.24	(373)
CO2 associated with space heating (sec	ondary) (309) x	0	-	0	(374)
CO2 associated with water from immersi	on heater or instantaneous	s heater (312) x	0.52	-	0	(375)
Total CO2 associated with space and wa	ter heating (373) + (374) + (375) =		10	069.24	(376)
CO2 associated with space cooling	(315) x	0.52	= 3	38.94	(377)
CO2 associated with electricity for pumps	and fans within dwelling	(331)) x	0.52	=	0	(378)
CO2 associated with electricity for lightin	g (332))) x	0.52	= 2	68.11	(379)
Total CO2, kg/year	sum of (376)(382) =			1:	376.29	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				9.56	(384)
El rating (section 14)				Į į	90.24	(385)
13b. Primary Energy – Community heatir	ig scheme	-	D.:			
		Energy kWh/year	Primary factor	P.Ener kWh/ye		
Energy from other sources of space and Efficiency of heat source 1 (%)	water heating (not CHP) If there is CHP using two	o fuels repeat (363) to	(366) for the second fu	iel	350	(367a)
Energy associated with heat source 1	[(307b)+(310	b)] x 100 ÷ (367b) x	0	= 6	110.93	(367)
Electrical energy for heat distribution	[(31:	3) x		= 2	13.88	(372)
Total Energy associated with community	systems (363)(366) + (368)(372	2)	= 63	324.81	(373)
if it is negative set (373) to zero (unles	s specified otherwise, see	C7 in Appendix C	;)	6	324.81	(373)

Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from immersion heater or ins	tantaneous heater(312) x	3.07	=	0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =			6324.81	(376)
Energy associated with space cooling	(315) x	3.07	=	230.32	(377)
Energy associated with electricity for pumps and fans withi	n dwelling (331)) x	3.07	=	0	(378)
Energy associated with electricity for lighting	(332))) x	3.07	=	1585.92	(379)
Total Primary Energy, kWh/year sum of (376)(382) =			8141.06	(383)

			User D	etails:									
Assessor Name: Software Name:													
Addross I	28 Redington Road,			Address.	Fial Z								
Address : 1. Overall dwelling dimer	•	, 199375											
Ground floor		\		229	(1a) x		ight(m) 3.1	(2a) =	Volume(m³) 709.9) (3a)			
Total floor area TFA = (1a	i)+(1b)+(1c)+(1d)+(1e	e)+(1n) 2	229	(4)								
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	709.9	(5)			
2. Ventilation rate:									-	_			
Number of chimneys Number of open flues		econdary eating 0 0	/] + [_] + [_	0 0 0] = [total 0 0		40 = 20 =	m³ per hou	(6a) (6b)			
Number of intermittent fan	IS				- _	5	x ′	10 =	50	(7a)			
Number of passive vents						0	x ^	10 =	0	(7b)			
Number of flueless gas fire	es				L L	0	X 4	40 =	0	(7c)			
Air changes per hour													
Infiltration due to chimney					ontinue fre	50 om (9) to (÷ (5) =	0.07	(8)			
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dw <mark>elling</mark> (ns)							-1]x0.1 =	0	(9) (10)			
if both types of wall are pre deducting areas of opening	esent, use the value corres gs); if equal user 0.35	ponding to	the greate	er wall area	a (after				0	(11)			
If suspended wooden flo		ed) or 0.	1 (seale	d), else	enter 0				0	(12)			
If no draught lobby, ente									0	(13)			
Percentage of windows	and doors draught st	ripped		0.25 - [0.2	v (14) · 1	001 -			0	(14)			
Window infiltration				(8) + (10) ·		-	± (15) –		0	(15)			
Infiltration rate Air permeability value, c	750 overaged in out	ic motro						aroa	0	(16)			
If based on air permeabilit	. , .			•	•		invelope	aica	4.5 0.3	(17) (18)			
Air permeability value applies						is being u	sed		0.3				
Number of sides sheltered			-		-	-			1	(19)			
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.92	(20)			
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.27	(21)			
Infiltration rate modified fo	or monthly wind speed	1											
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	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7					
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18					

Adjuste	ed infiltrat	tion rate	e (allowi	ng for sh	elter an	d wind s	peed) =	= (21a) x	(22a)m						
	0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.31	0.32			
	ate effect echanical		•	rate for t	he appli	cable ca	se							(23a)	`
	aust air hea			endix N. (2	3b) = (23a	a) x Fmv (e	equation ((N5)) . othe	rwise (23b) = (23a)			0		
	anced with I		• • •		, ,	, ,) (200)			0		
	balanced		-		-					2b)m + ('	23h) v [*	l _ (23c)	0 	(23c))
(24a)m=				0	0					0	0	1 - (230)	- 100j	(24a))
	balanced	-	-	_		-	-	-	-		-	Ŭ		,	
(24b)m=	0	0	0	0	0	0					0	0		(24b))
	whole ho	use ext	ract ven	tilation	or positiv	le input v	/entilati	on from (outside						
,	f (22b)m				•	•				5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c))
d) If	natural v	entilatio	n or wh	ole hous	e positiv	/e input v	ventilati	ion from	loft		L				
i r	f (22b)m	= 1, the	en (24d)	m = (22k)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			1		
(24d)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d))
Effec	ctive air c		rate - er	· ·		o) or (240	, ,	4d) in bo	x (25)				1		
(25)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)	
3. Hea	at l <mark>osses</mark>	and he	at loss p	paramete	er:										
ELEM	IENT	Gros	-	Openin	gs	Net Ar		U-val		AXU		k-value		AXk	
		area	(m²)	m	2	A ,n	n²	W/m2	2K	(VV/I	<)	kJ/m²-ł	<	kJ/K	
Doors						2.1	×		= [1.68				(26)	
	ws Type					0.9	×	1/[1/(1.2)+	- 0.04] =	1.03				(27)	
Window	ws Type 2	2				1.2	x	1/[1/(1.2)+	0.04] =	1.37				(27)	
Window	ws Type :	3				2.8	x	1/[1/(1.2)+	- 0.04] =	3.21				(27)	
Window	ws Type	4				1.2	X	1/[1/(1.2)+	0.04] =	1.37				(27)	
Walls T	Гуре1	33.1	7	8.1		25.07	' x	0.12	=	3.01				(29)	
Walls T	Гуре2	48.3	6	0		48.36	x	0.11	=	5.24				(29)	
Walls T	ГуреЗ	28.52	2	0		28.52	x	0.12	=	3.42				(29)	
Walls T	Гуре4	63.24	4	4.9		58.34	. x	0.12	=	7				(29)	
Walls T	Гуре5	14.20	6	0		14.26	x	0.11	=	1.54				(29)	
Total a	rea of ele	ements,	m²			187.5	5							(31)	
	dows and r e the areas						ated usin	g formula 1	1/[(1/U-valı	ie)+0.04] a	is given in	paragraph	3.2		
Fabric	heat loss	s, W/K =	= S (A x	U)				(26)(30) + (32) =				34.	37 (33)	
Heat ca	apacity C	; m = S(/	Axk)						((28).	.(30) + (32	2) + (32a).	(32e) =	0	(34)	
Therma	al mass p	paramet	ter (TMF	P = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		25	0 (35)	
-	gn assessn sed instead				construct	ion are not	known p	precisely the	e indicative	values of	TMP in Ta	able 1f			
Therma	al bridges	s : S (L	x Y) cal	culated u	using Ap	pendix k	<						28.	13 (36)	
	of thermal		are not kn	own (36) =	= 0.15 x (3	1)									
Total fa	abric hea	t loss							(33) +	(36) =			62.	51 <mark>(37)</mark>	

Ventila	tion hea	at loss ca	alculated	d monthly	y		-		(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	131.35	130.8	130.26	127.72	127.24	125.03	125.03	124.62	125.88	127.24	128.2	129.21		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	193.86	193.31	192.77	190.22	189.75	187.54	187.54	187.12	188.39	189.75	190.71	191.72		
Heat lo	oss para	imeter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁. · (4)	12 /12=	190.22	(39)
(40)m=	0.85	0.84	0.84	0.83	0.83	0.82	0.82	0.82	0.82	0.83	0.83	0.84		
Numbe	er of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 /12=	0.83	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
										<u> </u>				
4. Wa	ater heat	ting ene	rav reau	irement:								kWh/ye	ear:	
		Ŭ												
if TF				(1 - exp	(-0.0003	849 x (TF	-A -13.9)2)] + 0.(0013 x (⁻	FFA -13.		04		(42)
			ater usa	ae in litre	es per da	av Vd.av	erade =	(25 x N)	+ 36		10	6.39		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed	to achieve		se target o		5.00		(10)
not more	e that 125	litres per	person pe	r day (all w	rater use, l	hot and co	ld)					_		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	117.03	112.7 <mark>7</mark>	108.52	104.26	100.01	95.75	95.75	100.01	104.26	108.52	112.77	117.03		_
Energy	content of	hot water	used - cal	lculated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1276.69	(44)
(45)m=	173.55	151.79	156.63	136.56	131.03	113.07	104.77	120.23	121.67	141.79	154.78	168.08		
lf instan	taneous w	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46,		Total = Su	- m(45) ₁₁₂ =	-	1673.95	(45)
(46)m=	26.03	22.77	23.5	20.48	19.65	16.96	15.72	18.03	18.25	21.27	23.22	25.21		(46)
Water	storage	loss:		1										
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		1		(47)
	•	-		ank in dw er (this ir	-			(47) ombi boil	ers) ente	er '0' in ((47)			
	storage					<i></i>	<i>.</i>							
,				oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	e 2b								0		(49)
			•	e, kWh/ye cylinder l		or is not		(48) x (49)) =			1		(50)
				rom Tabl							0.	03		(51)
		eating s			- (<i>.</i> ,					00		()
Volum	e factor	from Ta	ble 2a								4.	93		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/ye	ear			(47) x (51)	x (52) x (53) =	0	.1		(54)
Enter	(50) or ((54) in (5	55)								0	.1		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) <mark>× (</mark> 41)ı	m				
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)

(57)m= 3.03 2.74 3.03 2.93 3.03 2.93 3.03 2.93 3.03 2.93 3.03 2.93 3.03	
	57)
Primary circuit loss (annual) from Table 3	58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26 22.51 23.26	59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	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= 199.84 175.54 182.93 162 157.32 138.51 131.07 146.52 147.11 168.08 180.22 194.37	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	63)
Output from water heater	
(64)m= 199.84 175.54 182.93 162 157.32 138.51 131.07 146.52 147.11 168.08 180.22 194.37	
Output from water heater (annual) 1983.52	64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
	65)
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= 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38 182.38	66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 108.63 96.48 78.46 59.4 44.4 37.49 40.51 52.65 70.67 89.73 104.73 111.64	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
	68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
	69)
Pumps and fans gains (Table 5a)	
	70)
Losses e.g. evaporation (negative values) (Table 5)	
	71)
Water heating gains (Table 5)	,
	72)
)
Total internal gains = $(66)m + (67)m + (68)m + (70)m + (71)m + (72)m$	72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 922.06 913.61 874.97 815.91 754.68 702.21 673.64 686.53 722.52 781.82 846.66 896.43	73)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 922.06 913.61 874.97 815.91 754.68 702.21 673.64 686.53 722.52 781.82 846.66 896.43 6. Solar gains: 6. Solar gains:	73)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 922.06 913.61 874.97 815.91 754.68 702.21 673.64 686.53 722.52 781.82 846.66 896.43	73)

East	0.9x	1	x	2.8	x	19.64	x	0.9	x	0.9	=	40.09	(76)
East	0.9x				1						1	78.42](70)](76)
East	0.9x	1	X	2.8	x	38.42	x	0.9	x	0.9	=		(76)
East	0.9x	1	x x	2.8	x x	63.27	x x	0.9	x x	0.9	=	129.15](76)](76)
East	0.9x	1		2.8	1	92.28					-	188.36](70)](76)
East	0.9x	1	X	2.8	x	113.09	x	0.9	x	0.9	1	230.84	(76)
East	0.9x	1	x x	2.8	x x	115.77 110.22	x	0.9	x x	0.9	=	236.31 224.98](76)](76)
East	0.9x	1			1		x				1](70)](76)
East	0.9x	1	X	2.8	x	94.68	x	0.9	x	0.9	=	193.25	(76)
East	0.9x	1	x x	2.8	x x	73.59 45.59	x x	0.9	x x	0.9	=	150.21](76)](76)
East	0.9x	1	x		1				x			93.06](70)](76)
East	0.9x	1	x	2.8	x	24.49	x	0.9		0.9	=	49.99	(76)
South	0.9x	1		2.8	X	16.15	X	0.9	x	0.9	1	32.97](70)](78)
South	0.9x	1	X	L	x	46.75	x		x	0.9	=	153.37	(78)
South	0.9x	1	x x	1.2	x	46.75	x x	0.9	x	0.9	=	81.8 40.9	(78)
South	0.9x	1			x	46.75			x		1		4
South	0.9x	1	X	0.9	X	76.57	X	0.9	x	0.9	=	251.18	(78)
South		1	X	1.2	×	76.57	X	0.9	X	0.9	=	133.96	(78)
South	0.9x	1	X	1.2		76.57	×	0.9	X	0.9	=	66.98	(78)
South	0.9x 0.9x	1	X	0.9	X	97.53	X	0.9	X	0.9	=	319.96	(78)
South	0.9x	1	X	1.2	x	97.53	X	0.9	X	0.9	=	170.65	(78)
South	0.9x	1	X	1.2		97.53	X	0.9	X	0.9	=	85.32	(78)
South	0.9x		x	0.9	X	110.23	X	0.9	x	0.9	=	3 <mark>61.62</mark>	(78) (78)
South	0.9x	1	X	1.2	X	110.23	x	0.9	x x	0.9	1	192.87	(78)
South	0.9x		x	1.2	X	110.23	x	0.9		0.9	=	9 <mark>6.43</mark>	_(78) _(78)
South	0.9x	1	X	0.9	x	114.87	x	0.9	x	0.9	=	376.83	(78)
South	0.9x	1	x	1.2	x	114.87	x x	0.9	x	0.9	=	200.98	(78)
South	0.9x	1	x x	0.9	x x	114.87 110.55	x	0.9	x x	0.9	- =	100.49 362.65	_(78)
South	0.9x		x		x		x		x			193.41	(78)
South	0.9x	1	x	1.2	x	110.55 110.55	x	0.9	x	0.9		96.71	_(78)
South	0.9x	1	x	0.9	x	108.01	x	0.9	x	0.9			(78)
South	0.9x	1	x	1.2	x		x	0.9	x	0.9		354.33	(78)
South	0.9x	1	x	1.2	x	108.01 108.01	x	0.9	x	0.9	=	188.98 94.49](70)](78)
South	0.9x	1	x	0.9	x	104.89	x	0.9	x	0.9	=	344.11](78)
South	0.9x	1	x	1.2	x	104.89	x	0.9	x	0.9	-	183.52](70)](78)
South	0.9x		x		1				x		=](78)
South	0.9x	1	x	1.2	x x	104.89	x x	0.9	x	0.9	= =	91.76	(78)
South	0.9x	1	x	0.9	x	101.89	x	0.9	x	0.9	=	334.24	(78)
South	0.9x	1	x	1.2	x	101.89 101.89	x	0.9	x	0.9	=	178.26 89.13	(78)
South	0.9x	1	x		x		x		x		=		(78)
South	0.9x			0.9	1	82.59		0.9		0.9	= =	270.92	(78)
Coun	0.98	1	X	1.2	×	82.59	x	0.9	x	0.9		144.49	

	_															
South	0.9x	1	x	1	.2	x	8	32.59	x		0.9	×	0.9	=	72.25	(78)
South	0.9x	1	x	0	.9	x	5	5.42	x		0.9	x	0.9	=	181.8	(78)
South	0.9x	1	x	1	.2	x	5	5.42	x		0.9	×	0.9	=	96.96	(78)
South	0.9x	1	x	1	.2	x	5	5.42	x		0.9	×	0.9	=	48.48	(78)
South	0.9x	1	x	0	.9	x	4	40.4	x		0.9	x	0.9	=	132.53	(78)
South	0.9x	1	x	1	.2	x	4	40.4	x		0.9	×	0.9	=	70.68	(78)
South	0.9x	1	x	1	.2	x	4	40.4	x		0.9	×	0.9	=	35.34	(78)
Solar g	ains in	watts, ca	alculated	d for eac	h month	1		-	(83)m	= Sur	m(74)m .	(82)m				
(83)m=	316.16	530.55	705.08	839.29	909.15	8	89.08	862.78	812.	64	751.83	580.72	377.22	271.51		(83)
Total g	ains – i	nternal a	and sola	r (84)m :	= (73)m	+ (8	83)m	, watts								
(84)m=	1238.21	1444.16	1580.05	1655.2	1663.83	15	591.29	1536.41	1499	.17 [·]	1474.36	1362.54	1223.88	1167.94		(84)
7. Me	an inter	nal temp	perature	(heating	g seasor	າ)										
Temp	erature	during h	neating p	periods i	n the livi	ng	area	from Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living ar	ea, h1,m	า (s	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.96	0.89		0.72	0.53	0.5	7	0.81	0.97	1	1		(86)
Me <mark>an</mark>	interna	temper	ature in	living ar	ea T1 (f		w ste	ps 3 to 7	in T	able			•			
(87)m=	20.13	20.27	20.46	20.69	20.88	T	0.98	21	21		20.95	20.72	20.38	20.11		(87)
	oroturo	during h		l oriodo i	n root of	du	ulling	from To								
(88)m=	20.21	20.22	20.22	20.23	20.23	1	20.24	from Ta 20.24	20.2		2 (C) 20.23	20.23	20.22	20.22		(88)
						1					20.23	20.20	20.22	20.22		(00)
		tor for g		_		T -		e Table	<u>,</u>						1	(00)
(89)m=	1	1	0.99	0.95	0.86		0.65	0.44	0.4	8	0.74	0.96	1	1		(89)
Me <mark>an</mark>	interna	l temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9 <mark>c)</mark>				
(90)m=	19.04	19.25	19.53	19.86	20.1	2	20.22	20.24	20.2	24	20.2	19.9	19.41	19.01		(90)
											f	LA = Livi	ng area ÷ (4	4) =	0.23	(91)
Mean	interna	l temper	ature (fo	or the wh	nole dwe	ellin	g) = fl	LA × T1	+ (1 ·	– fLA	() × T2					
(92)m=	19.29	19.49	19.75	20.05	20.29		20.4	20.41	20.4	42	20.37	20.09	19.63	19.27		(92)
Apply	adjustr	nent to t	he mear	n interna	I tempe	atu	ire fro	m Table	4e, v	wher	e appro	priate				
(93)m=	19.29	19.49	19.75	20.05	20.29		20.4	20.41	20.4	42	20.37	20.09	19.63	19.27		(93)
8. Spa	ace hea	ting requ	uiremen	t												
				•		ned	l at ste	ep 11 of	Tabl	e 9b,	so that	t Ti,m=	(76)m an	d re-calo	culate	
the ut		factor fo Feb	Mar	r – –	1	\mathbf{T}	Jun	Jul	۸.		Sep	Oct	Nov	Dec	1	
l Itilisa	Jan tion fac	tor for g		Apr	May		Jun	Jui	Αι	Jg [Sep	Oci	INOV	Dec		
(94)m=	1	0.99	0.98	0.95	0.86		0.67	0.46	0.5	5	0.76	0.96	0.99	1		(94)
	l gains.	hmGm]	
	.	1434.91	, <u> </u>	1571.26	r Ó	1	058.6	713.03	747.	56	1115.46	1302.45	5 1216.43	1166.06		(95)
Month	nly aver	age exte	rnal terr	peratur	e from T	abl	e 8				I		1		1	
(96)m=	4.3	4.9	6.5	8.9	11.7	-	14.6	16.6	16.	4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	e for me	an interr	nal temp	erature,	Lm	1, W =	=[(39)m :	x [(93	3)m–	(96)m]				
(97)m=	2906.87	2819.87	2553.41	2121.85	1629.25	10	087.52	715.4	751.	33	1181.93	1800.56	3 2390.38	2888.42		(97)
Space	e heatin	g require	ement fo	r each r	nonth, k	Wh	/mont	th = 0.02	24 x [(97)r	n – (95))m] x (4	11)m		-	
(98)m=	1243.61	930.7	744.53	396.42	148.93		0	0	0		0	370.59	845.24	1281.44		

Total per year (kWh/year) = Sum(98) ₁₅₉₁₂											8)15,912 =	5961.46	(98)	
Spac	e heatir	ng requir	ement ir	n kWh/m²	²/year								26.03	(99)
8c. S	pace co	oling rea	quiremer	nt										
Calcu	lated fo	or June, .	July and	August.	See Tal	ble 10b				-			1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		<u> </u>	1	r – –	r	i · · · ·	í –	i	î .	<u> </u>	re from T	,	1	
(100)m=		0	0	0	0	1762.83	1387.76	1422.15	0	0	0	0		(100)
		ctor for lo	1										1	(404)
(101)m=	0	0	0	0	0	0.82	0.91	0.89	0	0	0	0		(101)
		r È	r - '	(100)m >	r`	I IIII	4004.00	4007.57				0		(102)
(102)m=		0	0	0	0		1261.66		0	0	0	0		(102)
	<u> </u>	gains ca		for appli		1	1536.41		· ·	0	0	0		(103)
(103)m=			ů	-	_					-	_	0	(<i>11</i>)m	(103)
•		•		< 3 × (98		iwening,	continue	ous (kn	(n) = 0.0	24 X [(1)	03)m – (102)mj	(41)m	
(104)m=	<u> </u>	0	0	0	0	103.86	204.42	172.31	0	0	0	0		
		I	1	1					I Total	= Sum	(104)	=	480.59	(104)
Cooled	d fractio	n									area ÷ (4	1) =	1	(105)
Interm	ittency f	factor (T	able 10b)										
(106) <mark>m=</mark>	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Tota	l = Sum	(104)	=	0	(106)
Space	cooling	requir <mark>e</mark>	men <mark>t for</mark>	month =	(104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	25.97	51.1	43.08	0	0	0	0		
									Total	= Sum	(107)	=	120.15	(107)
Spa <mark>ce</mark>	cooling	require	ment in I	<mark>kWh/</mark> m²/	year				(107)) ÷ (4) =			0.52	(108)
9b. En	ergy re	quireme	nts – Co	mmunity	heating	scheme)				-			
This pa	art is us	ed for sp	bace hea	ating, spa	ace cool	ing or wa	ater heat	ting prov	vided by	a comm	unity sch	neme.		
Fractic	on of spa	ace heat	from se	condary	/supplen	nentary	heating (Table 1	1) '0' if n	one	-		0	(301)
Fractic	on of spa	ace heat	from co	mmunity	v system	1 – (30 ⁻	1) =						1	(302)
	-			-	-			allows for	CHP and i	un to four	other heat	sources: t	he latter	
	-		-	mal and wa							ounor nour	0001000, 1		
Fractic	on of he	at from (Commur	ity heat	pump								1	(303a)
Fractic	on of tot	al space	heat fro	m Comr	nunity he	eat pum	C			(3	802) x (303	a) =	1	(304a)
Factor	for con	trol and	charging	g methoc	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
				, 12c) for (•	5-7-				1.05	(306)
	heatin		(.,							kWh/yea	
•		9 heating	requiren	nent									5961.46	<u> </u>
Space	heat fro	om Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	6259.54	(307a)
Efficie	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	a require	ment fro	m secor	idary/su	oplemen	tary syst	tem	(98) x (30	01) x 100	÷ (308) =		0	(309)
•						-								
	ater heating												1983.52	

If DHW from community scheme:

Water heat from Community heat pump		(64) x (303a) x (305) x (306) =		2082.69	(310a)
Electricity used for heat distribution	C	0.01 × [(307a)(307e) + (310a)(310	e)] =	83.42	(313)
Cooling System Energy Efficiency Ratio				3.38	(314)
Space cooling (if there is a fixed cooling s	system, if not enter 0)	= (107) ÷ (314) =		35.6	(315)
Electricity for pumps and fans within dwel mechanical ventilation - balanced, extract		de		0	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =		0	(331)
Energy for lighting (calculated in Appendia	x L)			767.34	(332)
10b. Fuel costs – Community heating sc	heme				
	Fuel kWh/year	Fuel Price (Table 12)		Fuel Cost E/year	
Space heating from CHP	(307a) x	4.24 × 0	.01 =	265.4	(340a)
Water heating from CHP	(310a) x	4.24 × 0	.01 =	88.31	(342a)
Space cooling (community cooling system Pumps and fans Energy for lighting Additional standing charges (Table 12) Total energy cost 11b. SAP rating - Community heating sc Energy cost deflator (Table 12)	(331) (332) = (340a)(342e) + (345)(354) = heme (355) x (356)] ÷ [(4) + 45.0] = g scheme	Fuel Price 13.19 × 0 13.19 × 0 13.19 × 0 13.19 × 0		4.7 0 101.21 120 579.62 0.42 0.89 87.61	(348) (349) (350) (351) (355) (355) (356) (357) (358)
CO2 from other sources of space and wa Efficiency of heat source 1 (%)		uels repeat (363) to (366) for the seco	nd fuel	350	(367a)
CO2 associated with heat source 1	[(307b)+(310b))] x 100 ÷ (367b) x 0] = [1237.03	(367)
Electrical energy for heat distribution	[(313)	x 0.52] = [43.3	(372)
Total CO2 associated with community sys	stems (363)	(366) + (368)(372)] =	1280.33	(373)
CO2 associated with space heating (seco	ndary) (309)	× 0] = [0	(374)
CO2 associated with water from immersion	on heater or instantaneous l	heater (312) x 0.52] = [0	(375)
Total CO2 associated with space and wat	ter heating (373) -	+ (374) + (375) =	[1280.33	(376)
CO2 associated with space cooling	(315) >	x 0.52] = [18.48	(377)

CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	=	398.25	(379)
Total CO2, kg/year	sum of (376)(382) =			Г	1697.06	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				7.41	(384)
El rating (section 14)					91.7	(385)
13b. Primary Energy – Community heat	ing scheme					
		Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)		HP) ing two fuels repeat (363) to	(366) for the second	d fuel	350	(367a)
Energy associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0	=	7317.33	(367)
Electrical energy for heat distribution		[(313) x		= [256.11	(372)
Total Energy associated with community	y systems	(363)(366) + (368)(37	2)	=	7573.43	(373)
if it is negative set (373) to zero (unle	ss specified otherwise	, see C7 in Appendix C	;)	[7573.43	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from imm	ersion heater or instar	taneous heater(312) x	3.07	=	0	(375)
Total Energy associated with space and	water heating	(373) + (374) + (375) =			7573.43	(376)
Energy associated with space cooling		(31 5) x	3.07	=	109.29	(377)
Energy associated with electricity for pu	mps and fans within d	welling (331)) x	3.07	=	0	(378)
Energy associated with electricity for lig	hting	(332))) x	3.07	=	2355.75	(379)
Tot <mark>al Primary Energy</mark> , kWh/yea	r sum of (376)(382) =			10038.47	(383)

User Details:													
Assessor Name: Software Name:	Stro	oma FS	AP 201			Strom Softwa	are Vei			Versio	on: 1.0.3.11		
						Address	: Flat 3						
Address :			on Road,	NW3 71	RB								
1. Overall dwelling dim	ensions	s:											
					Area	a(m²)	1	Av. Hei	ight(m)	-	Volume(m ³)		
Ground floor						65	(1a) x	3	3.1	(2a) =	201.5	(3a)	
First floor						178	(1b) x	2	2.9	(2b) =	516.2	(3b)	
Total floor area TFA = (1a)+(1b)+(1c)+((1d)+(1e)+(1r	i) :	243	(4)			_		_	
Dwelling volume							(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	717.7	(5)	
2. Ventilation rate:												_	
		nain leating		econdar eating	у	other		total			m ³ per hou	r	
Number of chimneys	ſ	0	"ז + ר	0] + [0] = [0	X 4	40 =	0	(6a)	
Number of open flues	Γ	0	<u> </u> + [0	Ī + Ē	0	_] = [0	×	20 =	0	(6b)	
Number of intermittent f	ans						Γ	4	x ′	10 =	40	(7a)	
Number of passive vent	s						Ē	0	x ^	10 =	0	(7b)	
Number of flueless gas	0	(7c)											
Infiltration due to obimp	ovo flux			a) (6b) (7	a) $(7b)$ $($	7c) -					hanges per ho	_	
Infiltration due to chimne If a pressurisation test has							continue fr	40 om (9) to (÷ (5) =	0.06	(8)	
Number of storeys in	the dwe	elling (ne	5)								0	(9)	
Additional infiltration									[(9)	-1]x0.1 =	0	(10)	
Structural infiltration:	0.25 for	steel or	timber f	frame or	0.35 foi	r masoni	y constr	uction			0	(11)	
if both types of wall are deducting areas of open				ponding to	the great	er wall are	a (after						
If suspended wooden				ed) or 0.	1 (seale	ed), else	enter 0				0	(12)	
If no draught lobby, e	nter 0.0	5, else e	enter 0								0	(13)	
Percentage of window	vs and o	doors dr	aught st	ripped							0	(14)	
Window infiltration						0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)	
Infiltration rate						(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)	
Air permeability value	, q50, e	xpresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	4.5	(17)	
If based on air permeab	•										0.28	(18)	
Air permeability value appl		essurisatio	on test has	s been don	e or a deg	gree air pe	rmeability	is being us	sed			_	
Number of sides shelter	ed					(20) - 1	[0 075 v (1	0)1			1	(19)	
Shelter factor			1			(20) = 1 -		9)] =			0.92	(20)	
Infiltration rate incorpora	-					(21) = (18) x (20) =				0.26	(21)	
Infiltration rate modified	r				11	A	0	0-4	N		1		
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]		
Monthly average wind s	· · · · · ·			2.0	2.0	27	4	4.2	AE	47	1		
(22)m= 5.1 5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7			

Wind F	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		
Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m					
	0.33	0.32	0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31		
			change i	rate for t	he appli	cable ca	se	Į				نــــــــــــــــــــــــــــــــــــ		
	echanica			and the NL (O	0h) (00	·) · · · · · · · · / ·	· · · · · · · · · · /) (00-)		l	0	(23a)
								N5)) , othe) = (23a)		l	0	(23b)
			-	-	-			n Table 4h					0	(23c)
ŕ							<u> </u>	1 ^ `	ŕ	r í	· · ·	1 – (23c)	÷ 100]	(240)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
, i r				1			r	MV) (24b	ŕ	r í	, 			(24b)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(240)
,					•	•		on from c c) = (22t		5 v (22h				
(24c)m=	0	0	0		(231) = (231)			$\frac{1}{0} = (221)$	0	0	0	0		(24c)
	-			-	-		-	-		0	0	Ů		(=)
								on from l 0.5 + [(2		0.5]				
(24d) <mark>m=</mark>	· ,	0.55	0.55	0.54	0.54	0.53	0.53	0.53	, 0.53	0.54	0.54	0.55		(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24	o) or (24	c) or (24	ld) in bo	(25)			<u> </u>	-	
(25)m=	0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(25)
													_	
			eat loss p									li		
ELEN	IENI	Gros area		Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·k		A X k kJ/K
Doors			,			2.1	×	0.8		1.68				(26)
Window	ws Type	: 1				1.5		/[1/(1.2)+	0.04] =	1.72				(27)
Window	ws Type	2				2.44		/[1/(1.2)+	0.04] =	2.79	=			(27)
Window	ws Type	3				0.9		/[1/(1.2)+	0.04] =	1.03	\exists			(27)
	vs Type					1.4		/[1/(1.2)+	0.04] =	1.6				(27)
	ws Type					0.91		/[1/(1.2)+	L	1.04	\exists			(27)
	ws Type					1.58	=	/[1/(1.2)+	L	1.81				(27)
	ws Type					1.50		/[1/(1.2)+	L	1.83				(27)
Rooflig						0.5		/[1/(1.3) +	L	0.65				(27) (27b)
Walls T		20.1	6	9.5		10.66		0.12	= [1.28				(29)
Walls T									¦		╡┟		\exists	(29)
		11.8		0		11.89		0.12		1.43	╡┟		\dashv	
Walls T		6.5		6.37		0.14		0.11		0.02	╡╞		\downarrow	(29)
Walls T		14.2	26	0		14.26	3 ×	0.12	= [1.71	ļ		╡	(29)
Walls T		35.6	67	28.5		7.17	×	0.12	= [0.86	_		\downarrow \vdash	(29)
Walls T	ype6	78.	3	0		78.3	×	0.12	= [9.4			_	(29)
Roof		25		1		24	X	0.13	=	3.12				(30)
Total a	rea of e	lements	, m²			193.8	9							(31)

	ndows and de the area						lated using	formula 1,	/[(1/U-valu	e)+0.04] a	ns given in	paragraph	1 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				71.53	(33)
Heat o	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	216	(34)
Therm	al mass	parame	ter (TMF		- TFA) ir	n kJ/m²K	,		Indica	tive Value:	: Medium		250	(35)
For des		ments wh	ere the de	tails of the				ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix I	K						29.08	(36)
if details	s of therma	l bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			100.61	(37)
Ventila	ation hea	t loss ca	alculated	monthl	y			-	(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	131.4	130.9	130.4	128.08	127.65	125.63	125.63	125.25	126.41	127.65	128.53	129.45		(38)
Heat t	ransfer o	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	232.02	231.51	231.02	228.7	228.26	226.24	226.24	225.87	227.02	228.26	229.14	230.06		
			•				•		/	Average =	Sum(39)1.	₁₂ /12=	228.69	(39)
Heat le	oss para	meter (H	HLP), W/	′m²K		r			(40)m	= (39)m ÷	(4)		1	
(40)m= 0.95 0.95 0.95 0.94 0.94 0.93 0.93 0.93 0.93 0.94 0.94 0.95 Average = Sum(40) ₁₁₂ /12=														_
Numb	or of day		oth (Toh	0 10)					/	Average =	Sum(40)1.	12 /12=	0.94	(40)
NUMD	er of day		· ·	· ·	Mari	lun		A	Com	Oct	Nev	Dee		
(11)~~	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct 31	Nov	Dec		(41)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ener	rgy <mark>requ</mark> i	irement:								kWh/ye	ear:	
Assun	ned occu	pancy, I	Ν								3	06		(42)
if TF), N = 1		[1 - exp	(-0.0003	849 x (TF	-A -13.9)2)] + 0.(0 <mark>013 x (</mark> 1	ГF <mark>А -13</mark> .				()
								(25 x N)				6.82		(43)
	e the annua re that 125							to achieve	a water us	se target o	t			
					· · · · ·		r	A	Com	Oct	Nev	Dee	1	
Hot wat	Jan er usage ii	Feb	Mar day for ea	Apr ach month	May Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
		113.23	108.96	104.69	100.41	96.14	96.14	100.41	104.69	108.96	113.23	117.51	1	
(44)m=	117.51	113.23	106.90	104.09	100.41	90.14	90.14	100.41		Total = Su			1281.88	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600					1201.00	
(45)m=	174.26	152.41	157.27	137.11	131.56	113.53	105.2	120.72	122.16	142.37	155.4	168.76		
(-)		-	-	-				-		Total = Su			1680.75	(45)
lf instan	ntaneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46						
(46)m= Water	26.14 storage	22.86 loss:	23.59	20.57	19.73	17.03	15.78	18.11	18.32	21.36	23.31	25.31]	(46)
	-		includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		1		(47)
If com	munity h	eating a	ind no ta	nk in dw	velling, e	nter 110) litres in	(47)			L		I	
	•	-			-			mbi boil	ers) ente	er '0' in (47)			
	storage													
	nanufact				or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)

			r storage eclared o	-		or is not		(48) x (49) =			1		(50)
		-	s factor fr		e 2 (kWl	n/litre/da	ay)				0.	03		(51)
Volum	e factor	from Ta	ble 2a								4.	93		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
Energy	y lost fro	om wate	r storage	, kWh/ye	ear			(47) x (51) x (52) x (53) =	0	.1		(54)
Enter	(50) or	(54) in (ধ	55)								0	.1		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)
If cylinde	er contain	s dedicate	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 Append	хH	
(57)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(57)
Primar	v circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primar	y circuit	loss cal	Iculated from Tab	for each	month (,	. ,	. ,		r thermo		0		()
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
	loss ca	I Iculated	for each	month (61)m =	(60) ÷ 36	1 65 × (41)	ـــــــــــــــــــــــــــــــــــــ						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total	eat reg	uired for	water h	eating ca	alculated	for eac	r h month	(62)m =	0 85 x ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	200.55	176.15	183.56	162.56	157.85	138.97	131.49	147.01	147.61	168.66	180.85	195.05	(00)	(62)
			using App								I			``
			FGHRS			-				reonthout		i neating)		
(63)m=	0				0	0			0	0	0	0		(63)
					Ŭ	0		0		0	0	Ŭ		(00)
Output	r trom w													
(0.1)				100 50	457.05	100.07	101.10	4 47 04	4.47.04	100.00	400.05	405.05		
(64)m=	200.55	176.15	183.56	162.56	157.85	138.97	131.49	147.01	147.61	168.66	180.85	195.05	1000.20	
	200.55	176.15	183.56					Out	but from w	ater heater	r (annual)₁	12	1990.32	(64)
Heat g	200.55 ains fro	176.15 m water	183.56 heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	Outr) + (61)m	ב out from w 1] + 0.8 א	ter heater ((46)m	r (annual)₁ + (57)m	+ (59)m		1
Heat g	200.55 ains fro 76.55	176.15 m water 67.48	183.56 heating, 70.9	kWh/mo 63.6	onth 0.28 62.35	5 ´ [0.85 55.76	× (45)m 53.59	Outr + (61)n 58.75	but from wa n] + 0.8 > 58.63	ter heater ((46)m 65.95	r (annual)₁ + (57)m 69.68	+ (59)m 74.72]	(64) (65)
Heat g	200.55 ains fro 76.55	176.15 m water 67.48	183.56 heating, 70.9	kWh/mo 63.6	onth 0.28 62.35	5 ´ [0.85 55.76	× (45)m 53.59	Outr + (61)n 58.75	but from wa n] + 0.8 > 58.63	ter heater ((46)m 65.95	r (annual)₁ + (57)m 69.68	+ (59)m]	1
Heat g (65)m= inclu	200.55 ains fro 76.55 ide (57)	176.15 m water 67.48 m in cale	183.56 heating, 70.9	kWh/mo 63.6 of (65)m	onth 0.28 62.35 only if c	5 ´ [0.85 55.76	× (45)m 53.59	Outr + (61)n 58.75	but from wa n] + 0.8 > 58.63	ter heater ((46)m 65.95	r (annual)₁ + (57)m 69.68	+ (59)m 74.72]	1
Heat g (65)m= inclu 5. Int	200.55 ains fro 76.55 ide (57) ternal ga	m water 67.48 m in cale	183.56 heating, 70.9 culation o	kWh/mo 63.6 of (65)m 5 and 5a)	onth 0.28 62.35 only if c	5 ´ [0.85 55.76	× (45)m 53.59	Outr + (61)n 58.75	but from wa n] + 0.8 > 58.63	ter heater ((46)m 65.95	r (annual)₁ + (57)m 69.68	+ (59)m 74.72]	1
Heat g (65)m= inclu 5. Int	200.55 ains fro 76.55 ide (57) ternal ga	m water 67.48 m in cale	183.56 heating, 70.9 culation of a Table 5	kWh/mo 63.6 of (65)m 5 and 5a)	onth 0.28 62.35 only if c	5 ´ [0.85 55.76	× (45)m 53.59	Outr + (61)n 58.75	but from wa n] + 0.8 > 58.63	ter heater ((46)m 65.95	r (annual)₁ + (57)m 69.68	+ (59)m 74.72]	1
Heat g (65)m= inclu 5. Int	200.55 ains fro 76.55 ude (57) ternal ga olic gain	m water 67.48 m in cale ains (see	183.56 heating, 70.9 culation of Table 5 5), Wat	kWh/mo 63.6 of (65)m and 5a) ts	onth 0.29 62.35 only if c	5 ´ [0.85 55.76 ylinder is	× (45)m 53.59 s in the c	Outr + (61)n 58.75 dwelling	out from warn] + 0.8 > 58.63 or hot w	ater heater ((46)m 65.95 ater is fr	r (annual), + (57)m 69.68 rom com	+ (59)m 74.72 munity h]	1
Heat g (65)m= inclu 5. Int Metabo	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47	176.15 m water 67.48 m in cale ains (see ns (Table Feb 183.47	183.56 heating, 70.9 culation of Table 5 a 5), Wat Mar	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47	onth 0.2 62.35 only if c): May 183.47	5 ´ [0.85 55.76 ylinder is Jun 183.47	× (45)m 53.59 s in the o Jul 183.47	Outr + (61)n 58.75 dwelling Aug 183.47	out from war 1] + 0.8 > 58.63 or hot w Sep 183.47	((46)m 65.95 ater is fr	r (annual), + (57)m 69.68 rom com	+ (59)m 74.72 munity h]	(65)
Heat g (65)m= inclu 5. Int Metabo	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47	176.15 m water 67.48 m in cale ains (see ns (Table Feb 183.47	183.56 heating, 70.9 culation (2 Table 5 2 5), Wat Mar 183.47	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47	onth 0.2 62.35 only if c): May 183.47	5 ´ [0.85 55.76 ylinder is Jun 183.47	× (45)m 53.59 s in the o Jul 183.47	Outr + (61)n 58.75 dwelling Aug 183.47	out from war 1] + 0.8 > 58.63 or hot w Sep 183.47	((46)m 65.95 ater is fr	r (annual), + (57)m 69.68 rom com	+ (59)m 74.72 munity h]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	200.55 ains fro 76.55 ide (57) ternal ga olic gain Jan 183.47 g gains 91.44	176.15 m water 67.48 m in cale ains (see ns (Table Feb 183.47 (calcula 81.22	183.56 heating, 70.9 culation of Table 5 5), Wat 183.47 ted in Ap 66.05	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47 opendix 1 50	onth 0.29 62.35 only if c : May 183.47 L, equati 37.38	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32	but from war [] + 0.8 > 58.63 or hot w Sep 183.47 Table 5 59.49	ater heater ([(46)m 65.95 ater is fr Oct 183.47 75.53	r (annual), + (57)m 69.68 rom com Nov 183.47	+ (59)m 74.72 munity h Dec 183.47]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m=	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47 g gains 91.44 nces ga	176.15 m water 67.48 m in cale ains (see ns (Table Feb 183.47 (calcula 81.22	183.56 heating, 70.9 culation of Table 5 Table 5 Mar 183.47 ted in Ap	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47 opendix 1 50	onth 0.29 62.35 only if c : May 183.47 L, equati 37.38	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32	but from war [] + 0.8 > 58.63 or hot w Sep 183.47 Table 5 59.49	ater heater ([(46)m 65.95 ater is fr Oct 183.47 75.53	r (annual), + (57)m 69.68 rom com Nov 183.47	+ (59)m 74.72 munity h Dec 183.47]	(65)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m=	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47 ng gains 91.44 nces ga 612.35	176.15 m water 67.48 m in cale ains (see S (Table Feb 183.47 (calcula 81.22 ins (calc 618.7	183.56 heating, 70.9 culation of Table 5 Table 5 Mar 183.47 ted in Ap 66.05 culated in 602.69	kWh/mo 63.6 of (65)m and 5a) ts Apr 183.47 ppendix l 50 Append 568.6	onth 0.29 62.35 only if c : May 183.47 L, equati 37.38 dix L, eq 525.57	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56 uation L 485.13	× (45)m 53.59 s in the c Jul 183.47 r L9a), a 34.1 13 or L1 458.11	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76	but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 o see Ta 467.77	Atter heater atter heater 65.95 atter atter is fr Oct 183.47 75.53 ble 5 501.86 501.86	r (annual), + (57)m 69.68 rom com Nov 183.47 88.16	+ (59)m 74.72 munity h Dec 183.47 93.98]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m=	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47 ng gains 91.44 nces ga 612.35	176.15 m water 67.48 m in cale ains (see S (Table Feb 183.47 (calcula 81.22 ins (calc 618.7	183.56 heating, 70.9 culation of Table 5 5), Wat Mar 183.47 ted in Ap 66.05	kWh/mo 63.6 of (65)m and 5a) ts Apr 183.47 ppendix l 50 Append 568.6	onth 0.28 62.35 only if c : May 183.47 L, equati 37.38 dix L, eq 525.57	5 ´ [0.85 55.76 ylinder is Jun 183.47 ion L9 of 31.56 uation L 485.13	× (45)m 53.59 s in the c Jul 183.47 r L9a), a 34.1 13 or L1 458.11	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76	but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 o see Ta 467.77	Atter heater atter heater 65.95 atter atter is fr Oct 183.47 75.53 ble 5 501.86 501.86	r (annual), + (57)m 69.68 rom com Nov 183.47 88.16	+ (59)m 74.72 munity h Dec 183.47 93.98]	(65) (66) (67)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m= Cookir (69)m=	200.55 ains fro 76.55 ude (57) ternal ga olic gain 183.47 g gains 91.44 nces ga 612.35 ng gains 56.4	176.15 m water 67.48 m in cale ains (see ns (Table Feb 183.47 (calcula 81.22 ins (calcula 618.7 (calcula 56.4	183.56 heating, 70.9 culation of Table 5 Aar 183.47 ted in Ap 66.05 culated in Ap 602.69 ated in Ap 56.4	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47 50 50 568.6 ppendix 56.4	onth 0.29 62.35 only if c : May 183.47 L, equati 37.38 dix L, equati 525.57 L, equat	5 ´ [0.85 55.76 ylinder is Jun 183.47 on L9 of 31.56 uation L 485.13 ion L15	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1 13 or L1 458.11 or L15a)	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76), also se	but from w but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 See Ta 467.77 be Table	Atter heater atter heater 65.95 atter atter is fr Oct 183.47 75.53 ble 5 501.86 5	r (annual), + (57)m 69.68 om com Nov 183.47 88.16 544.89	+ (59)m 74.72 munity h Dec 183.47 93.98 585.33]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Appliau (68)m= Cookir (69)m= Pumps	200.55 ains fro 76.55 ude (57) ternal ga olic gain Jan 183.47 ng gains 91.44 nces ga 612.35 ng gains 56.4 s and fai	176.15 m water 67.48 m in cale ains (see hs (Table 183.47 (calcula 81.22 ins (calcula 618.7 c(calcula 56.4	183.56 heating, 70.9 culation of Table 5 Table 5 Mar 183.47 tted in Ap 66.05 culated in Ap 602.69 ated in Ap 56.4 (Table 5)	kWh/mo 63.6 of (65)m and 5a) ts Apr 183.47 ppendix 1 50 Appendix 1 568.6 ppendix 568.4 56.4	onth 0.29 62.35 only if c : 183.47 L, equati 37.38 dix L, equati 525.57 L, equat 56.4	5 ´ [0.85 55.76 ylinder is Jun 183.47 on L9 of 31.56 uation L 485.13 ion L15 56.4	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1 13 or L1 458.11 or L15a) 56.4	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76), also se 56.4	but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 o see Ta 467.77 be Table 56.4	ater heater ater heater 65.95 ater is fr Oct 183.47 75.53 ble 5 501.86 5 56.4	r (annual), + (57)m 69.68 rom com Nov 183.47 88.16 544.89 56.4	+ (59)m 74.72 munity h Dec 183.47 93.98 585.33]	(65)(66)(67)(68)(69)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	200.55 ains fro 76.55 ide (57) ternal ga olic gain Jan 183.47 ig gains 91.44 nces ga 612.35 ng gains 56.4 s and fat 0	176.15 m water 67.48 m in cale ains (see ns (Table 183.47 (calcula 81.22 ins (calcula 618.7 calcula 56.4 ns gains 0	183.56 heating, 70.9 culation of a Table 5 a Table 5 b Table 5 a Table 7 b Table 5 b Table 6 a Table 7 b Table 6 culated in Apple 66.05 culated in Apple 602.69 ated in Apple 56.4 c 0	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47 ppendix 1 50 568.6 ppendix 56.4 56.4 5a) 0	onth 0.25 62.35 only if c): May 183.47 L, equati 37.38 dix L, equati 525.57 L, equat 56.4	5 ´ [0.85 55.76 ylinder is Jun 183.47 on L9 of 31.56 uation L 485.13 ion L15 56.4	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1 13 or L1 458.11 or L15a)	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76), also se	but from w but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 See Ta 467.77 be Table	Atter heater atter heater 65.95 atter atter is fr Oct 183.47 75.53 ble 5 501.86 5	r (annual), + (57)m 69.68 om com Nov 183.47 88.16 544.89	+ (59)m 74.72 munity h Dec 183.47 93.98 585.33]	(65) (66) (67) (68)
Heat g (65)m= inclu 5. Int Metabo (66)m= Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	200.55 ains fro 76.55 ide (57) ternal ga olic gain Jan 183.47 ig gains 91.44 nces ga 612.35 ng gains 56.4 s and fat 0	176.15 m water 67.48 m in cale ains (see ns (Table 183.47 (calcula 81.22 ins (calcula 618.7 calcula 56.4 ns gains 0	183.56 heating, 70.9 culation of Table 5 Table 5 Mar 183.47 tted in Ap 66.05 culated in Ap 602.69 ated in Ap 56.4 (Table 5)	kWh/mo 63.6 of (65)m 5 and 5a) ts Apr 183.47 ppendix 1 50 568.6 ppendix 56.4 56.4 5a) 0	onth 0.25 62.35 only if c): May 183.47 L, equati 37.38 dix L, equati 525.57 L, equat 56.4	5 ´ [0.85 55.76 ylinder is Jun 183.47 on L9 of 31.56 uation L 485.13 ion L15 56.4	× (45)m 53.59 s in the o Jul 183.47 r L9a), a 34.1 13 or L1 458.11 or L15a) 56.4	Outr + (61)n 58.75 dwelling Aug 183.47 Iso see 44.32 3a), also 451.76), also se 56.4	but from w but from w 58.63 or hot w Sep 183.47 Table 5 59.49 o see Ta 467.77 be Table 56.4	ater heater ater heater 65.95 ater is fr Oct 183.47 75.53 ble 5 501.86 5 56.4	r (annual), + (57)m 69.68 rom com Nov 183.47 88.16 544.89 56.4	+ (59)m 74.72 munity h Dec 183.47 93.98 585.33]	(65)(66)(67)(68)(69)

(72)m 102.89 100.42 95.3 88.31 77.44 72.03 78.96 81.43 88.44 96.79 100.43 (77) Total internal gains = (68)m + (70)m + (68)m + (70)m + (71)m + (72)m (73)m 52.424 917.9 881.6 82.4 764.32 711.89 881.8 62.22 726.25 73.89 847.38 90.73 (73)m 52.424 917.9 78.96 78.96 78.96 78.96 947.38 967.39 77.30 73.96 87.38 97.30 73.96 78.96 947.38 97.30 73.97 73.96 73.98	Water	heating	gains (Ta	ble 5)														
North Open Value	(72)m=	102.89	100.42	95.3	88.33	83.81	1	77.44	72.03	78.	96 81.43	88	8.64	96.78	100.4	3		(72)
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Area Flux 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 Gains North 0.9 North 0.8 0.9 Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2" North 0.8 0.9 North 0.8 0.9 0.9 Colspan= 2.3.7 Colspan= 2.3.7 <td>Total i</td> <td>nternal</td> <td>gains =</td> <td></td> <td></td> <td></td> <td></td> <td>(66)</td> <td>m + (67)m</td> <td>n + (68</td> <td>3)m + (69)m +</td> <td>+ (70)n</td> <td>n + (i</td> <td>71)m + (72)ı</td> <td>m</td> <td></td> <td></td> <td></td>	Total i	nternal	gains =					(66)	m + (67)m	n + (68	3)m + (69)m +	+ (70)n	n + (i	71)m + (72)ı	m			
Solar gave are calculated using solar flux from Table 6a Area Flux Gains North 0.9x 1 × 1.58 × 10.63 × 0.9 × 0.9 = 61.24 (7) North 0.9x 1 × 1.58 × 10.63 × 0.9 × 0.9 = 61.24 (7) North 0.9x 1 × 1.6 × 20.32 × 0.9 × 0.9 = 61.24 (7) North 0.9x 1 × 1.6 × 20.32 × 0.9 × 0.9 = 61.24 (7) North 0.9x 1 × 1.6 × 20.32 × 0.9 × 0.9 = 0.228 (7) North 0.9x 1 × 1.6 × 56.46 × 0.9 × 0.9 = 0.28 (7) North 0.9x 1 × 1.6 × 74.72 ×<	(73)m=	924.24	917.9	881.6	824.5	764.3	2 7	11.69	681.8	692	2.6 726.25	78	3.59	847.39	897.3	1		(73)
Orientation: Access Factor Table 6d Area m ² Flux Table 6a g Table 6b FF Table 6c Gains (W) North 0.9 1 × 1.58 × 10.63 × 0.9 × 0.9 = 61.24 (74) North 0.9 1 × 1.68 × 20.32 × 0.9 × 0.9 = 117.03 (74) North 0.9 1 × 1.68 × 20.32 × 0.9 × 0.9 = 22.7 (74) North 0.9 1 × 1.68 × 20.9 × 0.9 = 20.7 (74) North 0.9 1 × 1.68 × 0.9 × 0.9 = 20.7 (74) North 0.9 1 × 1.58 × 74.72 0.9 × 0.9 = 20.7 (74) North 0.9 <td< td=""><td>6. So</td><td>lar gains</td><td>:</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	6. So	lar gains	:															
Table 6dm²Table 6aTable 6bTable 6c(W)North0.9x1x1.58x10.63x0.9x0.9=61.24(74)North0.9x1x1.68x20.32x0.9x0.9=12.24(74)North0.9x1x1.58x20.32x0.9x0.9=12.24(74)North0.9x1x1.58x20.32x0.9x0.9=23.7(74)North0.9x1x1.68x34.53x0.9x0.9=40.28(74)North0.9x1x1.68x34.53x0.9x0.9=40.28(74)North0.9x1x1.68x74.72x0.9x0.9=450.3(74)North0.9x1x1.58x79.99x0.9=450.3(74)North0.9x1x1.58x79.99x0.9=450.3(74)North0.9x1x1.58x79.99x0.9=450.3(74)North0.9x1x1.58x79.89x0.9=68.1(74)North0.9x1x1.58x74.58x0.9 <td< td=""><td>Solar g</td><td>ains are c</td><td>alculated us</td><td>sing sola</td><td>r flux fro</td><td>m Table 6</td><td>a anc</td><td>l associ</td><td>ated equa</td><td>tions</td><td>to convert to t</td><td>the ap</td><td>plica</td><td>ble orientati</td><td>on.</td><td></td><td></td><td></td></td<>	Solar g	ains are c	alculated us	sing sola	r flux fro	m Table 6	a anc	l associ	ated equa	tions	to convert to t	the ap	plica	ble orientati	on.			
North 0.9 1 x 1.58 x 10.63 x 0.9 x 0.9 = 61.24 (74) North 0.9 1 x 1.58 x 20.32 x 0.9 x 0.9 = 117.03 (74) North 0.9 1 x 1.58 x 20.32 x 0.9 x 0.9 = 117.03 (74) North 0.9 1 x 1.58 34.53 x 0.9 x 0.9 = 108.86 (74) North 0.9 1 x 1.58 55.46 x 0.9 x 0.9 = 64.69 (74) North 0.9 1 x 1.6 55.46 0.9 x 0.9 = 64.69 (74) North 0.9 1 x 1.58 74.72 x 0.9 x 0.9 40.02 (74) North 0.9 1 </td <td>Orienta</td> <td></td> <td></td> <td>octor</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Orienta			octor									-					
North 0.8x 1 x 1.66 x 10.63 x 0.9 x 0.9 = 0.12.4 (74) North 0.9x 1 x 1.58 x 20.32 x 0.9 x 0.9 = 117.03 (74) North 0.9x 1 x 1.58 x 20.32 x 0.9 x 0.9 = 23.7 (74) North 0.9x 1 x 1.58 x 34.53 x 0.9 x 0.9 = 40.28 (74) North 0.9x 1 x 1.58 x 55.46 x 0.9 x 0.9 = 440.64 (74) North 0.9x 1 x 1.58 x 74.72 x 0.9 x 0.9 = 440.3.2 (74) North 0.9x 1 x 1.58 x 74.72 x 0.9 x 0.9 = 440.3.2 (74) North 0.9x		I	able 6d		m		_	lat	ble 6a		l able 6b)	-	able 6c		_	(VV)	_
North 0.9x 1 x 1.58 x 20.32 x 0.9 x 0.9 = 117.03 (74) North 0.9x 1 x 1.65 x 20.32 x 0.9 x 0.9 = 23.7 (74) North 0.9x 1 x 1.65 x 20.32 x 0.9 x 0.9 = 23.7 (74) North 0.9x 1 x 1.65 x 20.32 x 0.9 x 0.9 = 23.7 (74) North 0.9x 1 x 1.65 x 65.46 x 0.9 x 0.9 = 40.28 (74) North 0.9x 1 x 1.56 x 74.72 x 0.9 x 0.9 = 430.64 (74) North 0.9x 1 x 1.56 x 74.99 x 0.9 x 0.9 = 430.07 (74) North 0.9x	North	0.9x	1	x	1	.58	x	1	0.63	x	0.9		×	0.9		= [61.24	(74)
North 0.9x 1 x 1.6 x 0.03 x 0.9 = 0.37 (74) North 0.9x 1 x 1.58 x 0.32.3 x 0.9 = 0.9.3 = 0.9.3 = 0.9.3 = 0.9.3 = 0.9.3 = 0.9.3 1 x 1.6 x 0.3.5 x 0.9 = 0.9.3 = 0.9.3 = 0.9.3 = 0.9.3 = 0.9.3 1 x 1.6 x 55.46 x 0.9 x 0.9 = 0.9.40.28 (74) North 0.9x 1 x 1.6 x 74.72 x 0.9 x 0.9 = 0.480.64 (74) North 0.9x 1 x 1.6 x 74.72 x 0.9 x 0.9 = 0.9 2.9 480.64 (74) North 0.9x 1 x 1.6 74.68 x 0.9 x 0.9 = 0.9.	North	0.9x	1	x		1.6	x	1	0.63	x	0.9		×	0.9		- [12.4	(74)
North 0.9x 1 x 1.58 x 24.0 x 0.9 x 10.8.6 (74) North 0.9x 1 x 1.6 x 34.53 x 0.9 x 0.9 a 108.66 (74) North 0.9x 1 x 1.6 x 34.53 x 0.9 x 0.9 a 40.28 (74) North 0.9x 1 x 1.6 x 55.46 x 0.9 x 0.9 a 40.28 (74) North 0.9x 1 x 1.6 x 74.72 x 0.9 x 0.9 a 430.3 64.69 (74) North 0.9x 1 x 1.6 x 74.72 x 0.9 a 9.9 a 9.9 a 0.9 a 430.3 64.69 (74) North 0.9x 1 x 1.6 74.68 x 0.9 a 9.9 a 0.9 a 331.21 (74)<	North	0.9x	1	x	1	.58	x	2	0.32	x	0.9		x	0.9		-	117.03	(74)
North $0.5x$ 1 x 1.6 x 34.53 x 0.9 = 40.28 (74) North $0.9x$ 1 x 1.58 x 55.46 x 0.9 x 0.9 = 40.28 (74) North $0.9x$ 1 x 1.58 x 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.58 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.58 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.58 74.72 x 0.9 x 0.9 = 93.29 (74) North $0.9x$ 1 x 1.58 74.68 x 0.9 = 93.29 (74) North $0.9x$ 1 x 1.58 <td>North</td> <td>0.9x</td> <td>1</td> <td>x</td> <td></td> <td>1.6</td> <td>x</td> <td>2</td> <td>0.32</td> <td>x</td> <td>0.9</td> <td></td> <td>x</td> <td>0.9</td> <td></td> <td>-</td> <td>23.7</td> <td>(74)</td>	North	0.9x	1	x		1.6	x	2	0.32	x	0.9		x	0.9		-	23.7	(74)
North $0.5x$ 1 x 1.58 x 55.46 x 0.9 x 0.9 = 319.43 (74) North $0.5x$ 1 x 1.6 x 55.46 x 0.9 x 0.9 = 64.69 (74) North $0.9x$ 1 x 1.58 x 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.6 x 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.58 74.72 x 0.9 x 0.9 = 430.3 (74) North $0.9x$ 1 x 1.58 74.68 x 0.9 = 93.29 (74) North $0.9x$ 1 x 1.58 59.25 x 0.9 = $93.41.21$ (74) North $0.9x$ 1 x	North	0.9x	1	x	1	.58	x	3	4.53	x	0.9		×	0.9		= [198.86	(74)
North 0.9 1 x 1.6 x 55.46 x 0.9 x 0.9 = 64.69 (74) North 0.9 1 x 1.58 x 74.72 x 0.9 x 0.9 = 440.3 (74) North $0.9x$ 1 x 1.58 77.72 x 0.9 x 0.9 = 420.3 (74) North $0.9x$ 1 x 1.58 $77.9.99$ x 0.9 x 0.9 = 48.064 (74) North $0.9x$ 1 x 1.58 79.99 x 0.9 x 0.9 = 48.007 (74) North $0.9x$ 1 x 1.58 74.68 x 0.9 x 0.9 = 34.121 (74) North $0.9x$ 1 x 1.6 59.25 0.9 x 0.9 = 69.1 (74) North $0.9x$ <	North	0.9x	1	x		1.6	x	3	4.53	x	0.9		x	0.9		= [40.28	(74)
North 0.9x 1 x 1.58 x 74.72 x 0.9 x 0.03 6.04 6.04 7.41 6.03 7.49 8.09 8.09 9.99 1.74 1.6 7.468 8.09 9.99 9.99 9.91 7.41 7.41 7.41 7.41 7.41 7.41 7.41 7.41 7.41 7.41 7.41 7.41	North	0.9x	1	x	1	.58	x	5	5.46	x	0.9		x	0.9		= [319.43	(74)
North 0.99 1 x 1.6 x 74.72 x 0.9 x 0.9 = 07.15 (74) North 0.9x 1 x 1.6 x 74.72 x 0.9 x 0.9 = 07.15 (74) North 0.9x 1 x 1.6 x 79.99 x 0.9 x 0.9 = 07.15 (74) North 0.9x 1 x 1.6 x 74.68 x 0.9 x 0.9 = 450.64 (74) North 0.9x 1 x 1.6 x 74.68 x 0.9 x 0.9 = 430.07 (74) North 0.9x 1 x 1.6 X 59.25 x 0.9 x 0.9 341.21 (74) North 0.9x 1 x 1.6 X 41.52 0.9 x 0.9 239.1 (74) North 0.9x 1 x 1.6 X<	North	0.9x	1	x		1.6	x	5	5.46	x	0.9		×	0.9		- [64.69	(74)
North $0.9 \times$ 1 \times 1.58 \times 79.99 \times 0.9 \times 0.9 $=$ 460.64 (74) North $0.9 \times$ 1 \times 1.58 \times 79.99 \times 0.9 $=$ 93.29 (74) North $0.9 \times$ 1 \times 1.58 \times 74.68 \times 0.9 $=$ 93.29 (74) North $0.9 \times$ 1 \times 1.58 \times 74.68 \times 0.9 \times 0.9 $=$ 430.07 (74) North $0.9 \times$ 1 \times 1.6 \times 74.68 \times 0.9 \times 0.9 $=$ 430.07 (74) North $0.9 \times$ 1 \times 1.6 \times 74.68 \times 0.9 \times 0.9 $=$ 33.29 (74) North $0.9 \times$ 1 \times 1.6 \times 59.25 \times 0.9 \times 0.9 $=$ 341.21 (74) North $0.9 \times$ 1 \times 1.58 41.52 \times 0.9 \times 0.9 $=$ 239.1 (74) North $0.9 \times$ 1 \times 1.58 24.19 \times 0.9 \times 0.9 $=$ 239.1 (74) North $0.9 \times$ 1 \times 1.6 24.19 \times 0.9 \times 0.9 $=$ 28.21 (74) North $0.9 \times$ 1 \times 1.6 24.19 \times 0.9 <	North	0.9x	1	x	1	.58	x	7	4.72	X	0.9		x	0.9	-	- [430.3	(74)
North0.9x1x1.6x79.99x0.9x0.9x0.9x0.9x0.9x0.9x0.9x0.9x0.9x0.9x0.9x1.58x74.68x0.9x0.9x0.9x0.9x1.6x74.68x0.9x0.9x0.9x1.6x74.68x0.9x0.9x0.9x1.74x1.6x74.68x0.9x0.9x0.9x1.74x1.6x59.25x0.9x0.9x0.9x1.74x1.6x59.25x0.9x0.9x0.9x1.74x1.6x59.25x0.9x0.9x0.9x1.74x1.6x1.58x1.58x1.58x1.58x1.6x1.6x1.74x0.9x0.9x0.9x0.9x0.9x0.9x0.9x1.74x1.6x1.6x1.16x1.16x1.16x1.16x1.171.16x1.16x1.161.161.161.161.161.161.161.161.161.161.161.161.161.161.161.161.16 <t< td=""><td>North</td><td>0.9x</td><td>1</td><td>x</td><td></td><td>1.6</td><td>x</td><td>7</td><td>4.72</td><td>x</td><td>0.9</td><td></td><td>x [</td><td>0.9</td><td>-</td><td></td><td>87.15</td><td>(74)</td></t<>	North	0.9x	1	x		1.6	x	7	4.72	x	0.9		x [0.9	-		87.15	(74)
North $0.9x$ 1 x 1.58 x 74.68 x 0.9 x 0.9 z <	North	0.9x	1	x	1	.58	x	7	9.99	x	0.9		x [0.9		- [460.64	(74)
North $0.9x$ 1 x 1.6 x 74.88 x 0.9 x 0.9 z 239.1 (74) North $0.9x$ 1 x 1.58 x 41.52 x 0.9 x 0.9 z 239.1 (74) North $0.9x$ 1 x 1.66 x 41.52 x 0.9 x 0.9 z 239.1 (74) North $0.9x$ 1 x 1.66 x 41.52 x 0.9 x 0.9 z 239.1 (74) North $0.9x$ 1 x 1.66 x 24.19 x 0.9 x 0.9 z 28.21 (74) North $0.9x$ 1 x 1.66 x 24.19 x 0.9 z <	North	0.9x	1	x		1.6	x	7	9.99	x	0.9		х [0.9	-	- [93.29	(74)
North $0.9x$ 1x 1.58 x 59.25 x 0.9 x 0.9 = 341.21 (74) North $0.9x$ 1x 1.6 x 59.25 x 0.9 x 0.9 = 69.1 (74) North $0.9x$ 1x 1.6 x 59.25 x 0.9 x 0.9 = 69.1 (74) North $0.9x$ 1x 1.58 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.6 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 139.31 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 51.56 (74) North $0.9x$ 1x 1.58 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 217.1 <td>North</td> <td>0.9x</td> <td>1</td> <td>x</td> <td>1</td> <td>.58</td> <td>x</td> <td>7</td> <td>4.68</td> <td>×</td> <td>0.9</td> <td></td> <td>х [</td> <td>0.9</td> <td>-</td> <td>- [</td> <td>430.07</td> <td>(74)</td>	North	0.9x	1	x	1	.58	x	7	4.68	×	0.9		х [0.9	-	- [430.07	(74)
North $0.9x$ 1x1.6x 59.25 x 0.9 x 0.9 = 69.1 (74) North $0.9x$ 1x 1.58 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.58 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.6 x 41.52 x 0.9 x 0.9 = 48.42 (74) North $0.9x$ 1x 1.58 x 24.19 x 0.9 x 0.9 = 139.31 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 51.55 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 217.1 <td>North</td> <td>0.9x</td> <td>1</td> <td>x</td> <td></td> <td>1.6</td> <td>x</td> <td>7</td> <td>4.68</td> <td>x</td> <td>0.9</td> <td></td> <td>x [</td> <td>0.9</td> <td></td> <td>- [</td> <td>87.1</td> <td>(74)</td>	North	0.9x	1	x		1.6	x	7	4.68	x	0.9		x [0.9		- [87.1	(74)
North $0.9x$ 1x 1.58 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.6 x 41.52 x 0.9 x 0.9 = 239.1 (74) North $0.9x$ 1x 1.6 x 41.52 x 0.9 x 0.9 = 48.42 (74) North $0.9x$ 1x 1.58 x 24.19 x 0.9 x 0.9 = 139.31 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 139.31 (74) North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.66 x 24.19 x 0.9 x 0.9 = 75.55 (74) North $0.9x$ 1x 1.66 x 13.12 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.66 x 8.86 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 =	North	0.9x	1	x	1	.58	x	5	9.25	x	0.9		x [0.9		- [3 <mark>41.21</mark>	(74)
North $0.9x$ 1 x 1.6 x 41.52 x 0.9 x 0.9 $=$ 48.42 (74) North $0.9x$ 1 x 1.58 x 24.19 x 0.9 x 0.9 $=$ 139.31 (74) North $0.9x$ 1 x 1.6 x 24.19 x 0.9 x 0.9 $=$ 28.21 (74) North $0.9x$ 1 x 1.6 x 24.19 x 0.9 x 0.9 $=$ 28.21 (74) North $0.9x$ 1 x 1.6 x 213.12 x 0.9 x 0.9 $=$ 28.21 (74) North $0.9x$ 1 x 1.6 x 13.12 x 0.9 x 0.9 $=$ 15.3 (74) North $0.9x$ 1 x 1.6 x 13.12 x 0.9 x 0.9 $=$ 15.3 (74) North $0.9x$ 1 x 1.6 x 8.86 x 0.9 x 0.9 $=$ 217.1 (78) South $0.9x$ 1 x 0.91 x 76.57 x 0.9 x 0.9 $=$ 217.1 (78) South $0.9x$ 1 x 0.91 x 77.53 x 0.9 x 0.9 $=$ 511.9 (78) South $0.9x$ 1 x 0.91	North	0.9x	1	х		1.6	x	5	9.25	x	0.9		×	0.9		- [69.1	(74)
North $0.9x$ 1x 1.58 x 24.19 x 0.9 x 0.9 = 139.31 (74) North $0.9x$ 1x 1.66 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.66 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.58 x 13.12 x 0.9 x 0.9 = 75.55 (74) North $0.9x$ 1x 1.66 x 13.12 x 0.9 x 0.9 = 15.3 (74) North $0.9x$ 1x 1.66 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.66 x 8.86 x 0.9 x 0.9 = 10.34 (74) North $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 =	North	0.9x	1	x	1	.58	x	4	1.52	x	0.9		×	0.9		- [239.1	(74)
North $0.9x$ 1x 1.6 x 24.19 x 0.9 x 0.9 = 28.21 (74) North $0.9x$ 1x 1.58 x 13.12 x 0.9 x 0.9 = 75.55 (74) North $0.9x$ 1x 1.6 x 13.12 x 0.9 x 0.9 = 75.55 (74) North $0.9x$ 1x 1.6 x 13.12 x 0.9 x 0.9 = 15.3 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 355.56 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 114.87 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 5	North	0.9x	1	x		1.6	x	4	1.52	x	0.9		×	0.9		- [48.42	(74)
North $0.9x$ 1x 1.58 x 13.12 x 0.9 x 0.9 = 75.55 (74) North $0.9x$ 1x 1.6 x 13.12 x 0.9 x 0.9 = 15.3 (74) North $0.9x$ 1x 1.58 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.58 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 97.53 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	North	0.9x	1	x	1	.58	x	2	4.19	x	0.9		×	0.9		- [139.31	(74)
North $0.9x$ 1x 1.6 x 13.12 x 0.9 x 0.9 = 15.3 (74) North $0.9x$ 1x 1.58 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 10.34 (74) South $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 97.53 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	North	0.9x	1	x		1.6	x	2	4.19	x	0.9		×	0.9		- [28.21	(74)
North $0.9x$ 1x 1.58 x 8.86 x 0.9 x 0.9 = 51.05 (74) North $0.9x$ 1x 1.6 x 8.86 x 0.9 x 0.9 = 10.34 (74) South $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 255.56 (78) South $0.9x$ 1x 0.91 x 97.53 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	North	0.9x	1	x	1	.58	x	1	3.12	x	0.9		×	0.9		- [75.55	(74)
North $0.9x$ 1x1.6x8.86x 0.9 x 0.9 = 10.34 (74) South $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 97.53 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	North	0.9x	1	x		1.6	x	1	3.12	x	0.9		×	0.9		- [15.3	(74)
South $0.9x$ 1x 0.91 x 46.75 x 0.9 x 0.9 = 217.1 (78) South $0.9x$ 1x 0.91 x 76.57 x 0.9 x 0.9 = 355.56 (78) South $0.9x$ 1x 0.91 x 97.53 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	North	0.9x	1	x	1	.58	x	8	3.86	x	0.9		×	0.9		- [51.05	(74)
South $0.9x$ 1 x 0.91 x 76.57 x 0.9 x 0.9 $=$ 355.56 (78) South $0.9x$ 1 x 0.91 x 97.53 x 0.9 x 0.9 $=$ 452.92 (78) South $0.9x$ 1 x 0.91 x 110.23 x 0.9 x 0.9 $=$ 511.9 (78) South $0.9x$ 1 x 0.91 x 114.87 x 0.9 x 0.9 $=$ 533.43 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 $=$ 513.35 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 $=$ 513.35 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 $=$ 513.35 (78)	North	0.9x	1	x		1.6	x	8	3.86	x	0.9		×Ē	0.9	-	- [10.34	(74)
South $0.9x$ 1 x 0.91 x 97.53 x 0.9 x 0.9 = 452.92 (78) South $0.9x$ 1 x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1 x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	South	0.9x	1	x	(.91	x	4	6.75	x	0.9		×「	0.9	-	- [217.1	(78)
South $0.9x$ 1 x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1 x 0.91 x 110.23 x 0.9 x 0.9 = 511.9 (78) South $0.9x$ 1 x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	South	0.9x	1	x		.91	x	7	6.57	x	0.9		×Ī	0.9	-	- [355.56	(78)
South $0.9x$ 1 x 0.91 x 114.87 x 0.9 x 0.9 = 533.43 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.43 (78) South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78) South 0.9x 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	South	0.9x	1	x		.91	x	9	7.53	x	0.9		×	0.9		- [452.92	(78)
South $0.9x$ 1 x 0.91 x 110.55 x 0.9 x 0.9 = 513.35 (78)	South	0.9x	1	x	(.91	x	1	10.23	x	0.9	Ħ	×「	0.9		= [511.9	(78)
	South	0.9x	1	x		.91	x	1	14.87	×	0.9	\exists	×Г	0.9		- [533.43	(78)
South $0.9x$ 1 x 0.91 x 108.01 x 0.9 x 0.9 = 501.58 (78)	South	0.9x	1	×		.91	x	1	10.55	x	0.9	\exists	×Г	0.9		- [513.35	(78)
	South	0.9x	1	×		.91	x	1(08.01	×	0.9	\exists	×Г	0.9		- [501.58	(78)
South 0.9x 1 x 0.91 x 104.89 x 0.9 x 0.9 = 487.1 (78)	South	0.9x	1	x	(.91	×	10	04.89	×	0.9		× [0.9		= [487.1	(78)

South	о o. Г		Ι		۱		1				1		
South	0.9x	1	x	0.91	×	101.89	×	0.9	x	0.9	=	473.13	(78)
	0.9x	1	x	0.91	X	82.59	X	0.9	x	0.9	=	383.51	(78)
South	0.9x	1	X	0.91	X	55.42	X	0.9	x	0.9	=	257.34	(78)
South	0.9x	1	X	0.91	X	40.4	X	0.9	x	0.9	=	187.6	(78)
West	0.9x	1	X	1.5	X	19.64	X	0.9	x	0.9	=	107.38	(80)
West	0.9x	1	х	2.44	X	19.64	X	0.9	x	0.9	=	174.68	(80)
West	0.9x	1	X	0.9	X	19.64	X	0.9	x	0.9	=	25.77	(80)
West	0.9x	1	x	1.4	x	19.64	X	0.9	x	0.9	=	100.22	(80)
West	0.9x	1	x	1.5	x	38.42	X	0.9	x	0.9	=	210.06	(80)
West	0.9x	1	x	2.44	X	38.42	X	0.9	x	0.9	=	341.7	(80)
West	0.9x	1	x	0.9	x	38.42	X	0.9	x	0.9	=	50.42	(80)
West	0.9x	1	x	1.4	x	38.42	X	0.9	x	0.9	=	196.06	(80)
West	0.9x	1	x	1.5	x	63.27	X	0.9	x	0.9	=	345.95	(80)
West	0.9x	1	x	2.44	x	63.27	X	0.9	x	0.9	=	562.74	(80)
West	0.9x	1	x	0.9	×	63.27	X	0.9	x	0.9	=	83.03	(80)
West	0.9x	1	x	1.4	x	63.27	X	0.9	x	0.9	=	322.88	(80)
West	0.9x	1	x	1.5	x	92.28	x	0.9	x	0.9	=	504.54	(80)
West	0.9x	1	x	2.44	X	92.28	х	0.9	x	0.9	=	820.72	(80)
West	0.9x	1	x	0.9	х	92.28	x	0.9	×	0.9	=	121.09	(80)
West	0.9x	1	x	1.4	x	92.28	×	0.9	×	0.9	=	4 <mark>70.91</mark>	(80)
West	0.9x	1	x	1.5	x	113.09	x	0.9	x	0.9	=	618.33	(80)
West	0.9x	1	x	2.44	x	113.09	х	0.9	x	0.9	=	1005.82	(80)
West	0.9x	1	x	0.9	x	113.09	x	0.9	x	0.9	=	148.4	(80)
West	0.9x	1	x	1.4	×	113.09	x	0.9	x	0.9	=	5 <mark>77.11</mark>	(80)
West	0.9x	1	x	1.5	x	115.77	x	0.9	x	0.9	=	632.98	(80)
West	0.9x	1	x	2.44	x	115.77	X	0.9	x	0.9	=	1029.64	(80)
West	0.9x	1	x	0.9	x	115.77	x	0.9	x	0.9	=	151.91	(80)
West	0.9x	1	x	1.4	x	115.77	x	0.9	x	0.9	=	590.78	(80)
West	0.9x	1	x	1.5	x	110.22	x	0.9	x	0.9	=	602.62	(80)
West	0.9x	1	x	2.44	x	110.22	x	0.9	x	0.9	=	980.26	(80)
West	0.9x	1	x	0.9	x	110.22	x	0.9	x	0.9	=	144.63	(80)
West	0.9x	1	x	1.4	x	110.22	X	0.9	x	0.9	=	562.44	(80)
West	0.9x	1	x	1.5	x	94.68	x	0.9	x	0.9	=	517.64	(80)
West	0.9x	1	x	2.44	x	94.68	x	0.9	x	0.9	=	842.03	(80)
West	0.9x	1	x	0.9	x	94.68	x	0.9	x	0.9	=	124.23	(80)
West	0.9x	1	x	1.4	×	94.68	×	0.9	x	0.9	=	483.13	(80)
West	0.9x	1	x	1.5	×	73.59	×	0.9	x	0.9	=	402.35	(80)
West	0.9x	1	×	2.44	×	73.59	×	0.9	x	0.9	=	654.49	(80)
West	0.9x	1	×	0.9	×	73.59	×	0.9	x	0.9	=	96.56	(80)
West	0.9x	1	×	1.4	×	73.59	×	0.9	x	0.9	=	375.53	(80)
West	0.9x	1	x	1.5	x	45.59	x	0.9	x	0.9	=	249.26	(80)

West 0.9x 1	×	2.44	x	45.59	x	0.9	×	0.9	=	405.46	(80)
West 0.9x 1	x	0.9	x	45.59	x	0.9	×	0.9	=	59.82	(80)
West 0.9x 1	x	1.4	x	45.59	x	0.9	×	0.9	=	232.64	(80)
West 0.9x 1	x	1.5	x	24.49	x	0.9	×	0.9	=	133.89	(80)
West 0.9x 1	x	2.44	x	24.49	x	0.9	x	0.9	=	217.8	(80)
West 0.9x 1	x	0.9	x	24.49	x	0.9	x	0.9	=	32.13	(80)
West 0.9x 1	x	1.4	x	24.49	x	0.9	x	0.9	=	124.97	(80)
West 0.9x 1	x	1.5	x	16.15	x	0.9	x	0.9	=	88.31	(80)
West 0.9x 1	x	2.44	x	16.15	x	0.9	x	0.9	=	143.65	(80)
West 0.9x 1	x	0.9	x	16.15	x	0.9	x	0.9	=	21.19	(80)
West 0.9x 1	x	1.4	x	16.15	x	0.9	x	0.9	=	82.42	(80)
Rooflights 0.9x 1	x	0.5	x	26	x	0.7	x	0.7	=	11.47	(82)
Rooflights 0.9x 1	x	0.5	x	54	x	0.7	x	0.7	=	23.81	(82)
Rooflights 0.9x 1	x x	0.5	x	96	x	0.7	x	0.7	=	42.34	(82)
Rooflights 0.9x 1	x	0.5	x	150	x	0.7	x	0.7	=	66.15	(82)
Rooflights 0.9x 1	x	0.5	x	192	x	0.7	x	0.7	=	84.67	(82)
Rooflights 0.9x 1	x	0.5	x	200	x	0.7	x	0.7	=	88.2	(82)
Rooflights 0.9x	x	0.5	x	189	х	0.7	x	0.7	=	83.35	(82)
Rooflights 0.9x	x	0.5	x	157	x	0.7	x	0.7	- 1	69.24	(82)
Rooflights 0.9x	×	0.5	x	115	x	0.7	x	0.7	=	5 <mark>0.71</mark>	(82)
Rooflights 0.9x 1	x	0.5	x	66	x	0.7	x	0.7	=	2 <mark>9.11</mark>	(82)
Rooflights 0.9x 1	×	0.5	x	33	x	0.7	x	0.7		14.55	(82)
Rooflights 0.9x	×	0.5	x	21	x	0.7	x	0.7	=	9.26	(82)
					-						
Solar gains in watts,	calculated	for each mon	th		(83)m	i = Sum(74)m	(82)m	-			
(83)m= 710.27 1318.3	35 2048.99	2879.43 3485.2	2 3	560.8 3392.05	2933	3.68 2340.29	1527.3	2 871.54	593.82		(83)
Total gains – interna	l and solar	(84)m = (73)n	1 + (i	83)m, watts						-	
(84)m= 1634.51 2236.2	26 2930.59	3703.93 4249.5	4 42	272.49 4073.85	3626	6.28 3066.54	2310.9	1 1718.93	1491.12		(84)
7. Mean internal ter	nperature	(heating seaso	on)								
Temperature during	heating p	eriods in the li	ving	area from Tat	ole 9,	Th1 (°C)				21	(85)
Utilisation factor for	gains for I	iving area, h1,	m (s	ee Table 9a)						<u> </u>	1
Jan Feb	o Mar	Apr May	y	Jun Jul	A	ug Sep	Oct	Nov	Dec]	
(86)m= 1 0.98	0.9	0.71 0.5		0.34 0.24	0.2	.9 0.51	0.87	0.99	1		(86)
Mean internal temp	erature in l	iving area T1	(follo	w steps 3 to 7	7 in T	able 9c)				-	
(87)m= 20.1 20.38		20.94 20.99	<u>`</u>	21 21	2	<u> </u>	20.85	20.4	20.05]	(87)
Temperature during	heating n	eriods in rest (of dw	elling from Ta	hla (1	
(88)m= 20.12 20.12		20.13 20.13	-	20.14 20.14	20.	<u> </u>	20.13	20.13	20.13	1	(88)
										1	x /
Utilisation factor for	<u> </u>			<u> </u>	<u> </u>		0.00	0.00	4	1	(20)
(89)m= 1 0.97		0.67 0.45		0.29 0.2	0.2		0.83	0.98	1	J	(89)
Mean internal temp				<u> </u>	r <u> </u>	- i i	,			1	
(90)m= 18.92 19.33	3 19.8	20.07 20.13	2	20.14 20.14	20.		19.98		18.85		(90)
						fL	A = Liv	ring area ÷ (4	+) =	0.18	(91)

Mean interna	al temper	ature (fo	or the wh	ole dwe	llina) = fl	A x T1	+ (1 – fl	A) x T2					
(92)m= 19.13	19.52	19.96	20.23	20.28	20.29	20.29	20.29	20.29	20.13	19.55	19.06		(92)
Apply adjust	ment to t	he mean	internal	l temper	ature fro	n Table	4e, whe	ere appro	opriate				
(93)m= 19.13	19.52	19.96	20.23	20.28	20.29	20.29	20.29	20.29	20.13	19.55	19.06		(93)
8. Space he	ating requ	uirement			•								
Set Ti to the					ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation	Feb	Mar	<u> </u>	· · · · · ·	lun	Jul	A.u.a	Son	Oct	Nov	Dec		
Jan Utilisation fa			Apr	May	Jun	Jui	Aug	Sep		Nov	Dec		
(94)m= 0.99	0.97	0.88	0.67	0.46	0.3	0.21	0.24	0.46	0.83	0.98	1		(94)
Useful gains					0.0	0.2.	0.2.1	0.10	0.00	0.00			
	2165.17	·	 	· · · · · · · · · · · · · · · · · · ·	1287.24	835.49	879.42	1397.23	1915.27	1683.66	1484.76		(95)
Monthly ave													
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for me	an intern	al tempe	i erature.	L	- =[(39)m ;	ı x [(93)m	– (96)m	1				
(97)m= 3440.76	1	i	· · ·		, 1287.94		879.56		2176.38	2853.24	3418.64		(97)
Space heati	ng require	ement fo	r each n	nonth, k	L Wh/mont	h = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m	1		
(98)m= 1352.1 ²	r i	397.98	73.8	8	0	0	0	0	194.26	, 842.1	1438.81		
	1		I	1			Tota	l per year	l (kWh/year) = Sum(9	8)15,912 =	5126.24	(98)
Space heating	ng require	ement in	kWh/m ²	²/year								21.1	(99)
8c. Space co	oling rec	uiremen	nt										
Calculated for				See Tal	ble 10b								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
He <mark>at los</mark> s rat	e Lm (ca	lculated	using 2	5°C inter	nal temp	perature	and exte		npe <mark>ratur</mark>	e from T	able 10)		
(100) <mark>m= 0</mark>	0	0	0	0	2126.66	1674.18	1716.58	0	0	0	0		(100)
Utilisation fa	ctor for lo	oss hm											
(101)m= 0	0	0	0	0	0.99	1	0.99	0	0	0	0		(101)
Useful loss,	hmLm (V	Vatts) = ((100)m x	(101)m	1								
(102)m= 0	0	0	0	0	2109.98	1669.3	1706.21	0	0	0	0		(102)
Gains (solar	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)					
(103)m= 0	0	0	0	0	4272.49	4073.85	3626.28	0	0	0	0		(103)
Space coolii set (104)m t	• •				dwelling,	continue	ous (kW	(h) = 0.0	24 x [(10)3)m – (102)m]:	x (41)m	
(104)m= 0	0	0	0	0	1557.01	1788.98	1428.54	0	0	0	0		
L	1			1				Total	= Sum(104)	=	4774.52	(104)
Cooled fraction	n							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermittency	factor (Ta	able 10b)						-				
(106)m= 0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
				((()	(Tota	l = Sum(104)	=	0	(106)
Space cooling	<u> </u>			r`	r	, <i>,</i>	r						
(107)m= 0	0	0	0	0	389.25	447.24	357.13	0	0	0	0		
_								Iotal	= Sum(107)	=	1193.63	(107)
Space cooling													
Space cooling	g require	ment in k	(Wh/m²/y	year				(107)) ÷ (4) =			4.91	(108)

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplement	atary boating (Table	11) '0' if papa		(301)
			0]
Fraction of space heat from community system 1 The community scheme may obtain heat from several sources		or CHP and up to four other heat sources: t	1	(302)
includes boilers, heat pumps, geothermal and waste heat from		•		_
Fraction of heat from Community heat pump			1	(303a)
Fraction of total space heat from Community heat	pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c	(3)) for community h	eating system	1	(305)
Distribution loss factor (Table 12c) for community	heating system		1.05	(306)
Space heating			kWh/year	-
Annual space heating requirement			5126.24	
Space heat from Community heat pump		(98) x (304a) x (305) x (306) =	5382.56	(307a)
Efficiency of secondary/supplementary heating sy	rstem in % (from Tab	ble 4a or Appendix E)	0	(308
Space heating requirement from secondary/suppl	ementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating				
Annual water heating requirement			1990.32]
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x (305) x (306) =	2089.84	(310a)
Electricity used for heat distribution	0.	01 × [(307a)(307e) + (310a)(310e)] =	74.72	(313)
Cooling System Energy Efficiency Ratio			3.38	(314)
Space cooling (if there is a fixed cooling system, i	f not enter 0)	= (107) ÷ (314) =	353.67	(315)
Electricity for pumps and fans within dwelling (Tat mechanical ventilation - balanced, extract or posit		e	0] (330a)
warm air heating system fans			0](330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)			645.95	(332)
10b. Fuel costs – Community heating scheme			045.95](002)
TOD. Fuel Costs - Community heating scheme				
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 × 0.01 =	228.22	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	88.61	(342a)
		Fuel Price		
Space cooling (community cooling system)	(315)	13.19 × 0.01 =	46.65	(348)
Pumps and fans	(331)	13.19 × 0.01 =	0	(349)
Energy for lighting	(332)	13.19 x 0.01 =	85.2	(350)
Additional standing charges (Table 12)			120	(351)

Total energy cost

= (340a)...(342e) + (345)...(354) =

568.68

(355)

11b. SAP rating - Community heating scheme				
Energy cost deflator (Table 12)			0.42	(356)
Energy cost factor (ECF) $[(355) \times (356)] \div [(4) + 45.0] =$			0.83	(357)
SAP rating (section12)			88.43	(358)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using	two fuels repeat (363) to (366) for the second fue	el 350	(367a)
CO2 associated with heat source 1 [(307b)+(3	810b)] x 100 ÷ (367b) x	0	= 1108.05	(367)
Electrical energy for heat distribution [(313) x	0.52	= 38.78	(372)
Total CO2 associated with community systems (3	363)(366) + (368)(372)	, =	= 1146.83	(373)
CO2 associated with space heating (secondary) (3	309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous	ous heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (3	373) + (374) + (375) =		1146.83	(376)
CO2 associated with space cooling	315) x	0.52	= 183.55	(377)
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52	= 0	(378)
CO2 associated with electricity for lighting	332))) x	0.52	= 335.25	(379)
Total CO2, kg/year sum of (376)(382) =			1665.63	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			6.85	(384)
El rating (section 14)			92.25	(385)
13b. Primary Energy – Community heating scheme				
	Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using) two fuels repeat (363) to (366) for the second fue	el 350	(367a)
Energy associated with heat source 1 [(307b)+(3	810b)] x 100 ÷ (367b) x	0	= 6554.35	(367)
Electrical energy for heat distribution [(313) x	=	= 229.4	(372)
Total Energy associated with community systems (3	363)(366) + (368)(372)		= 6783.76	(373)
if it is negative set (373) to zero (unless specified otherwise, se	ee C7 in Appendix C)	1	6783.76	(373)
Energy associated with space heating (secondary) (3	309) x	0	= 0	(374)
Energy associated with water from immersion heater or instantar	neous heater(312) x	3.07	= 0	(375)
Total Energy associated with space and water heating (3	373) + (374) + (375) =		6783.76	(376)
Energy associated with space cooling (3	315) x	3.07	= 1085.76	(377)
Energy associated with electricity for pumps and fans within dwe	lling (331)) x	3.07	= 0	(378)
Energy associated with electricity for lighting (3	332))) x	3.07	= 1983.06	(379)
Total Primary Energy, kWh/year sum of (376)(382) =		9852.58	(383)

Assessor Name: Stroma Number: Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.3.11 Property Address: Flat 4 Property Address: Flat 4	
Address : 28 Redington Road, NW3 7RB 1. Overall dwelling dimensions:	
Area(m²)Av. Height(m)Volume(m³)Ground floor 178 $(1a) \times$ 2.9 $(2a) =$ 516.2](3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 178 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 516.2$	(5)
2. Ventilation rate:	
main heatingsecondary heatingothertotal m^3 per hourNumber of chimneys0+0+0=0× 40 =0Number of open flues0+0+0=0× 20 =0](6a)](6b)
]``
Number of intermittent fans5× 10 =50	(7a)
Number of passive vents0x 10 =0	(7b)
Number of flueless gas fires 0 x 40 = 0 Air changes per hou](7c) Ir
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 50 \div (5) = 0.1$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	(8)
Number of storeys in the dwelling (ns) 0 Additional infiltration 0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0	(9) (10) (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35]
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 If no draught lobby, enter 0.05, else enter 0 0	
If no draught lobby, enter 0.05, else enter 0	(12)
	(13)
Percentage of windows and doors draught stripped 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(13) (14)
Percentage of windows and doors draught stripped 0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 Up to filter time and the stripped 0	(13) (14) (15)
Percentage of windows and doors draught stripped 0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0	(13) (14) (15) (16)
Percentage of windows and doors draught stripped 0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.5 If heard on sing permeability value, dson (19) = $[(12) \div 201/(9)]$ otherwise (19) = (16) (16)	(13) (14) (15) (16) (17)
Percentage of windows and doors draught stripped $0.25 - [0.2 \times (14) \div 100] =$ 0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.5	(13) (14) (15) (16)
Percentage of windows and doors draught stripped 0 Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.32 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 1	(13) (14) (15) (16) (17)
Percentage of windows and doors draught stripped $0.25 - [0.2 \times (14) \div 100] =$ 0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.32 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 0.32 Number of sides sheltered 1 Shelter factor $(20) = 1 - [0.075 \times (19)] =$	(13) (14) (15) (16) (17) (18)
Percentage of windows and doors draught stripped $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.32 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 1 Number of sides sheltered 1	(13) (14) (15) (16) (17) (18) (19)
Percentage of windows and doors draught stripped 0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.32 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 1 Number of sides sheltered 1 Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed 0.32	(13) (14) (15) (16) (17) (18) (19) (20)
Percentage of windows and doors draught stripped 0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.32 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 1 Number of sides sheltered 1 Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$	(13) (14) (15) (16) (17) (18) (19) (20)
Percentage of windows and doors draught stripped 0 Window infiltration 0.25 - [0.2 x (14) ÷ 100] = 0 Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.5 If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16) 0.32 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 1 Number of sides sheltered 1 Shelter factor (20) = 1 - [0.075 x (19)] = 0.32 Infiltration rate incorporating shelter factor (21) = (18) x (20) = 0.3 Infiltration rate modified for monthly wind speed 0.3 0.3 Monthly average wind speed from Table 7 May Jun Jul Aug Sep Oct Nov Dec	(13) (14) (15) (16) (17) (18) (19) (20)
Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ 0Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area4.5If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.32Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used1Number of sides sheltered1Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed0.3JanFebMarAprMayJunJunAugSepOctNovDec	(13) (14) (15) (16) (17) (18) (19) (20)
Percentage of windows and doors draught stripped 0 Window infiltration 0.25 - [0.2 x (14) ÷ 100] = 0 Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4.5 If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16) 0.32 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 1 Number of sides sheltered 1 Shelter factor (20) = 1 - [0.075 x (19)] = 0.32 Infiltration rate incorporating shelter factor (21) = (18) x (20) = 0.3 Infiltration rate modified for monthly wind speed 0.3 0.3 Monthly average wind speed from Table 7 May Jun Jul Aug Sep Oct Nov Dec	(13) (14) (15) (16) (17) (18) (19) (20)

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_		
	0.38	0.37	0.36	0.33	0.32	0.28	0.28	0.28	0.3	0.32	0.33	0.35			
		<i>ctive air c</i> al ventila		rate for t	he applic	cable ca	se								(23a)
		eat pump i		endix N. (2	3b) = (23a) x Fmv (e	equation (N	N5)), othe	rwise (23b) = (23a)				0	(23a)
		h heat reco) (200)				0	(230) (23c)
		ed mecha	•		Ū		,		,	2h)m + ('	23h) x ['	1 – (23c)	L_{100}	-	(200)
(24a)m=				0	0	0	0			0	0	0]	1	(24a)
		ed mecha	ı anical ve	ntilation	without	heat rec	L Coverv (N	и ЛV) (24b	m = (22)	1 2b)m + (;	1 23b)		1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	positiv	e input v	ventilatio	n from o	outside				1		
,		n < 0.5 ×			-	•				.5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,		ventilation = 1, the			•					0.5]					
(24d)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56]		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (240	c) or (24	d) in bo	x (25)	_	-	_	_		
(25)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56			(25)
3. He	at losse	s and he	eat loss i	paramete	er:							_			_
ELEN		Gros	ss	Openin		Net Ar	ea	U-val		AXU		k-value	е		Xk
ELEN		Gros area			gs	Net Ar A ,r		U-val W/m2		A X U (W/ł	<)	k-value kJ/m²-			X k J/K
Doors		area		Openin	gs		m² x	W/m2	2K		<)				
Doors Windo	ws Type	area		Openin	gs	A ,n	m² x	W/m2	2K	(VV/ł	<)				J/K
Doors Windo		area		Openin	gs	A ,r	m ² x	W/m2	2 K = [.0.04] = [(W/H	<)				J/K (26)
Doors Windo Windo	ws Type	area e 1 e 2		Openin	gs	A ,r 2.1 0.91	m ² x x 1. x 1.	W/m2 0.8 /[1/(1.2)+	2K = [• 0.04] = [• 0.04] = [(W/H 1.68 1.04	<)				J/K (26) (27)
Doors Windo Windo Windo	ws Type ws Type	area e 1 e 2 e 3		Openin	gs	A ,n 2.1 0.91 0.97	n ² x x1. x1. x1.	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+	2K = [• 0.04] = [• 0.04] = [• 0.04] = [(W/H 1.68 1.04 1.11	<)				J/K (26) (27) (27)
Doors Windov Windov Windov Windov	ws Type ws Type ws Type	area e 1 e 2 e 3 e 4		Openin	gs	A ,r 2.1 0.91 0.97 0.79	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{array}{c} 2 \\ \hline \\ 0.04 \\ \hline \\ 0.04 \\ \hline \\ 0.04 \\ \hline \\ 0.04 \\ \hline \\ 0.04 \\ \hline \\ \end{array} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/H 1.68 1.04 1.11 0.9					J/K (26) (27) (27) (27)
Doors Windov Windov Windov Windov	ws Type ws Type ws Type ws Type	area = 1 = 2 = 3 = 4 = 5		Openin	gs	A ,r 2.1 0.91 0.97 0.79 2.8	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$2K = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(W/k 1.68 1.04 1.11 0.9 3.21					J/K (26) (27) (27) (27) (27)
Doors Windoo Windoo Windoo Windoo Windoo	ws Type ws Type ws Type ws Type ws Type	area = 1 = 2 = 3 = 4 = 5 = 6		Openin	gs	A ,r 2.1 0.91 0.97 0.79 2.8 2.8	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{array}{c} 2 \\ \hline \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	(W/k 1.68 1.04 1.11 0.9 3.21 3.21					J/K (26) (27) (27) (27) (27) (27)
Doors Windoo Windoo Windoo Windoo Windoo	ws Type ws Type ws Type ws Type ws Type ws Type	area = 1 = 2 = 3 = 4 = 5 = 6 = 7		Openin	gs	A ,r 2.1 0.91 0.97 0.79 2.8 2.8 0.78	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{array}{c} 2 \\ \hline \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	(W/k 1.68 1.04 1.11 0.9 3.21 3.21 0.89					J/K (26) (27) (27) (27) (27) (27) (27)
Doors Windoo Windoo Windoo Windoo Windoo	ws Type ws Type ws Type ws Type ws Type ws Type ws Type	area = 1 = 2 = 3 = 4 = 5 = 6 = 7	(m²)	Openin	gs	A ,r 2.1 0.91 0.97 0.79 2.8 2.8 0.78 2.8	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$\begin{array}{c} 2 \\ \hline \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	(W/k 1.68 1.04 1.11 0.9 3.21 3.21 0.89 3.21					J/K (26) (27) (27) (27) (27) (27) (27) (27)
Doors Windov Windov Windov Windov Windov Windov	ws Type ws Type ws Type ws Type ws Type ws Type ws Type fype1	area = 1 = 2 = 3 = 4 = 5 = 6 = 7 = 8	(m²) 3	Openin	gs	A ,r 2.1 0.91 0.97 0.79 2.8 2.8 2.8 2.8 2.8 2.8 2.8	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+	$2 \mathbf{K} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.0$	(W/k 1.68 1.04 1.11 0.9 3.21 3.21 0.89 3.21 2.86					J/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windo Windo Windo Windo Windo Windo	ws Type ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2	area = 1 = 2 = 3 = 4 = 5 = 6 = 7 = 8 28.1	(m²) 3 46	Openin m	gs	A ,r 2.1 0.91 0.97 0.79 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ 0.12	$2K = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$	(W/k 1.68 1.04 1.11 0.9 3.21 3.21 0.89 3.21 2.86 3.38					J/K (26) (27) (27) (27) (27) (27) (27) (27) (27
Doors Windov Windov Windov Windov Windov Windov Windov Windov	ws Type ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3	area = 1 = 2 = 3 = 4 = 5 = 6 = 7 = 8 28.1 21.4	(m²) 3 16 3	Openin m	gs 2	A ,r 2.1 0.91 0.97 0.79 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.5 28.13 21.46	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.11	$\begin{array}{c} 2 \\ \\ & 0.04 \\ \\ \\ & 0.04 \\ \\ \\ \\ \\ & 0.04 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/A 1.68 1.04 1.11 0.9 3.21 3.21 0.89 3.21 2.86 3.38 2.32					J/K (26) (27) (27) (27) (27) (27) (27) (27) (27

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	50.26
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	0
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: Medium	250

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

(33) (34) (35)

can be i	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	əs : S (L	x Y) cal	culated u	using Ap	pendix l	<						23.43	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			73.68	(37)
Ventila	ation hea	at loss ca	alculated	monthly	ý	-		_	(38)m	= 0.33 × (25)m x (5)	_		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	97.45	96.97	96.5	94.31	93.9	91.99	91.99	91.63	92.72	93.9	94.73	95.6		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	171.13	170.65	170.19	167.99	167.58	165.67	165.67	165.32	166.41	167.58	168.41	169.28		
										-	Sum(39)1.	12 /12=	167.99	(39)
	· · ·	· · · · ·	HLP), W/	1					· · ·	= (39)m ÷			1	
(40)m=	0.96	0.96	0.96	0.94	0.94	0.93	0.93	0.93	0.93	0.94	0.95	0.95		
Numb	er of day	/s in moi	nth (Tab	le 1a)						Average =	Sum(40) ₁ .	12 /12=	0.94	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
								•		•				
4. Wa	ater hea	tina ener	rav reau	irement:								kWh/ye	ear:	
		ipancy, l		[1 - oxp	(_0_0003		-130)2)] + 0.0	1013 v (TEA -13		97		(42)
	A £ 13.		+ 1.70 X	li - evh	(-0.0000	,43 x (11	A -13.9)2)]+0.0	, 10 10 X (II A -13.	.5)			
								(25 x N)				4.81		(43)
				usage by : r day (<mark>all</mark> w		-	7	to achieve	a water us	se target o	f			
normon														
11-4	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	- -			ach month										
(44)m=	115.29	111.1	106.91	102.72	98.52	94.33	94.33	98.52	102.72	106.91	111.1	115.29		-
Enerav	content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd.r	n x nm x D)))))))))))))))))))			<mark>m(44)</mark> 112 = ables 1b. 1		1257.76	(44)
(45)m=	170.98	149.54	154.31	134.53	129.09	111.39	103.22	118.45	119.86	139.69	152.48	165.58		
()				101100							m(45) ₁₁₂ =		1649.12	(45)
lf instan	taneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46			(-)			
(46)m=	25.65	22.43	23.15	20.18	19.36	16.71	15.48	17.77	17.98	20.95	22.87	24.84		(46)
	storage													
		, ,						within sa	ame ves	sel		1		(47)
		-		nk in dw	-			. ,			47)			
	storage		not wate	er (this in	iciudes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
			m Table			(" ddy)!					0		(49)
				_~ , kWh/y∉	ar			(48) x (49)	1 =			1		(50)
				cylinder l		or is not		(10) x (10)	, –			I		(00)
				om Tabl							0.	03		(51)
	-	-	ee secti	on 4.3										
		from Ta		0								93		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)

Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m = 3.03 2.74 3.03 2.93	(56) (57) (58) (59)
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 = 3.03 2.74 3.03 2.93 2.93 3.03 2.93 2.93 3.03 2.93 2.93 2.93 2.93 2.93 2.93 2.93 2.9	(57) (58) (59)
	(58)
Primary circuit loss (annual) from Table 3 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 heating and a cylinder thermostat) (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 Combi loss calculated for each month (61)m = (60) \div 365 × (41)m (61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(58)
Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) $(59)m = 23.26 \ 21.01 \ 23.26 \ 22.51 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 2$	(59)
Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) $(59)m = 23.26 \ 21.01 \ 23.26 \ 22.51 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 23.26 \ 2$	
$ \begin{array}{c} (59)m= \hline 23.26 & 21.01 & 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & 23.26 & 22.51 & 23.26 & 22.51 & 23.26 \\ \hline \\ Combi loss calculated for each month (61)m = (60) \div 365 \times (41)m \\ \hline (61)m= \hline 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \hline \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0$	
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$ (61)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
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 = 197.27 173.29 180.6 159.98 155.38 136.84 129.51 144.74 145.31 165.98 177.92 191.88 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)	1.2.1
(62)m=197.27173.29180.6159.98155.38136.84129.51144.74145.31165.98177.92191.88Solar 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)	(61)
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)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	(62)
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(22)
	(63)
Output from water heater	
(64)m= 197.27 173.29 180.6 159.98 155.38 136.84 129.51 144.74 145.31 165.98 177.92 191.88	
Output from water heater (annual) ₁₁₂ 1958.69	(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= 75.46 66.53 69.92 62.74 61.53 55.05 52.93 57.99 57.86 65.06 68.71 73.67	(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 (20) 170 20 17	(66)
(66)m= 178.39	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	(67)
(67)m= 77.92 69.21 56.29 42.61 31.85 26.89 29.06 37.77 50.69 64.37 75.13 80.09	(07)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 521.83 527.24 513.6 484.55 447.88 413.41 390.39 384.97 398.62 427.67 464.34 498.8	(68)
	(00)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 55.81 55.81 55.81 55.81 55.81 55.81 55.81	(69)
	(00)
Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0	
	(70)
Losses e.g. evaporation (negative values) (Table 5) (71)m= -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93 -118.93	(70)
Water heating gains (Table 5) (72)m= 101.43 99 93.98 87.14 82.7 76.45 71.14 77.95 80.37 87.44 95.43 99.01	(70) (71)
	(71)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 816.45 810.73 779.13 729.57 677.71 632.03 605.86 615.97 644.95 694.75 750.17 793.18	
6. Solar gains:	(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)	
North 0.9	x 1	x	0.97	×	10.63	x	0.9	x	0.9	=	37.6	(74)
North 0.9	x 1	x	0.79	x	10.63	x	0.9	x	0.9	=	18.37	(74)
North 0.9	x 1	x	2.8	x	10.63	x	0.9	x	0.9	=	21.7	(74)
North 0.9	x 1	x	0.97	x	20.32	x	0.9	x	0.9	=	71.85	(74)
North 0.9	x 1	x	0.79	x	20.32	x	0.9	x	0.9	=	35.11	(74)
North 0.9	x 1	x	2.8	x	20.32	x	0.9	x	0.9	=	41.48	(74)
North 0.9	x 1	x	0.97	x	34.53	x	0.9	x	0.9	=	122.09	(74)
North 0.9	x 1	x	0.79	x	34.53	x	0.9	x	0.9	=	59.66	(74)
North 0.9	x 1	x	2.8	×	34.53	x	0.9	x	0.9	=	70.48	(74)
North 0.9	x 1	x	0.97	x	55.46	x	0.9	x	0.9	=	196.1	(74)
North 0.9	x 1	x	0.79	x	55.46	x	0.9	x	0.9	=	95.83	(74)
North 0.9	x 1	x	2.8	x	55.46	x	0.9	x	0.9	=	113.21	(74)
North 0.9	x 1	x	0.97	x	74.72	x	0.9	x	0.9	=	264.17	(74)
North 0.9	x 1	x	0.79	x	74.72	x	0.9	x	0.9	=	129.09	(74)
North 0.9	x 1	x	2.8	x	74.72	x	0.9	x	0.9	=	152.51	(74)
North 0.9	x 1	x	0.97	×	79.99	х	0.9	X	0.9	=	282.8	(74)
North 0.9	x 1	x	0.79	х	79.99	x	0.9	x	0.9	=	138.19	(74)
North 0.9	x 1	x	2.8	х	79.99	×	0.9	х	0.9	=	163.27	(74)
North 0.9	x 1	x	0.97	x	74.68	×	0.9	x	0.9	=	2 <mark>64.03</mark>	(74)
North 0.9	x 1	x	0.79	×	74.68	х	0.9	x	0.9	=	129.02	(74)
North 0.9	x 1	x	2.8	x	74.68	х	0.9	х	0.9	=	152.43	(74)
North 0.9	x 1	x	0.97	×	59.25	x	0.9	x	0.9	=	209.47	(74)
North 0.9	× 1	x	0.79	×	59.25	x	0.9	x	0.9	=	102.36	(74)
North 0.9	· · · · · · · · · · · · · · · · · · ·	x	2.8	x	59.25	x	0.9	x	0.9	=	120.93	(74)
North 0.9		x	0.97	x	41.52	x	0.9	x	0.9	=	146.79	(74)
North 0.9		x	0.79	x	41.52	x	0.9	x	0.9	=	71.73	(74)
North 0.9		x	2.8	x	41.52	x	0.9	x	0.9	=	84.74	(74)
North 0.9		X	0.97	×	24.19	x	0.9	X	0.9	=	85.53	(74)
North 0.9		X	0.79	X	24.19	х	0.9	X	0.9	=	41.79	(74)
North 0.9		X	2.8	×	24.19	X	0.9	X	0.9	=	49.38	(74)
North 0.9		X	0.97	X	13.12	х	0.9	X	0.9	=	46.38	(74)
North 0.9		X	0.79	X	13.12	х	0.9	X	0.9	=	22.66	(74)
North 0.9		X	2.8	×	13.12	x	0.9	X	0.9	=	26.78	(74)
North 0.9		X	0.97	×	8.86	x	0.9	X	0.9	=	31.34	(74)
North 0.9		X	0.79	×	8.86	X	0.9	x	0.9	=	15.32	(74)
North 0.9		X	2.8	×	8.86	X	0.9	X	0.9	=	18.09	(74)
East 0.9		X	2.8	×	19.64	X	0.9	X	0.9	=	80.18	(76)
East 0.9		X	2.5	×	19.64	x	0.9	x	0.9	=	71.59	(76)
East 0.9	x 2	x	2.8	x	38.42	x	0.9	x	0.9	=	156.85	(76)

East	0.9x	0	v	0.5		20.40		0.0	v	0.0		140.04	(76)
East		2	X	2.5	X	38.42	X	0.9	x	0.9	=	140.04	
East	0.9x	2	X	2.8	X	63.27	X	0.9	x	0.9	=	258.31	(76)
East	0.9x	2	X	2.5	X	63.27	X	0.9	x	0.9	=	230.63	(76)
	0.9x	2	x	2.8	X	92.28	X	0.9	x	0.9	=	376.72	(76)
East	0.9x	2	X	2.5	X	92.28	X	0.9	x	0.9	=	336.36	(76)
East	0.9x	2	X	2.8	X	113.09	X	0.9	x	0.9	=	461.69	(76)
East	0.9x	2	X	2.5	X	113.09	X	0.9	X	0.9	=	412.22	(76)
East	0.9x	2	X	2.8	x	115.77	X	0.9	X	0.9	=	472.62	(76)
East	0.9x	2	X	2.5	x	115.77	X	0.9	x	0.9	=	421.98	(76)
East	0.9x	2	X	2.8	X	110.22	X	0.9	x	0.9	=	449.95	(76)
East	0.9x	2	x	2.5	x	110.22	x	0.9	x	0.9	=	401.75	(76)
East	0.9x	2	x	2.8	x	94.68	x	0.9	X	0.9	=	386.5	(76)
East	0.9x	2	x	2.5	x	94.68	x	0.9	x	0.9	=	345.09	(76)
East	0.9x	2	x	2.8	x	73.59	x	0.9	x	0.9	=	300.42	(76)
East	0.9x	2	x	2.5	x	73.59	x	0.9	x	0.9	=	268.23	(76)
East	0.9x	2	x	2.8	x	45.59	x	0.9	x	0.9	=	186.11	(76)
East	0.9x	2	x	2.5	x	45.59	x	0.9	x	0.9	=	166.17	(76)
East	0.9x	2	x	2.8	X	24.49	х	0.9	x	0.9	=	99.97	(76)
East	0.9x	2	x	2.5	х	24.49	x	0.9	x	0.9	=	89.26	(76)
East	0.9x	2	x	2.8	x	16.15	×	0.9	x	0.9	=	65.94	(76)
East	0.9x	2	x	2.5	x	16.15	x	0.9	x	0.9	=	58.87	(76)
South	0.9x	1	x	0.91	x	46.7 <mark>5</mark>	х	0.9	x	0.9	=	62.03	(78)
South	0.9x	1	x	0.78	x	46 <mark>.75</mark>	x	0.9	x	0.9	=	53.17	(78)
South	0.9x	1	x	2.8	x	46.75	x	0.9	x	0.9	=	1 <mark>90.86</mark>	(78)
South	0.9x	1	x	0.91	x	76.57	x	0.9	x	0.9	=	101.59	(78)
South	0.9x	1	x	0.78	x	76.57	x	0.9	x	0.9	=	87.08	(78)
South	0.9x	1	x	2.8	x	76.57	x	0.9	x	0.9	=	312.58	(78)
South	0.9x	1	x	0.91	x	97.53	x	0.9	x	0.9	=	129.41	(78)
South	0.9x	1	x	0.78	x	97.53	x	0.9	x	0.9	=	110.92	(78)
South	0.9x	1	x	2.8	x	97.53	x	0.9	x	0.9	=	398.17	(78)
South	0.9x	1	x	0.91	x	110.23	x	0.9	x	0.9	=	146.26	(78)
South	0.9x	1	x	0.78	x	110.23	x	0.9	x	0.9	=	125.36	(78)
South	0.9x	1	x	2.8	x	110.23	x	0.9	x	0.9	=	450.02	(78)
South	0.9x	1	x	0.91	x	114.87	x	0.9	x	0.9	=	152.41	(78)
South	0.9x	1	x	0.78	x	114.87	x	0.9	x	0.9	=	130.64	(78)
South	0.9x	1	x	2.8	x	114.87	x	0.9	x	0.9	=	468.95	(78)
South	0.9x	1	x	0.91	x	110.55	x	0.9	x	0.9	=	146.67	(78)
South	0.9x	1	x	0.78	x	110.55	x	0.9	x	0.9	=	125.72	(78)
South	0.9x	1	x	2.8	x	110.55	x	0.9	x	0.9	=	451.3	(78)
South	0.9x	1	x	0.91	x	108.01	x	0.9	x	0.9	=	143.31	(78)
South	0.9x	1	x	0.78	x	108.01	x	0.9	x	0.9	=	122.84	(78)

South	0.9x	1	x	2.8	x	108.01	x	0.9	x	0.9	=	440.95	(78)
South	0.9x	1	x	0.91	x	104.89	x	0.9	x	0.9	=	139.17	(78)
South	0.9x	1	x	0.78	x	104.89	x	0.9	x	0.9	=	119.29	(78)
South	0.9x	1	×	2.8	×	104.89	x	0.9	x	0.9	=	428.22	(78)
South	0.9x	1	x	0.91	x	101.89	x	0.9	x	0.9	=	135.18	(78)
South	0.9x	1	x	0.78	x	101.89	x	0.9	x	0.9	=	115.87	(78)
South	0.9x	1	x	2.8	x	101.89	x	0.9	x	0.9	=	415.94	(78)
South	0.9x	1	x	0.91	x	82.59	x	0.9	x	0.9	=	109.57	(78)
South	0.9x	1	x	0.78	x	82.59	x	0.9	x	0.9	=	93.92	(78)
South	0.9x	1	x	2.8	x	82.59	x	0.9	x	0.9	=	337.15	(78)
South	0.9x	1	x	0.91	x	55.42	x	0.9	x	0.9	=	73.53	(78)
South	0.9x	1	x	0.78	x	55.42	x	0.9	x	0.9	=	63.02	(78)
South	0.9x	1	x	2.8	x	55.42	x	0.9	x	0.9	=	226.23	(78)
South	0.9x	1	x	0.91	x	40.4	x	0.9	x	0.9	=	53.6	(78)
South	0.9x	1	x	0.78	x	40.4	x	0.9	x	0.9	=	45.94	(78)
South	0.9x	1	×	2.8	×	40.4	x	0.9	x	0.9	=	164.92	(78)
	-		-		-		-						-

Sola <mark>r g</mark>	jains in	watts, ca	alculated	for eac	h month			(83)m = <mark>S</mark>	um(74)m .	<mark>(8</mark> 2)m				
(83)m=	535.5	946.57	1379.66	1839.87	2171.67	<mark>22</mark> 02.56	2104.27	1851.05	1538.9	10 <mark>69.62</mark>	647.84	454.02		(83)
Tota <mark>l g</mark>	ains – ii	nternal a	ind solar	⁻ (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	<mark>13</mark> 51.95	1757. <mark>3</mark>	2158.8	2569.44	2849.38	2834.59	2710.14	2467.02	2183.86	17 <mark>64.37</mark>	1398.01	1247.2		(84)
7 . Me	an inter	nal temp	oerature	(heating	season)								
		during h					from Tab	ole 9 Th	1 (°C)				21	(85)
		tor for g	0.			Ŭ			. ()			l	2.	()
Ounse	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(96)m	0.99	0.97	0.9	0.74	0.54	0.37	0.27	0.31	0.52	0.85	0.98	1		(86)
(86)m=	0.99	0.97	0.9	0.74	0.54	0.37	0.27	0.31	0.52	0.85	0.96	I		(00)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	20.17	20.43	20.72	20.93	20.99	21	21	21	20.99	20.87	20.47	20.12		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	20.12	20.12	20.12	20.13	20.13	20.14	20.14	20.14	20.14	20.13	20.13	20.12		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	0.99	0.96	0.88	0.7	0.49	0.32	0.22	0.25	0.46	0.81	0.97	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	19.02	19.4	19.79	20.06	20.12	20.14	20.14	20.14	20.13	20	19.46	18.96		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.42	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.5	19.83	20.18	20.42	20.49	20.5	20.5	20.5	20.49	20.36	19.88	19.44		(92)
Apply	adjustn	nent to tl	he mear	internal	tempera	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.5	19.83	20.18	20.42	20.49	20.5	20.5	20.5	20.49	20.36	19.88	19.44		(93)
8. Sp	ace hea	ting requ	uirement											
					re obtain	ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
		factor fo					•		-	. (,			
the ut	liisalion		Ji yanis		ible 9a									

L LCP														
			ains, hm	r									I	(0.4)
(94)m=	0.99	0.96	0.88	0.71	0.51	0.34	0.24	0.27	0.48	0.82	0.97	0.99	Í	(94)
			, W = (94	r · · · ·	ŕ								1	
(95)m=			1908.36		1457.85		646.14	677.85	1056.32	1448.83	1357.43	1238.1		(95)
	·	-	ernal tem	r i	1	1	i		i			i	1	<i>(</i>)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		-	1 I	· · · ·	ř –	1	1	r	– (96)m	Ē			1	
(97)m=	2601.75	2547.71	2327.81	1935.45	1472.3	977.46	646.23	678.06	1063.92	1635.75	2152.59	2580.67		(97)
Space	e heatin	<u> </u>	1	i	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		1	
(98)m=	940.71	576.81	312.07	75.13	10.75	0	0	0	0	139.07	572.51	998.87		_
								Tota	al per year	(kWh/year	r) = Sum(9	8)15,912 =	3625.93	(98)
Space	e heatin	g require	ement in	kWh/m ²	²/year								20.37	(99)
8c St	nace co	olina rec	quiremer	nt										
			July and		See Tal	hle 10h								
Calcu	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat			I.			I	1	Ŭ Ŭ	ernal ter				1	
(100)m=	0	0	0	0	0	1557.3	1	1256.41	0	0	0	0		(100)
	ation fac	tor for lo	I DSS hm	1		I			I	1	1		l	
(101)m=		0	0	0	0	0.99	1	0.99	0	0	0	0		(101)
		mLm (V	Vatts) =	(100)m >	(101)m				1					
(102)m=		0	0	0		1537.4	1220.07	1245.44	0	0	0	0		(102)
		nains ca	l lculated	l for appli	i cable w				10)					
(103)m=		0	0	0	0	1	2710.14		0	0	0	0		(103)
		a require	ement fo	r month	whole o				h) = 0.0	24 x [(1((3)m - (102)m 1	x (41)m	
-			(104)m <							[((····]		
(104)m=	0	0	0	0	0	933.98	1108.61	908.85	0	0	0	0		
			•						Tota	l = Sum(104)	=	2951.44	(104)
Coolec	fraction	n							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)			•							
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Tota	l = Sum((104)	=	0	(106)
	cooling	requirer	ment for	month =	: (104)m	× (105)		1					1	
(107)m=	0	0	0	0	0	233.49	277.15	227.21	0	0	0	0		_
									Tota	l = Sum(107)	=	737.86	(107)
Space	cooling	requirer	ment in k	(Wh/m²/	year				(107)) ÷ (4) =			4.15	(108)
9b. En	ergy rec	uiremer	nts – Coi	mmunity	heating	scheme	÷							
								ting prov	vided by	a comm	unity sch	neme.		
									1) '0' if n		,		0	(301)
Fractio	n of spa	ace heat	from co	mmunitv	v system	1 – (30 [.]	1) =						1	(302)
					•		,	allours fr		up to fair	othertert			
	-		y obtain he s, geotheri						CHP and ndix C.	up to tour	uner neat	sources; t	ne latter	
			Commun				5.2.010						1	(303a)

Fraction of heat from Community heat pump

Fraction of total space heat from Community heat pump

1

	ergy Emission factor /h/year kg CO2/kWh	Emissions kg CO2/year	
12b. CO2 Emissions – Community heating scheme	_	_	
SAP rating (section12)		87.65	(358)
Energy cost factor (ECF) $[(355) \times (356)] \div [(4) + 45.0] =$		0.89	(357)
Energy cost deflator (Table 12)		0.42	(356)
11b. SAP rating - Community heating scheme			
Total energy cost = (340a)(342e) + (345)(354) =		470.07	(355)
Additional standing charges (Table 12)		120	(351)
Energy for lighting (332)	13.19 × 0.01 =	72.61	(350)
Pumps and fans (331)	13.19 × 0.01 =	0	(349)
Space cooling (community cooling system) (315)	Fuel Price 13.19 x 0.01 =	28.84	(348)
Water heating from CHP (310a) x	4.24 × 0.01 =	87.2	(342a)
Space heating from CHP (307a) x	4.24 × 0.01 =	161.43	(340a)
Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
10b. Fuel costs – Community heating scheme			J```
Energy for lighting (calculated in Appendix L)	(100) (100) (100)	550.46	(332)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	0	(331)
pump for solar water heating		0	(330g)
warm air heating system fans		0	(330b)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		0	(330a)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	218.63	(315)
Cooling System Energy Efficiency Ratio		3.38	(314)
Electricity used for heat distribution 0.01	I × [(307a)(307e) + (310a)(310e)] =	58.64	(313)
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2056.62	(310a)
Water heating Annual water heating requirement		1958.69	1
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Efficiency of secondary/supplementary heating system in % (from Table	e 4a or Appendix E)	0	(308
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	3807.23	(307a)
Annual space heating requirement		3625.93]
Space heating		kWh/year	(300)
Distribution loss factor (Table 12c) for community heating system	aling system	1.05	(306)
Factor for control and charging method (Table 4c(3)) for community hea	ating system	1	(305)

CO2 from other sources of space and water heating Efficiency of heat source 1 (%)	ן (not CHP) re is CHP using two fuels repeat (363) to (366) for the sec	ond fuel	350	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0] = [869.53	(367)
Electrical energy for heat distribution	[(313) x	0.52		30.43	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)		= [899.96	(373)
CO2 associated with space heating (secondary)	(309) x	0] = [0	(374)
CO2 associated with water from immersion heater of	or instantaneous heater (312) x	0.52] = [0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		[899.96	(376)
CO2 associated with space cooling	(315) x	0.52] = [113.47	(377)
CO2 associated with electricity for pumps and fans	within dwelling (331)) x	0.52	_ = [0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52] = [285.69	(379)
Total CO2, kg/year sum of (376).	(382) =			1299.11	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				7.3	(384)
El rating (section 14)				92.19	(385)
13b. Primary Energy – Community heating scheme	_	<u>.</u> .		_	
	Energy kWh/year	Primary factor		Energy /h/year	
Energy from other sources of space and water heat	kWh/year ing (not CHP)	factor	k۷	/h/year	
Energy from other sources of space and water heat Efficiency of heat source 1 (%)	kWh/year ing (not CHP) re is CHP using two fuels repeat (363) to (3	factor 366) for the seco	kV	3 50	(367a)
Energy from other sources of space and water heat Efficiency of heat source 1 (%) If the Energy associated with heat source 1	kWh/year ing (not CHP) re is CHP using two fuels repeat (363) to (3 [(307b)+(310b)] x 100 ÷ (367b) x	factor	k۷	/h/year 350 5143.44	(367)
Energy from other sources of space and water heat Efficiency of heat source 1 (%)	kWh/year ing (not CHP) re is CHP using two fuels repeat (363) to (3	factor 366) for the sect	ond fuel [3 50	
Energy from other sources of space and water heat Efficiency of heat source 1 (%) If the Energy associated with heat source 1 Electrical energy for heat distribution	kWh/year ing (not CHP) re is CHP using two fuels repeat (363) to (3 [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372)	factor 366) for the second 0	bind fuel [/h/year 350 5143.44 180.02	(367) (372)
Energy from other sources of space and water heat Efficiency of heat source 1 (%) If the Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems	kWh/year ing (not CHP) re is CHP using two fuels repeat (363) to (3 [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372)	factor 366) for the second 0	bind fuel [/h/year 350 5143.44 180.02 5323.46	(367) (372) (373)
Energy from other sources of space and water heat Efficiency of heat source 1 (%) If the Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified</i>	kWh/year ing (not CHP) re is CHP using two fuels repeat (363) to (3 [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) otherwise, see C7 in Appendix C) (309) x	factor 366) for the sect	ond fuel [= [= [= [/h/year 350 5143.44 180.02 5323.46 5323.46	(367) (372) (373) (373)
Energy from other sources of space and water heat Efficiency of heat source 1 (%) If the Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified</i> Energy associated with space heating (secondary)	kWh/year ing (not CHP) re is CHP using two fuels repeat (363) to (3 [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) otherwise, see C7 in Appendix C) (309) x er or instantaneous heater(312) x	factor 366) for the sect	bind fuel [/h/year 350 5143.44 180.02 5323.46 5323.46 0	(367) (372) (373) (373) (373) (374)
Energy from other sources of space and water heat Efficiency of heat source 1 (%) If the Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified</i> Energy associated with space heating (secondary) Energy associated with water from immersion heater	kWh/year ing (not CHP) re is CHP using two fuels repeat (363) to (3 [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) otherwise, see C7 in Appendix C) (309) x er or instantaneous heater(312) x	factor 366) for the sect	bind fuel [/h/year 350 5143.44 180.02 5323.46 5323.46 0 0	(367) (372) (373) (373) (373) (374) (375)
Energy from other sources of space and water heat Efficiency of heat source 1 (%) If the Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified</i> Energy associated with space heating (secondary) Energy associated with water from immersion heate Total Energy associated with space and water heat	kWh/year ing (not CHP) re is CHP using two fuels repeat (363) to (370)+(310b)] x 100 ÷ (367b) x $[(307b)+(310b)] x 100 ÷ (367b) x$ $[(313) x$ $(363)(366) + (368)(372)$ otherwise, see C7 in Appendix C) $(309) x$ er or instantaneous heater(312) x ing $(373) + (374) + (375) =$ $(315) x$	factor 366) for the second 0 0 3.07	bind fuel [/h/year 350 5143.44 180.02 5323.46 5323.46 0 0 0 5323.46	(367) (372) (373) (373) (373) (374) (375) (376)
Energy from other sources of space and water heat Efficiency of heat source 1 (%) If the Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified</i> Energy associated with space heating (secondary) Energy associated with water from immersion heater Total Energy associated with space and water heat Energy associated with space cooling	kWh/year ing (not CHP) re is CHP using two fuels repeat (363) to (3 [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) otherwise, see C7 in Appendix C) (309) x er or instantaneous heater(312) x ing (373) + (374) + (375) = (315) x	factor 366) for the second 0 3.07 3.07	bind fuel [/h/year 350 5143.44 180.02 5323.46 5323.46 0 0 0 5323.46 671.18	(367) (372) (373) (373) (373) (374) (375) (376) (377)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP			Stroma Softwa Address:	re Ver			Versio	on: 1.0.3.11	
	28 Redington F			Address.	Flat 5					
Address : 1. Overall dwelling dime	•	(uau, 111757)	ΧD							
Ground floor					(1a) x		ight(m) 2.9	(2a) =	Volume(m³) 437.9	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d))+(1e)+(1n	n) -	151	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	437.9	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	main heating	secondar heating + 0 + 0	у] + [_] + [_	0 0] = [] = [total 0 0		40 = 20 =	m ³ per hour	(6a) (6b)
		0		0	JĽ					
Number of intermittent fa					Ļ	5		10 =	50	(7a)
Number of passive vents						0	X 7	10 =	0	(7b)
Number of flueless gas fi						0	X 4	40 = Air ch	o nanges per ho	(7c) ur
Infiltration due to chimne					en linue fu	50		÷ (5) =	0.11	(8)
If a pressurisation test has to Number of storeys in the Additional infiltration Structural infiltration: 0	he dw <mark>elling</mark> (ns)							-1]x0.1 =	0	(9) (10) (11)
if both types of wall are p deducting areas of openii If suspended wooden t	resent, use the value ngs); if equal user 0.3	corresponding to 5	the greate	er wall area	a (after					_
If no draught lobby, en		,	i (Scale	u), cisc					0	(12) (13)
Percentage of window									0	(13) (14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in	n cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	4.5	(17)
If based on air permeabil	lity value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.34	(18)
Air permeability value applie		est has been don	e or a deg	ree air pei	meability	is being u	sed			_
Number of sides sheltere	ed			(20) = 1 - [0 075 v (1	0)1			1	(19)
Shelter factor	ting aboltor factor			(20) = (18)		9)] =			0.92	(20)
Infiltration rate incorporat	0	nood		(21) = (10)	x (20) -				0.31	(21)
Infiltration rate modified f		Vay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		- 1	•••					- • •		
(22)m= 5.1 5	- i i i	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
		1					I	1	I	
Wind Factor $(22a)m = (2)$ (22a)m 1.27 1.25	<u> </u>	.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
		0.00	0.00	0.02	•				l	

, lajaot	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.4	0.39	0.38	0.35	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37		
	ate effecte echanica		-	rate for t	he appli	cable ca	se							(220)
	aust air he			endix N. (2	3b) = (23a) x Fmv (e	auation (N5)), other	wise (23b) = (23a)				
	anced with) (200)				
			-	-	-					2b)m + (2	23h) x ['	1 – (23c)		(230)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0]	(24a)
		d mecha	ı anical ve	ntilation	without	heat rec	overv (ľ	MV) (24b)m = (22	2b)m + (2	23b)	1	J	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	ouse ex	tract ver	tilation of	or positiv	e input v	ventilatio	on from c	outside				4	
i	if (22b)rr	า < 0.5 ×	(23b), t	hen (24	c) = (23b); otherv	vise (24	c) = (22b	o) m + 0.	.5 × (23b)	-	_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,	natural v if (22b)m									0.5]				
(24d)m=	r Ó T	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57]	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (240	c) or (24	d) in boy	(25)				-	
(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
3 He	at losses	s and he	at loss i	naramete	ər:									
		Gros		Openin		Net Ar	ea	U-valı	Je	AXU		k-value	<u> </u>	AXk
		area	(m²)	m	12	A ,n		W/m2		(VV/ł	<)	kJ/m ² ·		kJ/K
Doors		area	(m²)	m	12						<)			
	ws Type		(m²)	m	12	A ,n	n ² x	W/m2	K	(VV/ł	<)			kJ/K
Windo	ws Type ws Type	1	(m²)	m	12	A ,n 2.1	n ² x	W/m2	K = 0.04] =	(W/ł 1.68	<) 			kJ/K (26)
Windo Windo		e 1 e 2	(m²)	m	2	A ,n 2.1 0.91	n ² x x x1 x1	W/m2 0.8 /[1/(1.2)+	K 0.04] = 0.04] =	(W/H 1.68 1.04				kJ/K (26) (27)
Windo Windo Windo	ws Type	2 2 3	(m²)	'n	2	A ,n 2.1 0.91 1.54	n ² x x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] = 0.04] =	(W/H 1.68 1.04 1.76				kJ/K (26) (27) (27)
Windo Windo Windo	ws Type ws Type ws Type	2 2 3		m 0	2	A ,n 2.1 0.91 1.54 0.96	n ² x x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] = 0.04] =	(W/ł 1.68 1.04 1.76 1.1				kJ/K (26) (27) (27) (27)
Windo Windo Windo Windo	ws Type ws Type ws Type Type1	1 2 3 4	13		2	A ,n 2.1 0.91 1.54 0.96 2.76	n ² x x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K = 0.04] = 0.04] = 0.04] = 0.04] =	(W/ł 1.68 1.04 1.76 1.1 3.16				kJ/K (26) (27) (27) (27) (27)
Windo Windo Windo Windo Walls	ws Type ws Type ws Type Type1 Type2	2 3 4 34.3	13 3	0		A ,n 2.1 0.91 1.54 0.96 2.76 34.33	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12	K 0.04] = 0.04] = 0.04] = 0.04] = =	(W/k 1.68 1.04 1.76 1.1 3.16 4.12				kJ/K (26) (27) (27) (27) (27) (29)
Windo Windo Windo Windo Walls	ws Type ws Type ws Type Type1 Type2 Type3	1 2 3 4 34.3 34.3	13 3 3	0		A ,n 2.1 0.91 1.54 0.96 2.76 34.33 34.3	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12	K = 0.04] = 0.04] = 0.04] = 0.04] = = =	(W/k 1.68 1.04 1.76 1.1 3.16 4.12 4.12				kJ/K (26) (27) (27) (27) (27) (27) (29) (29)
Windo Windo Windo Windo Walls ⁻ Walls ⁻	ws Type ws Type ws Type Type1 Type2 Type3 Type4	2 2 3 4 34.3 34.3 78.3	13 3 3 14	0 0 2.76		A ,n 2.1 0.91 1.54 0.96 2.76 34.33 34.3 75.54	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12 0.12	K = 0.04] = 0.04] = 0.04] = = = = = =	(W/k 1.68 1.04 1.76 1.1 3.16 4.12 4.12 9.06				kJ/K (26) (27) (27) (27) (27) (29) (29) (29)
Windo Windo Windo Walls ⁻ Walls ⁻ Walls ⁻	ws Type ws Type ws Type Type1 Type2 Type3 Type4 Type5	2 2 3 4 34.3 34.3 78.3 13.3	33 3 34 88	0 0 2.76		A ,n 2.1 0.91 1.54 0.96 2.76 34.33 34.3 34.3 75.54 13.34	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ (1/(1.2)+ 0.12 0.12 0.12 0.12	K 0.04] = 0.04] = 0.04] = 0.04] = = = = = =	(W/k 1.68 1.04 1.76 1.1 3.16 4.12 4.12 9.06 1.6				kJ/K (26) (27) (27) (27) (27) (29) (29) (29) (29) (29)
Windo Windo Windo Walls ⁻ Walls ⁻ Walls ⁻ Walls ⁻	ws Type ws Type Type1 Type2 Type3 Type4 Type5 Type6	1 2 3 4 34.3 34.3 78.3 13.3 20.8	13 3 3 14 18 14	0 0 2.76 0		A ,n 2.1 0.91 1.54 0.96 2.76 34.33 34.3 34.3 75.54 13.34	n ² x x1 x1 x1 x1 x1 x1 x1 x x x x x x x x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12 0.12 0.12 0.12 0.12	K 0.04] = 0.04] = 0.04] = 0.04] = = = = = = =	(W/k 1.68 1.04 1.76 1.1 3.16 4.12 4.12 9.06 1.6 2.26				kJ/K (26) (27) (27) (27) (27) (29) (29) (29) (29) (29) (29) (29) (29
Windo Windo Windo Walls Walls Walls Walls Walls	ws Type ws Type Type1 Type2 Type3 Type4 Type5 Type6	 1 2 3 4 34.3 34.3 78.3 13.3 20.8 13.5 13.3 	13 3 3 14 14 18 14 14 14	0 0 2.76 0 0 0		A ,n 2.1 0.91 1.54 0.96 2.76 34.33 34.3 75.54 13.34 20.88 13.54	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x x x x x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12 0.12 0.12 0.12 0.11	K = 0.04] = 0.04] = 0.04] = = = = = = = = = =	(W/k 1.68 1.04 1.76 1.76 1.76 1.76 1.76 4.12 4.12 9.06 1.6 2.26 1.47				kJ/K (26) (27) (27) (27) (29) (29) (29) (29) (29) (29) (29) (29

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	41.61	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	0	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: Medium	250	(35)
For design assessments where the details of the construction are not known p can be used instead of a detailed calculation.	recisely the indicative values of TMP in Table 1f		-

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

if details of thermal bridging are not known (36) = $0.15 \times (31)$			_
Total fabric heat loss (33) + (36) =		74.8	(37)
Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$			
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec		
(38)m= 83.82 83.37 82.93 80.86 80.47 78.67 78.67 78.34 79.37 80.47 81.25	82.07		(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m			
(39)m= 158.61 158.16 157.72 155.65 155.27 153.47 153.47 153.13 154.16 155.27 156.05	156.87		
Average = Sum(39)1.Heat loss parameter (HLP), W/m²K $(40)m = (39)m \div (4)$	12 /12=	155.65	(39)
(40)m= 1.05 1.05 1.04 1.03 1.03 1.02 1.02 1.01 1.02 1.03 1.03	1.04		
Average = Sum(40). Number of days in month (Table 1a)	12 /12=	1.03	(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 30	31		(41)
4. Water heating energy requirement:	kWh/ye	ear:	
	.94		(42)
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)	3.92		(43)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec		
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	-		
(44)m= 114.32 110.16 106 101.85 97.69 93.53 93.53 97.69 101.85 106 110.16	114.32		_
$Total = Sum(44)_{112} = Sum$		1 <mark>247.09</mark>	(44)
(45)m= 169.53 148.27 153 133.39 127.99 110.45 102.34 117.44 118.84 138.5 151.19	164.18		
Total = $Sum(45)_{112}$ = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	=	1635.13	(45)
(46)m= 25.43 22.24 22.95 20.01 19.2 16.57 15.35 17.62 17.83 20.78 22.68	24.63		(46)
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel	1		(47)
If community heating and no tank in dwelling, enter 110 litres in (47)			
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss:			
a) If manufacturer's declared loss factor is known (kWh/day):	0		(48)
Temperature factor from Table 2b	0		(49)
Energy lost from water storage, kWh/year (48) × (49) = b) If manufacturer's declared cylinder loss factor is not known:	1		(50)
Hot water storage loss factor from Table 2 (kWh/litre/day) 0. If community heating see section 4.3 0.	.03		(51)
	.93	,	(52)
Temperature factor from Table 2b	.6		(53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$).1		(54)

Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)
If cylinder 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 Append	lix H	
(57)m= 3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03]	(57)
Primary circuit	loss (an	inual) fro	om Table	e 3							0]	(58)
Primary circuit	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor fr	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)		_	
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss cal	culated	for each	month (61)m =	(60) ÷ 36	65 × (41))m	-				_	
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat requ	ired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 195.82	172.02	179.29	158.83	154.28	135.89	128.64	143.73	144.29	164.79	176.63	190.47		(62)
Solar DHW input c	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	-	
(add additional	lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (G)		_	_	_	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa	ater hea	ter										-	
(64)m= 195.82	172.02	179.29	158.83	154.28	135.89	128.64	143.73	144.29	164.79	176.63	190.47		
••							Outp	out from wa	ater heate	r (annual)₁	12	1944.7	(64)
Hea <mark>t gains fron</mark>	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 >	(<mark>46)m</mark>	+ (57)m	+ (59)m	1	
(65)m= 74.98	66.11	69.48	62.36	61.17	<mark>5</mark> 4.73	52.64	57.66	57.53	64.66	68.28	73.2		(65)
in <mark>clude</mark> (57)n	n in c <mark>alc</mark>	culation o	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	neating	
	_				ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Internal ga	ins (see	Table 5	and 5a		ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
	ins (see	Table 5	and 5a		ylinder is Jun	s in the o Jul	dwelling Aug	or hot w Sep	ater is fr Oct	om com	munity h	neating	
5. Internal ga Metabolic gains	ins (see s (Table	Table 5 5), Wat	and 5a):								neating	(66)
5. Internal ga Metabolic gains Jan	ins (see s (Table Feb 176.14	5), Wat Mar 176.14	ts Apr 176.14): May 176.14	Jun 176.14	Jul 176.14	Aug 176.14	Sep 176.14	Oct	Nov	Dec	neating	(66)
5. Internal ga Metabolic gains Jan (66)m= 176.14	ins (see s (Table Feb 176.14	5), Wat Mar 176.14	ts Apr 176.14): May 176.14	Jun 176.14	Jul 176.14	Aug 176.14	Sep 176.14	Oct	Nov	Dec	neating	(66)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65	ins (see s (Table Feb 176.14 (calculat 68.08	5), Wat Mar 176.14 ted in Ap 55.37	ts Apr 176.14 opendix 41.92	: 176.14 L, equati 31.33	Jun 176.14 ion L9 or 26.45	Jul 176.14 r L9a), a 28.58	Aug 176.14 Iso see 37.15	Sep 176.14 Table 5 49.87	Oct 176.14 63.32	Nov 176.14	Dec 176.14	neating	
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains (ins (see s (Table Feb 176.14 (calculat 68.08	5), Wat Mar 176.14 ted in Ap 55.37	ts Apr 176.14 opendix 41.92	: 176.14 L, equati 31.33	Jun 176.14 ion L9 or 26.45	Jul 176.14 r L9a), a 28.58	Aug 176.14 Iso see 37.15	Sep 176.14 Table 5 49.87	Oct 176.14 63.32	Nov 176.14	Dec 176.14	neating	
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01	ins (see s (Table Feb 176.14 (calculat 68.08 ns (calc 484.99	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44	and 5a ts Apr 176.14 opendix 41.92 Append 445.72): 176.14 L, equati 31.33 dix L, eq 411.99	Jun 176.14 ion L9 of 26.45 uation L 380.29	Jul 176.14 r L9a), a 28.58 13 or L1 359.11	Aug 176.14 Iso see 37.15 3a), also 354.12	Sep 176.14 Table 5 49.87 see Ta 366.68	Oct 176.14 63.32 ble 5 393.4	Nov 176.14 73.9	Dec 176.14 78.78	neating	(67)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain	ins (see s (Table Feb 176.14 (calculat 68.08 ns (calc 484.99	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44	and 5a ts Apr 176.14 opendix 41.92 Append 445.72): 176.14 L, equati 31.33 dix L, eq 411.99	Jun 176.14 ion L9 of 26.45 uation L 380.29	Jul 176.14 r L9a), a 28.58 13 or L1 359.11	Aug 176.14 Iso see 37.15 3a), also 354.12	Sep 176.14 Table 5 49.87 see Ta 366.68	Oct 176.14 63.32 ble 5 393.4	Nov 176.14 73.9	Dec 176.14 78.78	neating	(67)
5. Internal ga Metabolic gains (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calculat 55.55	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in A 55.55	and 5a ts Apr 176.14 opendix 41.92 Append 445.72 opendix 55.55): 176.14 L, equati 31.33 dix L, equ 411.99 L, equat	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a)	Aug 176.14 Iso see 37.15 3a), also 354.12 , also se	Sep 176.14 Table 5 49.87 5 see Ta 366.68 5 e Table	Oct 176.14 63.32 ble 5 393.4 5	Nov 176.14 73.9 427.13	Dec 176.14 78.78 458.83	heating	(67) (68)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calculat 55.55	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in A 55.55	and 5a ts Apr 176.14 opendix 41.92 Append 445.72 opendix 55.55): 176.14 L, equati 31.33 dix L, equ 411.99 L, equat	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a)	Aug 176.14 Iso see 37.15 3a), also 354.12 , also se	Sep 176.14 Table 5 49.87 5 see Ta 366.68 5 e Table	Oct 176.14 63.32 ble 5 393.4 5	Nov 176.14 73.9 427.13	Dec 176.14 78.78 458.83	neating	(67) (68)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calculat 55.55 s gains 0	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0): 176.14 L, equati 31.33 dix L, equ 411.99 L, equat 55.55	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55	Aug 176.14 Iso see 37.15 3a), also 354.12), also se 55.55	Sep 176.14 Table 5 49.87 5 see Ta 366.68 20 Table 55.55	Oct 176.14 63.32 ble 5 393.4 5 55.55	Nov 176.14 73.9 427.13 55.55	Dec 176.14 78.78 458.83 55.55	heating	(67) (68) (69)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ($(67)m=$ 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva	ins (see s (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calcula 55.55 s gains 0 aporatio	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5)	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55	Aug 176.14 Iso see 37.15 3a), also 354.12 55.55 0	Sep 176.14 Table 5 49.87 5 see Ta 366.68 55.55 0	Oct 176.14 63.32 ble 5 393.4 5 55.55 0	Nov 176.14 73.9 427.13 55.55	Dec 176.14 78.78 458.83 55.55	heating	(67) (68) (69)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva (71)m= -117.43	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calcula 55.55 s gains 0 aporatio -117.43	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat -117.43	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5)	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55	Aug 176.14 Iso see 37.15 3a), also 354.12), also se 55.55	Sep 176.14 Table 5 49.87 5 see Ta 366.68 55.55 0	Oct 176.14 63.32 ble 5 393.4 5 55.55	Nov 176.14 73.9 427.13 55.55	Dec 176.14 78.78 458.83 55.55	heating	(67) (68) (69) (70)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva (71)m= -117.43 Water heating g	ins (see s (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calcula 55.55 s gains 0 aporatio -117.43 gains (T	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat -117.43	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu -117.43): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab -117.43	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5) -117.43	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55 0 -117.43	Aug 176.14 Iso see 37.15 3a), also 354.12), also se 55.55 0 -117.43	Sep 176.14 Table 5 49.87 55.55 0 -117.43	Oct 176.14 63.32 ble 5 393.4 5 55.55 0 -117.43	Nov 176.14 73.9 427.13 55.55 0 -117.43	Dec 176.14 78.78 458.83 55.55 0	heating	(67) (68) (69) (70)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva (71)m= -117.43 Water heating gains (72)m= 100.78	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calcula 55.55 s gains 0 aporatio -117.43 gains (T 98.38	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat -117.43 rable 5) 93.39	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5) -117.43 76.02	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55 0 -117.43 70.75	Aug 176.14 Iso see 37.15 3a), also 354.12 0, also se 55.55 0 -117.43	Sep 176.14 Table 5 49.87 5 see Ta 366.68 2 Table 55.55 0 -117.43 79.9	Oct 176.14 63.32 ble 5 393.4 5 55.55 0 -117.43 86.91	Nov 176.14 73.9 427.13 55.55 0 -117.43 94.83	Dec 176.14 78.78 458.83 55.55 0 -117.43 98.39	heating	 (67) (68) (69) (70) (71)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva (71)m= -117.43 Water heating g (72)m= 100.78	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calcula 55.55 s gains 0 aporatio -117.43 gains (T 98.38 gains =	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat -117.43 Table 5) 93.39	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu -117.43 86.61): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab -117.43 82.21	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5) -117.43 76.02 (66)	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55 0 -117.43 70.75 m + (67)m	Aug 176.14 Iso see - 37.15 3a), also 354.12), also se 55.55 0 -117.43 77.5 + (68)m -	Sep 176.14 Table 5 49.87 5 see Ta 366.68 55.55 0 -117.43 79.9 + (69)m + (69)m + (69)m + (69)m + (61)	Oct 176.14 63.32 ble 5 393.4 5 55.55 0 -117.43 86.91 70)m + (7	Nov 176.14 73.9 427.13 55.55 0 -117.43 94.83 1)m + (72)	Dec 176.14 78.78 458.83 55.55 0 -117.43 98.39	heating	 (67) (68) (69) (70) (71) (72)
5. Internal ga Metabolic gains Jan (66)m= 176.14 Lighting gains ((67)m= 76.65 Appliances gain (68)m= 480.01 Cooking gains (69)m= 55.55 Pumps and fan (70)m= 0 Losses e.g. eva (71)m= -117.43 Water heating gains (72)m= 100.78	ins (see 5 (Table Feb 176.14 (calculat 68.08 ns (calc 484.99 (calculat 55.55 s gains 0 aporatio -117.43 gains (T 98.38 gains = 765.72	Table 5 5), Wat Mar 176.14 ted in Ap 55.37 ulated in 472.44 ted in Ap 55.55 (Table 5 0 n (negat -117.43 rable 5) 93.39	and 5a ts Apr 176.14 opendix 41.92 Appendix 445.72 opendix 55.55 5a) 0 tive valu -117.43): 176.14 L, equati 31.33 dix L, equati 411.99 L, equati 55.55 0 es) (Tab -117.43	Jun 176.14 ion L9 of 26.45 uation L 380.29 ion L15 55.55 0 le 5) -117.43 76.02	Jul 176.14 r L9a), a 28.58 13 or L1 359.11 or L15a) 55.55 0 -117.43 70.75	Aug 176.14 Iso see 37.15 3a), also 354.12 0, also se 55.55 0 -117.43	Sep 176.14 Table 5 49.87 5 see Ta 366.68 2 Table 55.55 0 -117.43 79.9	Oct 176.14 63.32 ble 5 393.4 5 55.55 0 -117.43 86.91	Nov 176.14 73.9 427.13 55.55 0 -117.43 94.83	Dec 176.14 78.78 458.83 55.55 0 -117.43 98.39	heating	 (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	or	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.	9x 1	×	1.54	×	10.63	x	0.9	x	0.9	=	35.81	(74)
North 0.	9x 1	x	0.96	x	10.63	x	0.9	x	0.9	=	14.88	(74)
North 0.	9x 1	x	1.54	x	20.32	x	0.9	x	0.9	=	68.44	(74)
North 0	9x 1	x	0.96	x	20.32	x	0.9	x	0.9	=	28.44	(74)
North 0.	9x 1	x	1.54	x	34.53	x	0.9	x	0.9	=	116.3	(74)
North 0.	9x 1	x	0.96	x	34.53	x	0.9	x	0.9	=	48.33	(74)
North 0.	9x 1	x	1.54	x	55.46	x	0.9	x	0.9	=	186.8	(74)
North 0.	9x 1	x	0.96	x	55.46	x	0.9	x	0.9	=	77.63	(74)
North 0.	9x 1	x	1.54	x	74.72	x	0.9	x	0.9	=	251.64	(74)
North 0	9x 1	x	0.96	x	74.72	x	0.9	x	0.9	=	104.58	(74)
North 0	9x 1	x	1.54	x	79.99	x	0.9	x	0.9	=	269.39	(74)
North 0	9x 1	x	0.96	x	79.99	x	0.9	x	0.9	=	111.95	(74)
North 0.	9x 1	x	1.54	x	74.68	x	0.9	x	0.9	=	251.51	(74)
North 0.	9x 1	x	0.96	x	74.68	x	0.9	x	0.9	=	104.52	(74)
North 0.	9x 1	x	1.54	x	59.25	x	0.9	x	0.9	=	199.54	(74)
North 0.	9x 1	x	0.96	×	59.25	x	0.9	X	0.9	=	82.93	(74)
North 0	9x 1	x	1.54	х	41.52	x	0.9	x	0.9	=	139.83	(74)
	9x 1	x	0.96	х	41.52	×	0.9	x	0.9	=	58.11	(74)
	9x 1	x	1.54	x	24.19	x	0.9	x	0.9	=	81.47	(74)
North 0	9x 1	x	0.96	x	24.19	х	0.9	x	0.9	=	<mark>3</mark> 3.86	(74)
North 0.	9x 1	x	1.54	x	13.12	х	0.9	x	0.9	=	44.18	(74)
	9x 1	x	0.96	×	13.12	x	0.9	x	0.9	=	18.36	(74)
	9x 1	x	1.54	x	8.86	x	0.9	x	0.9	=	29.86	(74)
	9x 1	x	0.96	x	8.86	x	0.9	x	0.9	=	12.41	(74)
	9x 1	x	0.91	×	46.75	x	0.9	x	0.9	=	155.07	(78)
	9x 1	x	0.91	×	76.57	x	0.9	x	0.9	=	253.97	(78)
	9x 1	x	0.91	×	97.53	x	0.9	x	0.9	=	323.51	(78)
	9x 1	x	0.91	×	110.23	x	0.9	x	0.9	=	365.64	(78)
	9x 1	X	0.91	×	114.87	x	0.9	x	0.9	=	381.02	(78)
	9x 1	x	0.91	x	110.55	x	0.9	x	0.9	=	366.68	(78)
	9x 1	x	0.91	x	108.01	x	0.9	x	0.9	=	358.27	(78)
- · ·	9x 1	x	0.91	x	104.89	x	0.9	x	0.9	=	347.93	(78)
	9x 1	X	0.91	×	101.89	x	0.9	x	0.9	=	337.95	(78)
	9x 1	X	0.91	×	82.59	x	0.9	x	0.9	=	273.93	(78)
	9x 1	x	0.91	x	55.42	x	0.9	x	0.9	=	183.82	(78)
	9x 1	x	0.91	x	40.4	x	0.9	x	0.9	=	134	(78)
	9x 1	×	2.76	×	19.64	x	0.9	x	0.9	=	39.52	(80)
	9x 1	×	2.76	x	38.42	x	0.9	x	0.9	=	77.3	(80)
West 0.	9x 1	x	2.76	x	63.27	X	0.9	x	0.9	=	127.31	(80)

						_										
West	0.9x	1	x	2.7	6	x	9	2.28	x		0.9	x	0.9	=	185.67	(80)
West	0.9x	1	x	2.7	6	x	1	13.09	x		0.9	x	0.9	=	227.55	(80)
West	0.9x	1	x	2.7	6	x	1	15.77	x		0.9	x	0.9	=	232.93	(80)
West	0.9x	1	x	2.7	6	x	1	10.22	x		0.9	_ x [0.9	=	221.76	(80)
West	0.9x	1	x	2.7	6	x [9	4.68	x		0.9	x	0.9	=	190.49	(80)
West	0.9x	1	x	2.7	6	x	7	3.59	x		0.9	x	0.9	=	148.06	(80)
West	0.9x	1	x	2.7	6	x [4	5.59	x		0.9	x	0.9	=	91.73	(80)
West	0.9x	1	x	2.7	6	x [2	4.49	x		0.9	x	0.9	=	49.27	(80)
West	0.9x	1	x	2.7	6	x [1	6.15	x		0.9	x	0.9	=	32.5	(80)
Solar g	gains in y	watts, ca	alculated	for eac	n month				(83)m	n = Su	um(74)m .	(82)m	_			
(83)m=	245.29	428.16	615.45	815.75	964.79	98	30.96	936.07	820	.89	683.95	480.99	295.63	208.76		(83)
Total g	jains – ir	nternal a	ind solar	r (84)m =	= (73)m	+ (8	33)m	, watts								
(84)m=	1016.99	1193.88	1350.92	1504.26	1604.59	15	77.98	1508.77	1403	3.93	1294.66	1138.88	1005.76	959.03		(84)
7. Me	an interr	nal temp	erature	(heating	season	ı)										
Temp	erature	during h	eating p	eriods ir	n the livi	ng a	area f	from Tab	ole 9,	, Th1	1 (°C)				21	(85)
Utilisa	ation fact	tor for g	ains for	living are	ea, h1,m	n (se	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May	Ì,	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.92	0.8		0.6	0.44	0.5	-	0.75	0.95	0.99	1		(86)
Moan	internal	temper	ature in	living ar	aa T1 (f		w sta	ns 3 to 7		able	90)					
(87)m=	19.96	20.14	20.39	20.69	20.9	1	0.98	21	2		20.94	20.66	20.26	19.93		(87)
· · /						<u> </u>										(-)
	erature					T	-			-		00.00	00.00	00.05		(88)
(88)m=	2 <mark>0.04</mark>	20.04	20.05	20.06	20.06		0.07	20.07	20.	07	20.07	20.06	20.06	20.05		(00)
Util <mark>isa</mark>	ation fact	tor for g	ains for	1	welling,	h2,	m (se	e Table	9a)							
(89)m=	1	0.99	0.97	0.9	0.74	C).52	0.35	0.4	4	0.68	0.93	0.99	1		(89)
Mean	internal	temper	ature in	the rest	of dwell	ing	T2 (fe	ollow ste	eps 3	to 7	' in Tabl	e 9c)				
(90)m=	18.66	18.92	19.28	19.7	19.96	2	0.06	20.07	20.	07	20.02	19.68	19.1	18.63		(90)
											f	LA = Livir	ng area ÷ (4	4) =	0.33	(91)
Mean	internal	temper	ature (fo	or the wh	ole dwe	llino	a) = fl	_A × T1	+ (1	– fL	A) × T2					
(92)m=	19.09	19.32	19.64	20.03	20.27	—	0.36	20.38	20.3	- 1	20.33	20.01	19.48	19.06		(92)
Apply	adjustm	nent to th	he mear	internal	temper	atu	re fro	m Table	4e, '	whe	re appro	priate	1			
(93)m=	19.09	19.32	19.64	20.03	20.27	-	0.36	20.38	20.3		20.33	20.01	19.48	19.06		(93)
8. Sp	ace heat	ting requ	uirement			1			L							
Set T	i to the n	nean int	ernal ter	mperatui	e obtair	ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									-	I	
	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
	ation fact			r		-			1				,	1	I	
(94)m=	0.99	0.99	0.96	0.9	0.76	C	0.55	0.38	0.4	13	0.7	0.93	0.99	1		(94)
	I gains,		<u> </u>	<u> </u>	, 										l	(05)
(95)m=				1352.13			68.68	577.77	605	.56	904.91	1059.23	992.09	954.58		(95)
	hly avera	-		ri		1		40.0	40		44.4	40.0	74	4.0	l	(06)
(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		(96)
	loss rate			· · ·		-		- /	<u> </u>	<u> </u>	. ,	-	1000.00	0004.40		(07)
(97)m-	2346.59	2280.68	2073.04	1731.98	1331.04	1 88	34.65	579.53	608	.88	960.2	1460.32	1932.28	2331.13		(97)

Space	e heatin	g require	ement fo	or each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95	5)m] x (4	1)m		_	
(98)m=	993.91	741.97	573.77	273.49	85.82	0	0	0	0	298.41	676.94	1024.16		
								Tota	al per year	(kWh/year	r) = Sum(9	8)15,912 =	4668.47	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								30.92	(99)
8c. S	pace co	oling rec	quiremer	nt										
Calcu	lated fo	r June, .	July and	August.	See Tat	ble 10b							1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
		Ì	1	1		· · ·	perature	i	1	r –	1	1)	(100)
(100)m=		0	0	0	0	1442.6	1135.66	1163.82	0	0	0	0	J	(100)
(101)m=	r	tor for lo		0	0	0.88	0.94	0.91	0	0	0	0	1	(101)
		-		1 <u> </u>			0.01	0.01					J	
(102)m=		0	0	0	0	1273.45	1067.05	1064.85	0	0	0	0]	(102)
Gains	s (solar	u gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)				1	
(103)m=	0	0	0	0	0	1577.98	1508.77	1403.93	0	0	0	0		(103)
•		- ·		or month, < 3 × (98		dwelling,	continue	ous (kN	h) = 0.0)24 x [(10	03)m – (102)m]	x (41)m	
(104)m=	· · · · · · · · · · · · · · · · · · ·	0	0	0	0	219.26	328.64	252.28	0	0	0	0		_
			1						Tota	I = Sum((104)	=	800.18	(104)
Coolec	l fractio	n							f C =	co <mark>oled</mark>	area ÷ (4) =	1	(105)
		actor (Ta		í								1	1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
Space	cooling	roquiro	mont for	month -	(104)m	× (105)	× (106)r	n	Tota	$I = Sum_0$	(104)	=	0	(106)
(107)m=						54.82	82.16	63.07	0	0	0	0	1	
` '									Tota	I = Sum((107)	=	200.05	(107)
Space	cooling	require	ment in I	«Wh/m²/	year				(107) ÷ (4) =	. ,		1.32	(108)
9b. En	ergy reo	quiremer	nts – Co	mmunity	heating	scheme	<u>;</u>							
							ater heat heating (unity scl	neme.		(301)
	-			mmunity			-		1) 0 11 1	lone			0	
													1	(302)
			•				procedure r stations.			up to four	other heat	sources; t	he latter	
			-	ity heat									1	(303a)
Fractio	on of tota	al space	heat fro	m Comr	nunity he	eat pump	C			(3	02) x (303	a) =	1	(304a)
Factor	for con	trol and	charging	, method	l (Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table	12c) for a	commun	ity heati	ng syste	m					1.05	(306)
Space	heatin	g											kWh/y	ear
Annua	l space	heating	requiren	nent									4668.47	
Space	heat fro	om Comi	munity h	eat pum	р				(98) x (3	04a) x (30	5) x (306)	=	4901.89	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	: E)		0	(308
Space	heating	require	ment fro	m secon	idary/sup	oplemen	tary syst	tem	(98) x (3	01) x 100 ·	÷ (308) =		0	(309)

Water heating Annual water heating requirement			1944.7	_
If DHW from community scheme:			1044.7	
Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2041.93	(310a)
Electricity used for heat distribution	0.01 ×	[(307a)(307e) + (310a)(310e	e)] = 69.44	(313)
Cooling System Energy Efficiency Ratio			3.38	(314)
Space cooling (if there is a fixed cooling system, if	not enter 0)	= (107) ÷ (314) =	59.27	(315)
Electricity for pumps and fans within dwelling (Tabl mechanical ventilation - balanced, extract or positive			0	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=	=(330a) + (330b) + (330g) =	0	(331)
Energy for lighting (calculated in Appendix L)			541.48	(332)
10b. Fuel costs – Community heating scheme				
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cos £/year	t
Space heating from CHP	(307a) x	4.24 × 0.0	01 = 207.84	(340a)
Water heating from CHP	(310a) x	4.2 <mark>4 × 0.0</mark>	01 = 86.58	(342a)
		Fuel Price		
Space cooling (community cooling system)	(315)	13.19 × 0.0	01 = 7.82	(348)
Pumps and fans	(331)	13.19 × 0.0		(349)
Energy for lighting	(332)	13.19 × 0.0	01 = 71.42	(350)
Additional standing charges (Table 12)			120	(351)
Total energy cost = (340a)(3	342e) + (345)(354) =		493.66	(355)
11b. SAP rating - Community heating scheme				
Energy cost deflator (Table 12)			0.42	(356)
Energy cost factor (ECF) [(355) x (356)	6)] ÷ [(4) + 45.0] =		1.06	(357)
SAP rating (section12)			85.24	(358)
12b. CO2 Emissions – Community heating scheme				
	Ener kWh	gy Emission fac /year kg CO2/kWh	tor Emissions kg CO2/yea	r
CO2 from other sources of space and water heatin Efficiency of heat source 1 (%)	ng (not CHP)	epeat (363) to (366) for the secon		(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 10		= 1029.67	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 36.04	(372)
Total CO2 associated with community systems) + (368)(372)	= 1065.71	(373)
CO2 associated with space heating (secondary)	(309) x		= 0	(374)
CO2 associated with water from immersion heater			= 0	(375)

Total CO2 associated with space and water h	eating (373) + (374) + (375	i) =		1065.71	(376)
CO2 associated with space cooling	(315) x	0.52	=	30.76	(377)
CO2 associated with electricity for pumps and	I fans within dwelling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	(332))) x	0.52] =	281.03	(379)
Total CO2, kg/year sum o	f (376)(382) =			1377.5	(383)
Dwelling CO2 Emission Rate (383)	÷ (4) =			9.12	(384)
El rating (section 14)				90.58	(385)
13b. Primary Energy – Community heating sc	heme				
	Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and wate Efficiency of heat source 1 (%)	r heating (not CHP) If there is CHP using two fuels repeat (3	63) to (366) for the seco	nd fuel	350	(367a)
Energy associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367	'b) x 0	=	6090.72	(367)
Electrical energy for heat distribution	[(313) x		=	213.18	(372)
Total Energy associated with community syste	ems (363)(366) + (368))(372)	=	6303.9	(373)
if it is negative set (373) to zero (unless spe	ecified otherwise, see C7 in Appen	ndix C)		6303.9	(373)
Energy associated with space heating (second	dary) (309) x	0	=	0	(374)
Energy associated with water from immersion	heater or instantaneous heater(31	2) x 3.07	=	0	(375)
Total Energy associated with space and wate	r heating (373) + (374) + (375	i) =		6303.9	(376)
Energy associated with space cooling	(315) x	3.07] =	181.97	(377)
Energy associated with electricity for pumps a	and fans within dwelling (33	31)) x 3.07	=	0	(378)
Energy associated with electricity for lighting	(332))) x	3.07	=	1662.35	(379)
Total Primary Energy, kWh/year	sum of (376)(382) =			8148.22	(383)

User Details:												
Assessor Name: Software Name:	on: 1.0.3.11											
	28 Podinate	on Road, NW3	Property .	Address.	Fial 0							
Address : 1. Overall dwelling dim		on Road, NVVS										
Ground floor	Volume(m³ 484.3) (3a)										
Total floor area TFA = (1a)+(1b)+(1c)+	(1d)+(1e)+(′	ln)	167	(4)							
Dwelling volume					(3a)+(3b))+(3c)+(3c	l)+(3e)+	.(3n) =	484.3	(5)		
2. Ventilation rate:	-											
Number of chimneys	main heating	seconda heating	_ + _	0 0] = [total 0		40 =	m ³ per hou	r (6a)		
Number of open flues	0	+ 0	+	0	=	0	X	20 =	0	(6b)		
Number of intermittent f	ans					4	x ′	10 =	40	(7a)		
Number of passive vent	s				Γ	0	x ′	10 =	0	(7b)		
Number of flueless gas	fires				Ē	0	X 4	40 =	0	(7c)		
								Air ch	anges per ho	ur		
Infiltration due to chimn If a pressurisation test has					continue fr	40 om (9) to (÷ (5) =	0.08	(8)		
Number of storeys in Additional infiltration								-1]x0.1 =	0	(9) (10)		
Structural infiltration: if both types of wall are					•	uction			0	(11)		
deducting areas of oper			to the great		a lanci							
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)		
lf no draught lobby, e	nter 0.05, else	enter 0							0	(13)		
Percentage of window	ws and doors dr	aught stripped							0	(14)		
Window infiltration				0.25 - [0.2		1			0	(15)		
Infiltration rate				(8) + (10)					0	(16)		
Air permeability value	· · · ·		•	•	•	etre of e	envelope	area	4.5	(17)		
If based on air permeab Air permeability value appl	•					ia haina u	and		0.31	(18)		
Number of sides shelter				giee all pei	meaning	is being u	seu		1	(19)		
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.92	(20)		
Infiltration rate incorpora	ating shelter fac	ctor		(21) = (18)) x (20) =				0.28	(21)		
Infiltration rate modified	for monthly wir	nd speed										
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind s	peed from Tab	le 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											
(22a)m= 1.27 1.25	1.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18				

Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	elter an	d wind s	peed) =	= (21a) x	(22a)m	-			_	
	0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.28	0.31	0.32	0.33		
		c <i>tive air (</i> al ventila	-	rate for t	he applic	cable ca	se							(220)
				endix N (2	3b) = (23a) x Fmv (e	equation (N5)) , othe	rwise (23h) = (23a)			(
								n Table 4h) = (20u)				
			-	-	-			HR) (24a		2b)m i ('	22b) v [·	1 (22a)	() (23c)
(24a)m=								0	a = (2)			$\frac{1-(230)}{0}$	 	(24a)
	-	-	÷			-	Ŧ	MV) (24b	$\frac{1}{1}$		23h)	Ů	J	
(24b)m=	0			0	0	0					0	0]	(24b)
	whole h			tilation of	or positiv			on from c	Jutside				J	
,					•	•		lc) = (22k		.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input v	ventilati	on from l	oft					
i	f (22b)n	n = 1, th	en (24d)	m = (22k	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	J	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (240	c) or (24	1d) in boy	k (25)				1	
(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(25)
	- C. Lanaration													
3. He	at losse	s and he	eat loss i	paramete	er:									
3. He		Gros	s	oaramete Openin	gs	Net Ar		U-vali		AXU		k-value		A X k
ELEN			s		gs	A ,n	n²	W/m2	2K	(VV/ł	<)	k-value kJ/m²-l		kJ/K
ELEN Doors	IENT	Gros area	s	Openin	gs	A ,n 2.1	n² X	W/m2	2K	(W/H 1.68	<)			kJ/K (26)
ELEN Doors Windov	IENT ws Type	Gros area	s	Openin	gs	A ,n 2.1 3.43	n ² x	W/m2 0.8	2K = 0.04] =	(W/H 1.68 3.93	<)			kJ/K (26) (27)
ELEN Doors Windov Windov	NENT ws Type ws Type	Gros area 9 1 9 2	s	Openin	gs	A ,n 2.1 3.43 1.54	n ² x x x1 x1	W/m2 0.8 //[1/(1.2)+ //[1/(1.2)+	2K = 0.04] = 0.04] =	(W/H 1.68 3.93 1.76				kJ/K (26) (27) (27)
ELEN Doors Windov Windov Windov	NT NS Type NS Type NS Type	Gros area e 1 e 2 e 3	s	Openin	gs	A ,n 2.1 3.43 1.54 2.8	n ² x x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] =	(W/H 1.68 3.93 1.76 3.21	<)			kJ/K (26) (27) (27) (27)
ELEN Doors Windov Windov Windov	NT ws Type ws Type ws Type ws Type	Gros area e 1 e 2 e 3 e 4	s	Openin	gs	A ,n 2.1 3.43 1.54 2.8 0.91	n ² × 1 × 1 × 1 × 1 × 1 × 1 × 1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	2K = 0.04] = 0.04] = 0.04] = 0.04] =	(W/k 1.68 3.93 1.76 3.21 1.04				kJ/K (26) (27) (27) (27) (27)
ELEN Doors Windo Windo Windo Windo	NT NS Type NS Type NS Type NS Type NS Type	Gros area 4 5	s	Openin	gs	A ,n 2.1 3.43 1.54 2.8	n ² x x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1	W/m2 0.8 /[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] =	(W/H 1.68 3.93 1.76 3.21				kJ/K (26) (27) (27) (27)
ELEN Doors Windo Windo Windo Windo	IENT ws Type ws Type ws Type ws Type ws Type ws Type	Gros area 9 1 9 2 9 3 9 4 9 5 9 6	s	Openin	gs	A ,n 2.1 3.43 1.54 2.8 0.91	n ² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[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] =	(W/k 1.68 3.93 1.76 3.21 1.04				kJ/K (26) (27) (27) (27) (27)
ELEN Doors Windo Windo Windo Windo	NT NS Type NS Type NS Type NS Type NS Type	Gros area 9 1 9 2 9 3 9 4 9 5 9 6	s	Openin	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8	n ² x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[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] =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21				kJ/K (26) (27) (27) (27) (27) (27)
ELEN Doors Windo Windo Windo Windo	NT NS Type NS Type NS Type NS Type NS Type NS Type NS Type	Gros area 9 1 9 2 9 3 9 4 9 5 9 6	55 (m²)	Openin	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26	n ² × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 ×	W/m2 0.8 /[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] =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21 1.44				kJ/K (26) (27) (27) (27) (27) (27)
ELEN Doors Windoo Windoo Windoo Windoo Windoo	NT NS Type WS Type WS Type WS Type WS Type WS Type Type1	Gros area 4 5 6 7	3 3	Openin	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26 2.8	n ² × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 ×	W/m2 0.8 /[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] =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21 1.44 3.21				kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEN Doors Windov Windov Windov Windov Windov Windov	NENT ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2	Gros area 2 1 2 2 2 3 2 4 2 5 2 6 2 7 28.1	3 3 3	Openin m	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26 2.8 2.8 2.8	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+	2K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21 1.44 3.21 3.38				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (29)
ELEN Doors Windor Windor Windor Windor Windor Windor Windor Walls	NT NS Type NS Type NS Type NS Type Type Type Type Type S Type Type S Type Type S Type Type S Type Type S Type Type S Type Type S Type Type Type Type Type Type Type Type	Gros area 2 1 2 2 2 3 4 4 2 5 2 6 2 7 28.1 63.4	3 3 46	Openin m 0 4.9	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26 2.8 2.8 2.8 2.8 3.8 9 2.8 3.8 9 2.8 3.8 9 2.8 3.8 9 2.8 3.8 9 2.8 3.8 9 2.8 3.8 9 2.8 3.8 3.8 3.8 3.8 3.8 3.8 3.8 3.8 3.8 3	n ² x x x x x x x x x x x x x x x x x x x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12	2K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = 0.04] = = = 0.04] = = = = 0.04] = = = = = = = = = =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21 1.44 3.21 3.38 7.07				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEN Doors Windoo Windoo Windoo Windoo Windoo Windoo Windoo Windoo	NT NS Type NS Type NS Type NS Type Type Type Type Type S Type Type S Type Type S Type Type S Type Type S Type Type S Type Type S Type Type Type Type Type Type Type Type	Gros area 2 3 4 5 6 7 28.1 63.1 21.4	3 (m ²) 3 8 46 3	Openin m 0 4.9 0	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26 2.8 2.8 2.8 2.8 2.8 3.6 2.8 2.8 2.8 2.8 2.8 2.8 2.1 2.8 2.1 2.1 2.1 2.1 2.8 2.8 2.8 2.1 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8 2.8	n ² x x x x x x x x x x x x x x x x x x x	W/m2 0.8 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12 0.11	2K = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	(W/A 1.68 3.93 1.76 3.21 1.04 3.21 1.44 3.21 3.38 7.07 2.32				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)
ELEN Doors Windov Windov Windov Windov Windov Walls ⁻ Walls ⁻ Walls ⁻ Walls ⁻	NENT ws Type ws Type ws Type ws Type ws Type ws Type Type1 Type2 Type3 Type4	Gros area 2 1 2 2 3 3 4 4 5 5 6 6 7 7 28.1 63.4 21.4 28.1	3 (m ²) 3 8 46 3	Openin m 0 4.9 0 0	gs	A ,n 2.1 3.43 1.54 2.8 0.91 2.8 1.26 2.8 2.8 28.13 58.9 21.46 28.13	n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	W/m2 0.8 //[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.12 0.12 0.11 0.12	2K = 0.04] = = = = = = = = = = =	(W/k 1.68 3.93 1.76 3.21 1.04 3.21 1.44 3.21 3.38 7.07 2.32 3.38				kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (29) (29)

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	61.4
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	648
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: Medium	250

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

(33) (34) (35)

can be l	used inste	ad of a de	tailed calc	ulation.										
Therm	nermal bridges : S (L x Y) calculated using Appendix K details of thermal bridging are not known (36) = $0.15 \times (31)$													(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			97.02	(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=	90.43	90.02	89.62	87.74	87.39	85.75	85.75	85.44	86.38	87.39	88.1	88.84		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	187.45	187.04	186.64	184.76	184.41	182.77	182.77	182.47	183.4	184.41	185.12	185.86		
Heat lo	oss para	meter (H	HLP). W	/m²K						Average = = (39)m ÷	Sum(39)1.	.12 /12=	184.76	(39)
(40)m=	1.12	1.12	1.12	1.11	1.1	1.09	1.09	1.09	1.1	1.1	1.11	1.11		
(-)											Sum(40)1		1.11	(40)
Numb	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)
													1	
4 \N/2	ater hea	ting ener	av reau	irement [.]								kWh/ye	ear:	
			gyroqu								-			
		ipancy, I		. [4	(0.000	40 (тг	- 40.0		040/			96		(42)
	A > 13.		+ 1.76 x	[I - exp	(-0.0003	549 X (11	-A -13.9)2)] + 0.0	JU13 X (IFA -13.	9)			
			ater usag	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		104	1.47		(43)
						-	7	to achieve	a water us	se target o				. ,
not mor	e that 125	litres per j	person pe	r day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	114.91	110.73	106.55	102.38	98.2	94.02	94.02	98.2	102.38	106.55	110.73	114.91		
-		. .			antha A	400 · · //d /		T (2000			m(44) ₁₁₂ =		1253.58	(44)
					-	r		0Tm / 3600			-		1	
(45)m=	170.41	149.04	153.8	134.09	128.66	111.02	102.88	118.05	119.46	139.22	151.97	165.03		_
lf instan	taneous w	vater heatii	na at noint	of use (no	hot water	storage)	enter∩in	boxes (46)		Total = Su	m(45) ₁₁₂ =	:	1643.65	(45)
						- · ·				00.00		04.70	1	(46)
(46)m= Water	25.56 storage	22.36	23.07	20.11	19.3	16.65	15.43	17.71	17.92	20.88	22.8	24.76		(46)
	-		includir	ng any so	olar or W	/WHRS	storage	within sa	me ves	sel		1		(47)
-		. ,		ink in dw			-						I	
	•	•			•			mbi boil	ers) ente	ər '0' in (47)			
Water	storage	loss:												
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				(0		(48)
Tempe	erature f	actor fro	m Table	2b							()		(49)
Energ	y lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=			1		(50)
,				cylinder l									1	
		-		om Tabl	e 2 (kW	h/litre/da	ay)				0.	03		(51)
	•	leating s from Tal		on 4.3									1	
		actor fro		2h								93 .6		(52) (53)
, on po												.0	l	(00)

		om water (54) in (5	-	e, kWh/yo	ear			(47) x (51) x (52) x (53) = 0.1 0.1						(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	e 3			-	-			0		(58)
	•	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	, cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	196.7	172.79	180.09	159.53	154.95	136.47	129.17	144.35	144.91	165.52	177.42	191.33		(62)
Solar D	-IW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)	-	-			
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	196.7	172.79	180.09	159.53	154.95	136.47	129.17	144.35	144.91	165.52	177.42	191.33		
								Outp	out from wa	ater heate	r (annual)₁	12	1953.22	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	1 + (61)m	1 <mark>] +</mark> 0.8 >	(<mark>46)m</mark> (+ (57)m	+ (<mark>59)</mark> m]	
(65)m=	75.27	66.37	69.75	62.59	61.39	54.92	52 .82	57.86	57.73	64.9	68.54	7 <mark>3.48</mark>		(65)
inclu	ide (57)	m in cale	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	<u>olic gair</u>	is (Table	<u>e 5), Wat</u>	ts				-				-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	177.51	177.51	177.51	177.51	177.51	177.51	177.51	177.51	177.51	177.51	177.51	177.51		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5	-	-	-		
(67)m=	75.44	67	54.49	41.25	30.84	26.03	28.13	36.57	49.08	62.32	72.73	77.54		(67)
Applia	nces ga	ins (calc	ulated ir	n Appeno	dix L, eq	uation L	13 or L1	3a), also	o see Ta	ble 5				
(68)m=	505.19	510.43	497.22	469.1	433.6	400.23	377.94	372.7	385.91	414.03	449.53	482.9		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	ion L15	or L15a)), also se	ee Table	5	-			
(69)m=	55.71	55.71	55.71	55.71	55.71	55.71	55.71	55.71	55.71	55.71	55.71	55.71		(69)
Pumps	s and fa	ns gains	(Table &	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. e\	vaporatio	on (nega	tive valu	es) (Tab	le 5)							-	
(71)m=	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34	-118.34		(71)
Water	heating	gains (1	able 5)										-	
(72)m=	101.17	98.76	93.75	86.93	82.51	76.28	70.99	77.77	80.18	87.23	95.2	98.77		(72)
Total i	nternal	gains =				(66))m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	m	-	
(73)m=	796.68	791.08	760.34	712.17	661.83	617.43	591.94	601.92	630.05	678.46	732.34	774.08		(73)
6. So	lar gain:	5:												

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	< <u>1</u>	x	1.54	x	10.63	x	0.9	x	0.9	=	35.81	(74)
North 0.9	(1	x	1.26	x	10.63	x	0.9	x	0.9	=	29.3	(74)
North 0.9	(1	x	2.8	x	10.63	x	0.9	x	0.9	=	65.11	(74)
North 0.9	< <u>1</u>	x	1.54	x	20.32	x	0.9	x	0.9	=	68.44	(74)
North 0.9	۲ (x	1.26	x	20.32	x	0.9	x	0.9	=	56	(74)
North 0.9	۲ (x	2.8	x	20.32	x	0.9	x	0.9	=	124.44	(74)
North 0.9	(1	x	1.54	x	34.53	x	0.9	x	0.9	=	116.3	(74)
North 0.9	(1	x	1.26	x	34.53	x	0.9	x	0.9	=	95.15	(74)
North 0.9	(1	x	2.8	x	34.53	x	0.9	x	0.9	=	211.45	(74)
North 0.9	(1	x	1.54	x	55.46	x	0.9	x	0.9	=	186.8	(74)
North 0.9	(1	x	1.26	x	55.46	x	0.9	x	0.9	=	152.84	(74)
North 0.9	(1	x	2.8	x	55.46	x	0.9	x	0.9	=	339.64	(74)
North 0.9	(1	x	1.54	x	74.72	x	0.9	x	0.9	=	251.64	(74)
North 0.9	(1	x	1.26	x	74.72	x	0.9	x	0.9	=	205.89	(74)
North 0.9	(1	x	2.8	x	74.72	x	0.9	x	0.9	=	457.53	(74)
North 0.9	(1	x	1.54	x	79.99	х	0.9	Х	0.9	=	269.39	(74)
North 0.9	r 1	x	1.26	х	79.99	x	0.9	x	0.9	=	220.41	(74)
North 0.9	(1	x	2.8	х	79.99	×	0.9	x	0.9	=	489.8	(74)
North 0.9	(1	x	1.54	x	74.68	x	0.9	x	0.9	=	2 <mark>51.51</mark>	(74)
North 0.9	< <u>1</u>	x	1.26	x	74.68	x	0.9	x	0.9	=	2 <mark>05.78</mark>	(74)
North 0.9	(1	x	2.8	x	74.68	×	0.9	x	0.9	=	4 <mark>57.29</mark>	(74)
North 0.9	< 1	x	1.54	x	59.25	x	0.9	x	0.9	=	199.54	(74)
North 0.9	۲ (x	1.26	x	59.25	x	0.9	x	0.9	=	163.26	(74)
North 0.9	(1	x	2.8	x	59.25	x	0.9	x	0.9	=	362.8	(74)
North 0.9	(1	x	1.54	x	41.52	x	0.9	x	0.9	=	139.83	(74)
North 0.9	(1	x	1.26	x	41.52	x	0.9	x	0.9	=	114.4	(74)
North 0.9	(1	x	2.8	x	41.52	x	0.9	x	0.9	=	254.23	(74)
North 0.9	(1	x	1.54	x	24.19	x	0.9	x	0.9	=	81.47	(74)
North 0.9	(1	x	1.26	x	24.19	x	0.9	x	0.9	=	66.66	(74)
North 0.9	(1	x	2.8	x	24.19	x	0.9	x	0.9	=	148.13	(74)
North 0.9	(1	x	1.54	x	13.12	x	0.9	x	0.9	=	44.18	(74)
North 0.9	(1	x	1.26	x	13.12	x	0.9	x	0.9	=	36.15	(74)
North 0.9	۲ (x	2.8	x	13.12	x	0.9	x	0.9	=	80.33	(74)
North 0.9	(1	x	1.54	x	8.86	x	0.9	x	0.9	=	29.86	(74)
North 0.9	(1	x	1.26	x	8.86	x	0.9	x	0.9	=	24.43	(74)
North 0.9	(1	x	2.8	x	8.86	x	0.9	x	0.9	=	54.28	(74)
East 0.9	(1	x	2.8	x	19.64	x	0.9	x	0.9	=	40.09	(76)
East 0.9	(1	x	2.8	x	38.42	x	0.9	x	0.9	=	78.42	(76)
East 0.9	(1	x	2.8	x	63.27	x	0.9	x	0.9	=	129.15	(76)

East	0.9x	1	x	2.8	x	92.28	x	0.9	x	0.9] =	188.36	(76)
East	0.9x	1	x	2.8	x	113.09	x	0.9	x	0.9] =	230.84	(76)
East	0.9x	1	x	2.8	x x	115.77	x	0.9	x	0.9] =	236.31	(76)
East	0.9x	1	x	2.8	x	110.22	x	0.9	x	0.9]] =	224.98	(76)
East	0.9x	1	x	2.8	x	94.68	x	0.9	x	0.9]] =	193.25	(76)
East	0.9x	1	x	2.8	x x	73.59	x	0.9	x	0.9] =	150.21	(76)
East	0.9x	1	x	2.8	x	45.59	x	0.9	x	0.9]] =	93.06	(76)
East	0.9x	1	x	2.8	l x	24.49	x	0.9	x	0.9]] _	49.99	(76)
East	0.9x	1	x	2.8	x	16.15	x	0.9	x	0.9	=	32.97](76)
South	0.9x	1	x	3.43	x	46.75	x	0.9	x	0.9] =	116.9](78)
South	0.9x	1	x	0.91	x	46.75	x	0.9	x	0.9	=	31.01	(78)
South	0.9x	1	x	2.8	x	46.75	x	0.9	x	0.9	=	95.43	(78)
South	0.9x	1	x	3.43	x	76.57	x	0.9	x	0.9	i =	191.46	 (78)
South	0.9x	1	x	0.91	x	76.57	x	0.9	x	0.9	=	50.79	(78)
South	0.9x	1	x	2.8	x	76.57	x	0.9	x	0.9	i =	156.29	(78)
South	0.9x	1	x	3.43	x	97.53	x	0.9	x	0.9	i =	243.88	(78)
South	0.9x	1	x	0.91	x	97.53	x	0.9	x	0.9	=	64.7	(78)
South	0.9x	1	x	2.8	x	97.53	х	0.9	х	0.9	-	199.09	(78)
South	0.9x	1	x	3.43	x	110.23	x	0.9	x	0.9	-	275.64	(78)
South	0.9x	1	x	0.91	x	110.23	×	0.9	×	0.9	=	73.13	(78)
South	0.9x	1	x	2.8	x	110.23	x	0.9	x	0.9	=	2 <mark>25.01</mark>	(78)
South	0.9x	1	x	3.43	x	114.87	х	0.9	x	0.9	=	2 <mark>87.23</mark>	(78)
South	0.9x	1	x	0.91	x	114.87	×	0.9	x	0.9] =	76.2	(78)
South	0.9x	1	x	2.8	×	114.87	x	0.9	x	0.9	=	2 <mark>34.47</mark>	(78)
South	0.9x	1	x	3.43	x	110.55	x	0.9	x	0.9	=	276.42	(78)
South	0.9x	1	x	0.91	x	110.55	x	0.9	x	0.9	=	73.34	(78)
South	0.9x	1	x	2.8	×	110.55	x	0.9	x	0.9] =	225.65	(78)
South	0.9x	1	x	3.43	x	108.01	x	0.9	x	0.9	=	270.08	(78)
South	0.9x	1	x	0.91	x	108.01	x	0.9	x	0.9	=	71.65	(78)
South	0.9x	1	x	2.8	x	108.01	x	0.9	x	0.9	=	220.47	(78)
South	0.9x	1	x	3.43	x	104.89	x	0.9	x	0.9	=	262.29	(78)
South	0.9x	1	x	0.91	×	104.89	x	0.9	x	0.9	=	69.59	(78)
South	0.9x	1	x	2.8	x	104.89	x	0.9	x	0.9	=	214.11	(78)
South	0.9x	1	x	3.43	x	101.89	x	0.9	x	0.9	=	254.76	(78)
South	0.9x	1	x	0.91	x	101.89	x	0.9	x	0.9	=	67.59	(78)
South	0.9x	1	x	2.8	X	101.89	x	0.9	x	0.9	=	207.97	(78)
South	0.9x	1	X	3.43	×	82.59	x	0.9	x	0.9	=	206.5	(78)
South	0.9x	1	X	0.91	×	82.59	x	0.9	x	0.9	=	54.79	(78)
South	0.9x	1	X	2.8	×	82.59	X	0.9	x	0.9	=	168.57	(78)
South	0.9x	1	X	3.43	×	55.42	x	0.9	X	0.9	=	138.57	(78)
South	0.9x	1	X	0.91	x	55.42	x	0.9	x	0.9	=	36.76	(78)

South 0.9x 1 X 2.8 X 55.42	x 0.9 x 0.9 =	113.12 (78)						
South 0.9x 1 X 3.43 X 40.4	x 0.9 x 0.9 =	101.01 (78)						
South 0.9x 1 × 0.91 × 40.4	X 0.9 X 0.9 =	26.8 (78)						
South 0.9x 1 X 2.8 X 40.4	X 0.9 X 0.9 =	82.46 (78)						
Solar gains in watts, calculated for each month	(83)m = Sum(74)m(82)m	7						
(83)m= 413.67 725.84 1059.72 1441.42 1743.81 1791.32 1701.7		(83)						
Total gains – internal and solar $(84)m = (73)m + (83)m$, watts		7						
(84)m= 1210.35 1516.91 1820.06 2153.59 2405.64 2408.75 2293.7	1 2066.75 1819.04 1497.64 1231.43 1125.89	(84)						
7. Mean internal temperature (heating season)								
Temperature during heating periods in the living area from T	able 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 0.95 0.85 0.67 0.48 0.35	0.4 0.66 0.92 0.99 1	(86)						
Mean internal temperature in living area T1 (follow steps 3 to	o 7 in Table 9c)	_						
(87)m= 19.91 20.14 20.45 20.77 20.95 20.99 21	21 20.96 20.7 20.23 19.87	(87)						
Tomporature during besting periods in root of dwelling from		1						
Temperature during heating periods in rest of dwelling from(88)m=19.9819.99202020.0120.01		(88)						
Utilisation factor for gains for rest of dwelling, h2,m (see Tab								
(89)m= 0.99 0.98 0.94 0.82 0.61 0.41 0.27	0.32 0.58 0.89 0.98 1	(89)						
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)								
(90)m= 18.54 18.88 19.32 19.75 19.95 20 20	20.01 19.98 19.67 19.02 18.49	(90)						
	fLA = Living area ÷ (4) =	0.43 (91)						
Mean internal temperature (for the whole dwelling) = $fLA \times T$	1 + (1 – fLA) × T2							
(92)m= 19.13 19.42 19.8 20.19 20.38 20.43 20.43		(92)						
Apply adjustment to the mean internal temperature from Tak	le 4e, where appropriate	1						
(93)m= 19.13 19.42 19.8 20.19 20.38 20.43 20.43		(93)						
8. Space heating requirement		-						
Set Ti to the mean internal temperature obtained at step 11	of Table 9b, so that Ti,m=(76)m and re-cal	culate						
the utilisation factor for gains using Table 9a		7						
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec							
Utilisation factor for gains, hm:		7 (7.1)						
(94)m= 0.99 0.98 0.94 0.82 0.64 0.44 0.3	0.35 0.61 0.9 0.98 0.99	(94)						
Useful gains, hmGm , $W = (94)m \times (84)m$		7 (05)						
(95)m= 1200.65 1482.28 1704.55 1776.13 1530.06 1056.52 699.3	2 733.51 1113.46 1343.16 1208.52 1119.4	(95)						
Monthly average external temperature from Table 8		7 (00)						
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6	16.4 14.1 10.6 7.1 4.2	(96)						
Heat loss rate for mean internal temperature, Lm , W =[(39)r (97)m= 2780.12 2716.11 2483.05 2086.37 1600.17 1064.88 700.3		(97)						
		(97)						
Space heating requirement for each month, kWh/month = 0. (98)m= 1175.13 829.13 579.21 223.37 52.16 0 0	$\begin{array}{c c} 024 \text{ x} [(97)\text{m} - (95)\text{m}] \text{ x} (41)\text{m} \\ \hline 0 & 0 & 305.42 & 787.84 & 1224.67 \end{array}$	1						
(98)m= 1175.13 829.13 579.21 223.37 52.16 0 0								
	Total per year (kWh/year) = $Sum(98)_{15912}$ =							
Space heating requirement in kWh/m²/year		31 (99)						

8c. Sp	bace co	oling rec	quiremer	nt										
Calcu	lated fo	r June, J	July and	August.	See Ta	ble 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	oss rat	e Lm (ca	lculated	using 2	5°C inter	i · · · ·	i	i i	ernal ter	nperatur	re from T	able 10)		
(100)m=	0	0	0	0	0	1718.02	1352.49	1386.74	0	0	0	0		(100)
		tor for lo	1	i		i		i				i	I	(1.5.1)
(101)m=	0	0	0	0	0	0.94	0.97	0.96	0	0	0	0		(101)
1		r È	r Ó	(100)m >	r`	i	l		<u> </u>				l	(100)
(102)m=	0	0	0	0	0	1622.23		1325.18		0	0	0		(102)
		1	1 I	1	1	i i	î.	e Table	1					(102)
(103)m=	0	0	0	0	0	2408.75		2066.75		0	0	0	(11)	(103)
•				< 3 × (98		iwening,	continu	ous (kvi	(n) = 0.0	24 X [(1)	<i>03)m</i> – (102)m]:	x (41)m	
(104)m=	0	0	0	0	0	566.29	727.34	551.73	0	0	0	0		
		1							Tota	l = Sum((104)	=	1845.37	(104)
Cooled	l fractio	n									area ÷ (4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)	-	_		_	-			_]
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
									Tota	l = Sum	(104)	=	0	(106)
			r	month =		× (105)	T				1		1	
(107)m=	0	0	0	0	0	141.57	181.83	137.93	0	0	0	0		7
										l = Sum((107)	=	461.34	(107)
Space	cooling	requirer	ment in l	«Wh/m²/	year				(107)) ÷ (4) =			2.76	(108)
9b. Ene	ergy red	quiremer	nts – Co	mmu <mark>nity</mark>	heating	scheme)							
				.		0		ting prov			unity sc	neme.		
Fractio	n of spa	ace neat	from se	condary	/suppler	nentary I	neating	(Table 1	1) 'U' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	v system	1 – (30	1) =						1	(302)
	-	-								up to four	other heat	sources; t	he latter	
			-			from powe	r stations.	See Appel	ndix C.					
				ity heat									1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =							a) =	1	(304a)					
Factor for control and charging method (Table 4c(3)) for community heating system								1	(305)					
Distribu	ution los	ss factor	(Table '	12c) for o	commun	ity heati	ng syste	m					1.05	(306)
Space	heatin	g											kWh/year	
Annual	space	heating	requiren	nent									5176.94	
Space	heat fro	om Comr	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	5435.79	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	idary/su	pplemen	itary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water	heating	1												_
		neating r	requirem	ent									1953.22	7
		ommuni									/			
				eat pum	C						5) x (306)		2050.88	(310a)
Electric	city use	d for hea	at distrib	ution				0.01	× [(307a)	(307e) +	+ (310a)	(310e)] =	74.87	(313)

Cooling System Energy Efficiency Ratio					3.38	(314)
Space cooling (if there is a fixed cooling system,	if not enter 0)	= (107) ÷ (314) =	=	Γ	136.69	(315)
Electricity for pumps and fans within dwelling (Ta						-
mechanical ventilation - balanced, extract or posi	tive input from outsid	de			0	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =		0	(331)
Energy for lighting (calculated in Appendix L)					532.91	(332)
10b. Fuel costs – Community heating scheme						
	Fuel kWh/year		l Price lle 12)		Fuel Cost £/year	
Space heating from CHP	(307a) x		4.24 × 0.0	1 =	230.48	(340a)
Water heating from CHP	(310a) x		4.24 × 0.0	1 =	86.96	(342a)
		Fuel	Price	_		-
Space cooling (community cooling system)	(315)		13.19 × 0.0	1 =	18.03	(348)
Pumps and fans	(331)		13.19 × 0.0	1 =	0	(349)
Energy for lighting	(332)		13.19 × 0.0	1 =	70.29	(350)
Additional standing charges (Table 12)					120	(351)
Total energy cost = (340a)	.(342e) + (345)(354) =			Г	525.76	(355)
11b. SAP rating - Community heating scheme						
Energy cost deflator (Table 12)				Г	0.42	(356)
Energy cost factor (ECF) [(355) × (3	56)] ÷ [(4) + 45.0] =				1.04	(357)
SAP rating (section12)					85.47	(358)
12b. CO2 Emissions – Community heating schen	ne					-
		inergy Wh/year	Emission fac kg CO2/kWh		nissions J CO2/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%) If	ing (not CHP) there is CHP using two fu	iels repeat (363) to (366) for the second	d fuel	350	(367a)
CO2 associated with heat source 1	[(307b)+(310b)]	x 100 ÷ (367b) x	0	=	1110.17	(367)
Electrical energy for heat distribution	[(313) >	(0.52	=	38.86	(372)
Total CO2 associated with community systems	(363)	.(366) + (368)(372))	=	1149.02	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater	er or instantaneous h	eater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water heati	ing (373) +	(374) + (375) =			1149.02	(376)
CO2 associated with space cooling	(315) x		0.52	=	70.94	(377)
CO2 associated with electricity for pumps and far	ns within dwelling (3	331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	(332)))	x	0.52	=	276.58	(379)
						_

Total CO2, kg/year	sum of (376)(382) =				1496.54	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				8.96	(384)
El rating (section 14)					90.54	(385)
13b. Primary Energy – Community heat	ing scheme					
		Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)		P) ig two fuels repeat (363) to ((366) for the second	fuel	350	(367a)
Energy associated with heat source 1	[(307b)-	-(310b)] x 100 ÷ (367b) x	0	=	6566.87	(367)
Electrical energy for heat distribution		[(313) x		=	229.84	(372)
Total Energy associated with communit	y systems	(363)(366) + (368)(372)	=	6796.71	(373)
if it is negative set (373) to zero (unle	ss specified otherwise,	see C7 in Appendix C,)		6796.71	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from imm	ersion heater or instant	aneous heater(312) x	3.07	=	0	(375)
Total Energy associated with space and	l water heating	(373) + (374) + (375) =			6796.71	(376)
Energy associated with space cooling		(315) x	3.07	=	419.65	(377)
Energy associated with electricity for pu	mps and fans within dw	velling (331)) x	3.07	=	0	(378 <mark>)</mark>
Energy associated with electricity for lig	hting	(332))) x	3.07	=	1636.0 <mark>3</mark>	(379)
Total Primary Energy, kWh/yea	sum of (376).	(382) =			8852.39	(383)

User Details:													
Assessor Name: Software Name:	Stroma FS	AP 201			Strom Softwa	are Vei			Versic	on: 1.0.3.11			
					Address	: Flat 7							
Address :	28 Redingto	on Road,	NW3 7	RB									
1. Overall dwelling dimer	nsions:												
				Area	a(m²)		Av. He	ight(m)	-	Volume(m ³)		
Ground floor					243	(1a) x	2	2.9	(2a) =	704.7	(3a)		
First floor					28	(1b) x	2	.75	(2b) =	77	(3b)		
Total floor area TFA = (1a	a)+(1b)+(1c)+((1d)+(1e)+(1n	ı)	271	(4)			_		_		
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	(3n) =	781.7	(5)		
2. Ventilation rate:													
	main heating		econdar eating	у	other		total			m ³ per hou	r		
Number of chimneys		"ז + ר	0	+	0] = [0	x	40 =	0	(6a)		
Number of open flues	0	- +	0	- +	0	ī - Г	0	×	20 =	0	(6b)		
Number of intermittent far	is					- <u> </u>	5	x	10 =	50	(7a)		
Number of passive vents	0	(7b)											
Number of flueless gas fir	40 = Air ch	0 anges per ho	(7c)										
Infiltration due to chimney	s, flues and fa	ans = (6;	a)+(6b)+(7	a)+(7b)+(7c) =	Г	50		÷ (5) =	0.06	(8)		
If a pressurisation test has be						continue fr			. (-)	0.00			
Number of storeys in the	e dw <mark>elling</mark> (ne	5)								0	(9)		
Additional infiltration								[(9)	-1]x0.1 =	0	(10)		
Structural infiltration: 0.2							uction			0	(11)		
if both types of wall are pre deducting areas of opening			oonding to	the great	er wall are	a (after							
If suspended wooden flo			ed) or 0.	1 (seale	ed), else	enter 0				0	(12)		
If no draught lobby, ente	er 0.05, else e	enter 0								0	(13)		
Percentage of windows	and doors dr	aught st	ripped							0	(14)		
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)		
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)		
Air permeability value, o	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	4.5	(17)		
If based on air permeabilit	ty value, then	(18) = [(1	7) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.29	(18)		
Air permeability value applies	s if a pressurisatio	on test has	been don	e or a deg	gree air pe	rmeability	is being us	sed			_		
Number of sides sheltered	b						0)1			1	(19)		
Shelter factor					(20) = 1 -		9)] =			0.92	(20)		
Infiltration rate incorporating shelter factor (21) = (18) x (20) =													
Infiltration rate modified for monthly wind speed													
Jan Feb I	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind spe										1			
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7				

Wind F	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			
Adjuste	ed infiltra	ation rat	e (allow	ing for sł	nelter an	nd wind s	peed) =	: (21a) x	(22a)m						
	0.34	0.33	0.33	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31			
	ate effec echanica		-	rate for t	he appli	cable ca	se	-					- 		
				endix N, (2	3h) - (23:	a) v Emv (e	auation (N5)) other	wise (23h) - (23a)				0	(23a)
				ciency in %) – (23a)				0	(23b)
			-	-	-					26) m i (*	00h) [/	1 (000)		0	(23c)
a) II (24a)m=				entilation					0 $m = (2)$	20)m + (. 0	230) × [1 - (230)	- 100 <u> </u>]	(24a)
	-			_							-	Ū			(210)
(24b)m=				entilation					0 = (22)	0	230)	0	1		(24b)
) í	-						_		-	0	0	0	J		(210)
,				ntilation o then (24)	•	•				5 x (23b)				
(24c)m=	0	0	0		0				0		0	0]		(24c)
	natural	ventilatio	n or wh	nole hous	e nositiv		ventilati						J		
,				m = (221)						0.5]					
(24d) <mark>m=</mark>	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55			(24d)
Effec	ctive air	change	rate - ei	nter (24a) or (2 <mark>4</mark> 1	o) or (24	c) or (24	ld) in boy	(25)						
(25)m=	0 .56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55			(25)
3 40	at losses	s and he	at loss	paramet	ar.								-		
ELEN		Gros		Openin		Net Ar	ea	U-valu	Je	AXU		k-value	÷		AXk
		area		m	-	A ,r		W/m2		(W/ł	<)	kJ/m²·l			kJ/K
Doo <mark>rs</mark>						2.1	x	0.8	=	1.68					(26)
Window	ws Type	1				0.98	x1	/[1/(1.2)+	0.04] =	1.12					(27)
Window	ws Type	2				4		/[1/(1.2)+	0.04] =	4.58					(27)
Window	ws Type	3				3.3		/[1/(1.2)+	0.04] =	3.78					(27)
Windov	ws Type	4				3.1		/[1/(1.2)+	0.04] =	3.55					(27)
Windov	ws Type	5				2.1		/[1/(1.2)+	0.04] =	2.4					(27)
Windo	ws Type	6				0.8		/[1/(1.2)+	0.04] =	0.92	\exists				(27)
	ws Type					1.54	=	/[1/(1.2)+		1.76					(27)
Rooflig						1		/[1/(1.3) +	0.04] =	1.3					(27b)
Walls 1		44.7	7	6.28		38.49		0.12		4.62	= r		7		(29)
Walls 1		69.0		2.1		66.92		0.12		8.03	╡┟		4		(29)
Walls 1									= 1		╡┟		\exists		
Walls 1		45.5		8.5		37.03		0.12		4.44	╡╏		\dashv		(29)
		13.3		0		13.34		0.11		1.44	╡╎				(29)
Walls T		21.4		2.94		18.52		0.11	=	2.01	╡┆				(29)
Walls T		69.0		4		65.02		0.12	=	7.8	_ Ļ				(29)
Walls 7		9.8	6	0		9.86	×	0.11	=	1.07	_				(29)
Roof T	ype1	28		2		26	x	0.18	=	4.68				1	(30)

Average = Sum(39)r/12= 276.44 (39) Heat loss parameter (HLP), W/m2K (40)m = (39)m ÷ (4) (40)m = (39)m ÷ (4) (40)m = 1.03 1.03 1.02 1.01 1.01 1.01 1.02 1.03 Number of days in month (Table 1a) Average = Sum(40)r/12= 1.02 (40) (41)m = 31 28 31 30 31 31 30 31	Roof ⁻	Type2	87	,	2		85	×	0.18	=	15.3				(30)	
** include the areas on both sides of internal walks and partitions Fabric heat loss, W/K = S (A × U) (21)(30) + (32) = 78.42 (33) Heat capacity (Cn = S(A × K) (22)(32) + (32)(32) = 0 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K Indicative values of TMP in Table 11 can be used instant to details of the construction are not known precisely the indicative values of TMP in Table 11 can be used instant of a detailed calculation. Thermal bridges : S (L × Y) calculated using Appendix K 57.9 (36) Table table instant bridging are not known (36) = 0.15 x (31) Total fabric heat loss (33) + (36) = 136.32 (37) Ventilation heat loss calculated monthly (39)m = 0.33 × (29)m x (5) Ventilation heat loss calculated monthly (39)m = 0.33 × (29)m x (5) Ventilation heat loss calculated monthly (39)m = 0.37 × (29)m x (5) Ventilation heat loss calculated monthly (39)m = 0.37 + (39)m (39)m = 280.28 279.59 279.12 276.45 275.94 273.61 273.61 273.61 274.51 275.94 276.96 276.02 American and the transfer coefficient, W/K (39)m = (37) + (39)m (39)m = 280.28 279.59 279.12 276.45 275.94 273.61 273.61 273.61 274.51 275.94 276.96 276.02 American and the table of the table table of the table table of the table table of table table table of table table of table table of table table of table tabl	Total a	area of e	lements	, m²			386								(31)	
$\begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} $								lated using	g formula 1	/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	n 3.2		
Thermal mass parameter (TMP = Cm = TFA) in kJ/m ² K Indicative Value: Medium 200 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 considered of detailed collustion. Thermal bridges : S (L x Y) calculated using Appendix K 57.9 (36) if details of thermal bridging are not known (39) = 0.15 x (31) Total fabric heat loss Ventilation heat loss calculated monthly (38) m = 0.33 x (25) m x (5) (38) m $133.8 + 143.8 + 143.8 + 140.1 + 139.65 + 137.3 + 137.3 + 138.2 + 139.63 + 140.64 + 141.7 (38) (39) m 2102.8 + 279.69 + 275.42 + 275.94 + 273.61 + 273.61 + 273.18 + 273.82 + 276.96 + 276.02 + 276.44 + 276.94$	Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				78.42	(33)	
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 are to used instand of a detailed calculation. Thermal bridging are not known (36) = 0.15 x (31) Total Tabric heat loss (33) + (36) = (13.36) 13.36 143.38 142.81 140.13 139.63 137.3 137.3 136.87 138.2 139.63 140.64 141.7 (39) m = 13.36 143.38 142.81 140.13 139.63 137.3 137.3 136.87 138.2 139.63 140.64 141.7 (39) m = 13.36 143.38 142.81 140.13 139.63 137.3 137.3 136.87 138.2 139.63 140.64 141.7 (39) m = 120.28 279.66 270.12 276.45 275.94 273.61 273.16 273.18 274.51 275.94 276.80 78.02 Nemper 2 (20.28 279.66 270.12 276.45 275.94 273.61 273.16 273.18 274.51 275.94 276.80 78.02 Nemper 0 floats in month (Table 1a) Heat loss parameter (HLP), W(m ² K (40) m = (103) 1.03 1.02 1.02 1.01 1.01 1.01 1.00 1.02 1.02	Heat c	apacity	Cm = S((A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)	
can be used instead of a detailed calculation. Thermal bridges : S (L × Y) calculated using Appendix K if details of thema hidging are not known (28) = 0.15 x (31) Total fabric heat loss (33) + (36) = (33) +	Therm	al mass	parame	eter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)	
if details of thermal bridging are not known (36) = $0.5 \times (31)$ Total fabric heat loss Ventilation heat loss calculated monthly (38) = $0.33 \times (25) \times (5)$ (39) = $0.33 \times (25) \times (5)$ Heat transfer coefficient, W/K (39) = $0.33 \times (25) \times (5)$ Heat transfer coefficient, W/K (39) = $0.33 \times (25) \times (5)$ Heat transfer coefficient, W/K (39) = $0.33 \times (25) \times (5)$ Heat transfer coefficient, W/K (39) = $0.33 \times (25) \times (5)$ Heat transfer coefficient, W/K (39) = $0.33 \times (25) \times (5)$ Heat loss parameter (HLP), W/m ² K (40) = $0.33 \times (1.02 \times 1.02 \times $		-				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f			
Total fabric heat loss (33) + (36) = (136.32) (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (6) (39)m= (136.92) (137) (39)m= 143.96 143.38 142.81 140.13 139.63 137.3 137.3 137.4 139.7 (139.7) (38)m = 0.33 x (25)m x (6) (39)m= 143.96 143.38 142.81 140.13 139.63 137.3 137.3 137.4 139.63 140.64 141.7 (38)m Heat transfer coefficient, W/K (39)m= (280.28 279.68 276.45 275.94 276.45 275.94 276.45 276.45 276.44 (39)m Heat transfer coefficient, W/K (40)m = (39)m = (4) (40)m = (30)m = (4) (41) (41)m = 31 28 31 30 31 30 31 30 31 30 31 30 31 30 31 30 31 30 31 30 31 30 31 30 31 30 </td <td>Therm</td> <td>al bridge</td> <td>es : S (L</td> <td>x Y) cal</td> <td>culated</td> <td>using Ap</td> <td>pendix l</td> <td>K</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>57.9</td> <td>(36)</td>	Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	K						57.9	(36)	
Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$ (38)m = Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 143.96 143.34 142.81 140.13 139.63 137.3 137.3 137.3 138.2 139.63 140.64 141.7 (38)m (39)m = 280.28 279.69 279.12 276.45 275.94 273.61 273.61 273.61 273.62 276.94 278.02 Xeverage = \$um(30), 1/2 = 276.44 (39) Heat loss parameter (HLP), W/m2K (40)m = (39)m = (3) 1.02 1.02 1.01 1.01 1.01 1.02 1.02 (40)m Value Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (41)m = Jan Feb Mar Apr May Jun Jul Jul Jul Aug Sep Oct Nov Dec (41)m = Jan Feb Mar <th< td=""><td></td><td></td><td></td><td>are not kn</td><td>own (36) =</td><td>= 0.15 x (3</td><td>1)</td><td></td><td></td><td></td><td>(2.2)</td><td></td><td></td><td>r</td><td>_</td></th<>				are not kn	own (36) =	= 0.15 x (3	1)				(2.2)			r	_	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$															(37)	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Ventila															
A transfer coefficient, W/K (39)m = (37) + (38)m (40)m = (30)m + (4) Number of days in month (Table 1a) Average = Sum(40) ₁₋₁₀ / 122 1.02 (40) (41) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (41) Average = Sum(40) ₁₋₁₀ / 122 1.02 (40) Number of days in month (Table 1a) Average = Sum(40) ₁₋₁₀ / 122 1.02 (40) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (42) IT FA 13.9)2] + 0.0013 x (TFA - 13.9)2] Average average for water usage to 7 IT FA 13.9 IT FA 13.9 IT FA 13.9)2] Averag	(0.0)									· · ·					(00)	
(39)me 280.28 279.69 279.12 276.45 275.94 273.61 273.61 273.18 274.51 275.94 276.92 Average = Sum(39)a /12= 276.44 (39) Heat loss parameter (HLP), W/m ² K (40)me 1.03 1.03 1.02 1.01 1.01 1.01 1.02 1.02 1.03 Number of days in month (Table 1a) Average = Sum(40) e/12= 1.02 (40) (41)me 31 28 31 30 31 31 30 <t< td=""><td>(38)m=</td><td>143.96</td><td>143.38</td><td>142.81</td><td>140.13</td><td>139.63</td><td>137.3</td><td>137.3</td><td>136.87</td><td>138.2</td><td>139.63</td><td>140.64</td><td>141.7</td><td></td><td>(38)</td></t<>	(38)m=	143.96	143.38	142.81	140.13	139.63	137.3	137.3	136.87	138.2	139.63	140.64	141.7		(38)	
Average = Sum(39)/12= 276.44 (39) Heat loss parameter (HLP), W/m²K (40)m = (33)m + (4) (41)m = (31 - 28) × (31 - 33	Heat t	ransfer c	oefficie	nt, W/K						(39)m	= (37) + (38)m		1		
Heat loss parameter (HLP), W/m²K (40)m = (39)m + (4) (40)m = 1.03 1.03 1.02 1.02 1.01 1.01 1.01 1.02 1.03 Number of days in month (Table 1a) Average = Sum(40), $1/2$ 1.02 (40) (41)m = 31 28 31 30 31	(39)m=	280.28	279.69	279.12	276.45	275.94	273.61	273.61	273.18							
(40)n= 1.03 1.03 1.02 1.02 1.01 1.01 1.01 1.02 1.03 Number of days in month (Table 1a) Average = Sum(40),, /12= 1.02 (40) (41)ne Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (41)ne Jai 28 31 30 31 30 31 30 31 30 31 (41) 4. Water heating energy requirement: KWh/year: KWh/year: KWh/year: (42) (42) (41) 4. Water heating energy requirement: KWh/year: 3.09 (42) (42) (42) (42) (42) (42) (43) Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 107.69 (43) (43) (44)	Heatle														(39)	
Average = Sum(40)z /12=1.02(40)Unmber of days in month (Table 1a)JunJunJulAugSepOctNovDec(41)m=3128313031303130313031304.10JunJunJunJunAugSepOctNovDec(41)m=31283130313031303130314.10Aug SepOctNovDecAverage(41)4. Water heating energy requirement:KWh/year:KWh/year:Assumed occupancy, N3.09(42)(42)if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)(42)Annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of(43)Annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of(43)not more that 125 litres per person per day (all water use, hot and cold)Image in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m=118.46114.15109.84105.53101.2396.92101.23105.53109.84Ital = Sum(44)e =Image in litres per day for each month Vd,m = factor from Table 1c x (43)Image in litres per day for each month Vd,m = factor from Table 1c x (43)Image in litres in table 13.221282.26(44)m=118.64114.15109.84105.53101.2396.92101.23105.53 <td< td=""><td></td><td>· · · · · ·</td><td></td><td><u>, </u></td><td></td><td>1.02</td><td>1 01</td><td>1 01</td><td>1.01</td><td>- · ·</td><td></td><td></td><td>1.03</td><td></td><td></td></td<>		· · · · · ·		<u>, </u>		1.02	1 01	1 01	1.01	- · ·			1.03			
Number of days in month (Table 1a)	(10)														(40)	
(41)me31283130313130313130313031303130313031303131303130313031303030303030303030303030 <th colspa<="" td=""><td>Numb</td><td colspan="12"></td><td></td><td></td></th>	<td>Numb</td> <td colspan="12"></td> <td></td> <td></td>	Numb														
4. Water heating energy requirement:KWh/year:Assumed occupancy, N 3.09 (42)if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)(42)if TFA £ 13.9, N = 1Annual average hot water usage in litres per day Vd, average = (25 x N) + 36107.69Annual average hot water usage in litres per day Vd, average = (25 x N) + 36107.69(43)Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of107.69(43)Not more that 125 litres per person per day (all water use, hot and cold)Image: target of107.69(43)Mot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)Image: target ofImage: target of107.69(44)me 118.46 114.15 109.84 105.53 101.23 96.92 96.92 101.23 105.53 109.84 114.15 118.46Image: target ofImage: target ofImage: target of(45)me 175.67 153.64 158.54 138.22 132.63 114.45 106.05 121.7 123.15 143.52 156.66 170.13Image: target ofImage: target ofImage: target of(46)me 26.35 23.05 23.78 20.73 19.89 17.17 15.91 18.25 18.47 21.53 23.5 25.52(46)Water storage loss:Image: target ofImage: target ofImage: target ofStorage volume (litres) including any solar or WWHRS storage within same vessel1(47)If community heating and no tank in dwelling, enter 110 litres in (47)Image: target ofImage: target of		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) (42) if TFA \pm 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) (43) Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 107.69 (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) (44)m= 118.46 114.15 109.84 105.53 101.23 96.92 96.92 101.23 105.53 109.84 114.15 118.46 Total = Sum(44)	(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) (42) if TFA \pm 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) (43) Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 107.69 (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) (44)m= 118.46 114.15 109.84 105.53 101.23 96.92 96.92 101.23 105.53 109.84 114.15 118.46 Total = Sum(44)																
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if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ [107.69] (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) (44)m= <u>118.46</u> <u>114.15</u> <u>109.84</u> 105.53 101.23 <u>96.92</u> <u>96.92</u> 101.23 105.53 109.84 114.15 <u>118.46</u> Total = Sum(44)e = <u>1292.26</u> (44) Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= <u>175.67</u> <u>153.64</u> <u>158.54</u> <u>138.22</u> <u>132.63</u> <u>114.45</u> <u>106.05</u> <u>121.7</u> <u>123.15</u> <u>143.52</u> <u>156.66</u> <u>170.13</u> Total = Sum(45)s = <u>1694.35</u> (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= <u>26.35</u> <u>23.05</u> <u>23.78</u> <u>20.73</u> <u>19.89</u> <u>17.17</u> <u>15.91</u> <u>18.25</u> <u>18.47</u> <u>21.53</u> <u>23.5</u> <u>25.52</u> (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel <u>1</u> (47) If community heating and no tank in dwelling, enter 110 litres in (47)														1		
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not more that 125 litres per person per day (all water use, hot and cold) $\begin{array}{c c c c c c c c c c c c c c c c c c c $				ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		10	7.69		(43)	
Hot water usage in litres per day for each month Vd, $m = factor from Table 1c x (43)$ (44) $m = 118.46 114.15 109.84 105.53 101.23 96.92 96.92 101.23 105.53 109.84 114.15 118.46$ Total = Sum(44) ₁₁₂ = 1292.26 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd, $m x nm x DTm / 3600 kWh/month$ (see Tables 1b, 1c, 1d) (45) $m = 175.67 153.64 158.54 138.22 132.63 114.45 106.05 121.7 123.15 143.52 156.66 170.13$ Total = Sum(45) ₁₁₂ = 1694.35 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46) $m = 26.35 23.05 23.78 20.73 19.89 17.17 15.91 18.25 18.47 21.53 23.5 25.52$ (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 1 (47)			-				-	-	to achieve	a water u	se target o	f		1		
$\begin{array}{c} (44)m= & 118.46 & 114.15 & 109.84 & 105.53 & 101.23 & 96.92 & 96.92 & 101.23 & 105.53 & 109.84 & 114.15 & 118.46 \\ & & & & & & & & & & & & & & & & & & $		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
$Total = Sum(44)_{112} = 1292.26$ (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 175.67 153.64 158.54 138.22 132.63 114.45 106.05 121.7 123.15 143.52 156.66 170.13 Total = Sum(45)_{112} = 1694.35 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26.35 23.05 23.78 20.73 19.89 17.17 15.91 18.25 18.47 21.53 23.5 25.52 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 1 (47) If community heating and no tank in dwelling, enter 110 litres in (47)	Hot wat	er usage in	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)							
Energy content of hot water used - calculated monthly = $4.190 \times Vd, m \times nm \times DTm / 3600 \ kWh/month$ (see Tables 1b, 1c, 1d) (45)m= 175.67 153.64 158.54 138.22 132.63 114.45 106.05 121.7 123.15 143.52 156.66 170.13 Total = Sum(45)_{112} = 1694.35 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26.35 23.05 23.78 20.73 19.89 17.17 15.91 18.25 18.47 21.53 23.5 25.52 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 1 (47) If community heating and no tank in dwelling, enter 110 litres in (47)	(44)m=	118.46	114.15	109.84	105.53	101.23	96.92	96.92	101.23	105.53	109.84	114.15	118.46			
$ \begin{array}{c} (45)m = & 175.67 & 153.64 & 158.54 & 138.22 & 132.63 & 114.45 & 106.05 & 121.7 & 123.15 & 143.52 & 156.66 & 170.13 \\ \hline \\ total = & Sum(45)_{112} = & 1694.35 & (45) \\ total = & Sum(45)_{112} = & 1694.35 & (45) \\ \hline \\ (46)m = & 26.35 & 23.05 & 23.78 & 20.73 & 19.89 & 17.17 & 15.91 & 18.25 & 18.47 & 21.53 & 23.5 & 25.52 \\ \hline \\ Water storage loss: \\ Storage volume (litres) including any solar or WWHRS storage within same vessel & 1 & (47) \\ \hline \\ If community heating and no tank in dwelling, enter 110 litres in (47) \\ \end{array} $	_													1292.26	(44)	
$Total = Sum(45)_{112} = 1694.35$ (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26.35 23.05 23.78 20.73 19.89 17.17 15.91 18.25 18.47 21.53 23.5 25.52 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 1 (47) If community heating and no tank in dwelling, enter 110 litres in (47)	Energy	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,i I	m x nm x L	JTM / 3600) KWh/mor I	nth (see Ta	ables 1b, 1	c, 1a)	1		
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 26.35 23.05 23.78 20.73 19.89 17.17 15.91 18.25 18.47 21.53 23.5 25.52 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 1 (47) If community heating and no tank in dwelling, enter 110 litres in (47) (47)	(45)m=	175.67	153.64	158.54	138.22	132.63	114.45	106.05	121.7	123.15	143.52	156.66	170.13			
Water storage loss:	lf instan	itaneous w	ater heati	ng at point	of use (no	hot wate	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ :	=	1694.35	(45)	
Storage volume (litres) including any solar or WWHRS storage within same vessel 1 (47) If community heating and no tank in dwelling, enter 110 litres in (47) (47)	1 (L			23.78	20.73	19.89	17.17	15.91	18.25	18.47	21.53	23.5	25.52		(46)	
If community heating and no tank in dwelling, enter 110 litres in (47)	Water storage loss:															
			,		0 ,			•		ame ves	sei		1		(47)	
		-	-			-				ers) ent	or '()' in (47)				

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):												0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
			-	e, kWh/ye				(48) x (49) =			1		(50)
,						or is not h/litre/da							I	
		leating s				n/iitie/ua	ay)				0.	.03		(51)
	•	from Ta									4.	.93		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/ye	ear			(47) x (51) x (52) x (53) =	0	0.1		(54)
	、 ,	(54) in (5	,								0	.1		(55)
Water	storage	loss cal	culated	for each	month	•	•	((56)m = (55) × (41)ı	n				
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)
If cylinde	er contain:	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – ((H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
	•					59)m = (. ,	. ,						
(mo	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)		I	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Tota <mark>l h</mark>	n <mark>ea</mark> t requ	uired for	water h	eating ca	alculated	for eac	h mo <mark>nth</mark>	(62)m =	0.85 × (45) <mark>m +</mark>	(46)m +	(57)m +	(59)m + (6 ⁻	l)m
(62)m=	201.96	177.3 <mark>9</mark>	18 <mark>4.84</mark>	163.67	158.92	139.89	132.34	147.99	148.59	169.81	182.11	196.42		(62)
Solar Di	HW input o	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, <mark>see</mark> Ap	pendix (<u>3)</u>			-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter					-						
(64)m=	201.96	177.39	184.84	163.67	158.92	139.89	132.34	147.99	148.59	169.81	182.11	196.42		
								Out	out from wa	ater heatei	(annual)₁	12	2003.92	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	77.02	67.89	71.33	63.97	62.71	56.06	53.87	59.07	58.96	66.33	70.1	75.18		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gain	s (Table	e 5), Wat	ts				-						
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	185.65	185.65	185.65	185.65	185.65	185.65	185.65	185.65	185.65	185.65	185.65	185.65		(66)
Lightin	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	105.02	93.28	75.86	57.43	42.93	36.24	39.16	50.9	68.32	86.75	101.25	107.94		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ole 5	_	-		
(68)m=	648.26	654.99	638.03	601.95	556.39	513.58	484.97	478.25	495.2	531.29	576.84	619.66		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equat	tion L15	or L15a)), also se	e Table	5				
(69)m=	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66	56.66		(69)
Pumps	s and fai	ns gains	(Table s	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)

Losses e.g. evaporation (negative values) (Table 5)															
(71)m=	-123.77	-123.77	-123.77	-123.7	7 -123.7	7 -1	23.77	-123.77	-123	.77 -123.77	-123.7	7 -123.77	-123.77]	(71)
Water	heating	, gains (T	able 5)		•	•						•	•	-	
(72)m=	103.52	101.03	95.87	88.84	84.29) 7	77.87	72.41	79	.4 81.88	89.1	5 97.36	101.04		(72)
Total i	nterna	l gains =					(66)	m + (67)m	1 + (68	3)m + (69)m + ((70)m +	(71)m + (72))m	-	
(73)m=	975.34	967.84	928.3	866.7	7 802.1	5 7	46.23	715.09	727	7.1 763.95	825.7	4 894	947.18]	(73)
6. So	ar gain	s:													
-			•	ar flux fro	om Table 6	Sa and		•	tions	to convert to th	e appli		tion.		
Orienta		Access F Table 6d	actor	Are m			Flu: Tab	x ole 6a		g_ Table 6b		FF Table 6c		Gains (W)	
N I o utilo						1					_				-
North	0.9x	1	×		0.8	×		0.63	X	0.9	_ ×	0.9	=	24.81	(74)
North	0.9x	1	×		1.54	×		0.63	X	0.9	_ ×	0.9	=	23.88	(74)
North	0.9x	1	×		0.8	×	<u> </u>	0.32	X	0.9	_ ×	0.9	=	47.4	(74)
North	0.9x	1	×		1.54	×	2	0.32	X	0.9	×	0.9	=	45.63	(74)
North	0.9x	1	×		0.8	×		4.53	X	0.9	_ ×	0.9	=	80.55	(74)
North	0.9x	1	×		1.54	×	3	4.53	X	0.9	_ ×	0.9	=	77.53	(74)
North	0.9x	1	×		0.8	×	<u> </u>	5.46	X	0.9	×	0.9		129.39	(74)
North	0.9x	1	×		1.54	X	⊨—	5.46	X	0.9	×	0.9		124.54	(74)
North	0.9x	1	×		0.8	X	<u> </u>	4.72	X	0.9	×	0.9	=	174.3	(74)
North	0.9x	1	×		1.54	X		4.72	X	0.9	×	0.9	=	167.76	(74)
North	0.9x	1	×		0.8	×		9.99	X	0.9	×	0.9	=	186.59	(74)
North	0.9x	1	×		1.54] ×		9.99	Х	0.9	×	0.9	=	179.59	(74)
North	0.9x	1	×		0.8	×	7	4.68	X	0.9	x	0.9	=	174.21	(74)
North	0.9x	1	X		1.54	×	7.	4.68	X	0.9	×	0.9	=	167.67	(74)
North	0.9x	1	×		0.8	×	5	9.25	X	0.9	×	0.9	=	138.21	(74)
North	0.9x	1	X		1.54	×		9.25	X	0.9	×	0.9	=	133.03	(74)
North	0.9x	1	X		0.8	×	4	1.52	X	0.9	×	0.9	=	96.85	(74)
North	0.9x	1	×		1.54	×	4	1.52	x	0.9	×	0.9	=	93.22	(74)
North	0.9x	1	×		0.8	×	2	4.19	x	0.9	×	0.9	=	56.43	(74)
North	0.9x	1	×		1.54	×	2	4.19	x	0.9	×	0.9	=	54.31	(74)
North	0.9x	1	×		0.8	×	1	3.12	x	0.9	×	0.9	=	30.6	(74)
North	0.9x	1	×		1.54	×	1	3.12	x	0.9	×	0.9	=	29.45	(74)
North	0.9x	1	X		0.8	×	8	8.86	x	0.9	×	0.9	=	20.68	(74)
North	0.9x	1	×		1.54	×	8	8.86	x	0.9	×	0.9	=	19.9	(74)
East	0.9x	1	×		4	×	1	9.64	x	0.9	x	0.9	=	57.27	(76)
East	0.9x	1	×		4] ×	3	8.42	x	0.9	x	0.9	=	112.03	(76)
East	0.9x	1	×		4	×	6	3.27	x	0.9	x	0.9	=	184.5	(76)
East	0.9x	1	×		4	×	9	2.28	x	0.9	x	0.9	=	269.09	(76)
East	0.9x	1	×		4	×	11	3.09	x	0.9	x	0.9	=	329.78	(76)
East	0.9x	1	x		4	×	11	5.77	x	0.9	x	0.9	=	337.59	(76)

East	0.9x	1	x	4	x	110.22	x	0.9	x	0.9] =	321.4	(76)
East	0.9x	1	x	4	x	94.68	x	0.9	x	0.9	=	276.07](76)
East	0.9x	1	x	4	x	73.59	x	0.9	x	0.9	=	214.59](76)
East	0.9x	1	x	4	x	45.59	x	0.9	x	0.9	=	132.94](76)
East	0.9x	1	x	4	x	24.49	x	0.9	x	0.9	=	71.41	(76)
East	0.9x	1	x	4	x	16.15	x	0.9	x	0.9	=	47.1	(76)
South	0.9x	1	x	3.3	x	46.75	x	0.9	x	0.9	=	112.47	(78)
South	0.9x	1	x	3.1	x	46.75	x	0.9	x	0.9	=	105.65	(78)
South	0.9x	1	x	2.1	x	46.75	x	0.9	x	0.9	=	71.57	(78)
South	0.9x	1	x	3.3	x	76.57	x	0.9	x	0.9	=	184.2	(78)
South	0.9x	1	x	3.1	x	76.57	x	0.9	x	0.9	=	173.04	(78)
South	0.9x	1	x	2.1	x	76.57	x	0.9	x	0.9	=	117.22	(78)
South	0.9x	1	x	3.3	x	97.53	x	0.9	x	0.9	=	234.64	(78)
South	0.9x	1	x	3.1	x	97.53	x	0.9	x	0.9	=	220.42	(78)
South	0.9x	1	x	2.1	x	97.53	x	0.9	x	0.9	=	149.31	(78)
South	0.9x	1	x	3.3	x	110.23	x	0.9	x	0.9	=	265.19	(78)
South	0.9x	1	x	3.1	x	110.23	x	0.9	x	0.9	=	249.12	(78)
South	0.9x	1	x	2.1	×	110.23	x	0.9	x	0.9	=	168.76	(78)
South	0.9x	1	x	3.3	x	114.87	x	0.9	x	0.9	=	276.35	(78)
South	0.9x	1	x	3.1	x	114.87	×	0.9	x	0.9	=	259.6	(78)
South	0.9x	1	x	2.1	x	114.87	x	0.9	x	0.9	=	175.86	(78)
South	0.9x	1	x	3.3	x	110. <mark>5</mark> 5	х	0.9	x	0.9	=	2 <mark>65.94</mark>	(78)
South	0.9x	1	x	3.1	x	110.55	x	0.9	x	0.9	=	2 <mark>49.83</mark>	(78)
South	0.9x	1	x	2.1	x	110.55	x	0.9	x	0.9	=	1 <mark>69.24</mark>	(78)
South	0.9x	1	x	3.3	x	108.01	x	0.9	x	0.9	=	259.84	(78)
South	0.9x	1	x	3.1	x	108.01	x	0.9	x	0.9	=	244.1	(78)
South	0.9x	1	x	2.1	x	108.01	x	0.9	x	0.9	=	165.36	(78)
South	0.9x	1	x	3.3	x	104.89	x	0.9	x	0.9	=	252.34	(78)
South	0.9x	1	x	3.1	x	104.89	x	0.9	x	0.9	=	237.05	(78)
South	0.9x	1	x	2.1	x	104.89	x	0.9	x	0.9	=	160.58	(78)
South	0.9x	1	x	3.3	x	101.89	x	0.9	x	0.9	=	245.11	(78)
South	0.9x	1	x	3.1	x	101.89	x	0.9	x	0.9	=	230.25	(78)
South	0.9x	1	X	2.1	X	101.89	X	0.9	x	0.9	=	155.98	(78)
South	0.9x	1	x	3.3	x	82.59	x	0.9	x	0.9	=	198.68	(78)
South	0.9x	1	X	3.1	X	82.59	X	0.9	x	0.9	=	186.64	(78)
South	0.9x	1	x	2.1	x	82.59	x	0.9	x	0.9	=	126.43	(78)
South	0.9x	1	X	3.3	x	55.42	x	0.9	x	0.9	=	133.32	(78)
South	0.9x	1	X	3.1	x	55.42	X	0.9	X	0.9	=	125.24	(78)
South	0.9x	1	X	2.1	x	55.42	X	0.9	x	0.9	=	84.84	(78)
South	0.9x	1	x	3.3	×	40.4	x	0.9	x	0.9	=	97.19	(78)
South	0.9x	1	X	3.1	X	40.4	x	0.9	x	0.9	=	91.3	(78)

	_								_								
South	0.9x	1		x	2.1)		40.4	x	0.9		x	0.9		=	61.85	(78)
West	0.9x	1		x	0.98)		19.64	x	0.9		x	0.9		=	42.09	(80)
West	0.9x	1		x	0.98)		38.42	x	0.9		x	0.9		=	82.35	(80)
West	0.9x	1		x	0.98)		63.27	x	0.9		x	0.9		=	135.61	(80)
West	0.9x	1		x	0.98)		92.28	x	0.9		x	0.9		=	197.78	(80)
West	0.9x	1		x	0.98)		113.09	x	0.9		x	0.9		=	242.39	(80)
West	0.9x	1		x	0.98)		115.77	x	0.9		x	0.9		=	248.13	(80)
West	0.9x	1		x	0.98)		110.22	x	0.9		x	0.9		=	236.23	(80)
West	0.9x	1		x	0.98)		94.68	x	0.9		x	0.9		=	202.91	(80)
West	0.9x	1		x	0.98	,		73.59	x	0.9		x	0.9		=	157.72	(80)
West	0.9x	1		x	0.98	,		45.59	x	0.9		x	0.9		=	97.71	(80)
West	0.9x	1		x	0.98	,		24.49	x	0.9		x	0.9		=	52.49	(80)
West	0.9x	1		x	0.98	Ξ,		16.15	x	0.9		x	0.9		=	34.62	(80)
Rooflig	hts 0.9x	1		x	1	Ξ,		26	x	0.7		x	0.7		=	22.93	(82)
Rooflig	hts 0.9x	1		x	1	,		54	x	0.7		x	0.7		=	47.63	(82)
Rooflig	hts <mark>0.9x</mark>	1		x	1	Ξ,		96	x	0.7		x	0.7		=	84.67	(82)
Rooflig	hts 0.9x	1		x	1],		150	x	0.7		x	0.7		=	132.3	(82)
Rooflig	hts 0.9x	1		x	1			192	x	0.7		х	0.7		=	169.34	(82)
Roof <mark>lig</mark>	hts <mark>0.9x</mark>	1		x	1	╡,		200	x	0.7		x	0.7		-	176.4	(82)
Roof <mark>lig</mark>	hts 0.9x	1		x	1	=,		189	i 🗴	0.7		x	0.7		=	166.7	(82)
Roof <mark>lig</mark>	hts 0.9x	1		x	1			157	x	0.7		x	0.7		=	138.47	(82)
Roof <mark>lig</mark>	hts 0.9x	1		x	1	۲,		115	x	0.7		x	0.7		=	101.43	(82)
Roof <mark>lig</mark>	hts 0.9x	1		x	1	╡,		66	×	0.7		x	0.7	=	=	58.21	(82)
Roof <mark>lig</mark>	hts 0.9x	1		x	1	,		33	x	0.7		x	0.7		=	29.11	(82)
Rooflig	hts 0.9x	1		x	1	۲,		21	x	0.7	-	x	0.7		=	18.52	(82)
	-																
Solar g	gains in	watts, ca	alculat	ed	for each m	onth			(83)m	n = Sum(74)m	n(82	2)m					
(83)m=	460.68	809.49	1167.2	24	1536.16 179	5.37	1813.	31 1735.49	153	8.68 1295.14	4 91	1.34	4 556.45	391.	.14		(83)
Total g	gains – i	nternal a	ind so	lar	(84)m = (73	3)m +	(83)	m, watts	-								
(84)m=	1436.02	1777.33	2095.5	54	2402.92 259	7.52	2559.	53 2450.58	226	5.78 2059.09	9 173	37.0	8 1450.45	1338	3.33		(84)
7. Me	an inter	nal temp	eratur	·е (heating sea	ason)											
Temp	perature	during h	eating	j pe	eriods in the	e livin	g are	ea from Tal	ole 9	, Th1 (°C)						21	(85)
Utilisa	ation fac	tor for ga	ains fo	or li	ving area, ł	n1,m	(see	Table 9a)									
	Jan	Feb	Ма	-		/lay	Ju		A	ug Sep		Oct	Nov	De	ес		
(86)m=	1	1	0.99		0.95 0.	84	0.66	6 0.49	0.5	55 0.81	0	.97	1	1			(86)
Mear	interna	l tempera	ature i	in li	iving area T	1 (fol	low s	steps 3 to 7	7 in 1	able 9c)	•						
(87)m=	19.85	20.03	20.3	-		.87	20.9		20.		20).58	20.15	19.8	82		(87)
			eating		eriods in res	et of c	Wall	ing from Tr			-		-1			I	
(88)m=	20.05	20.06	20.06	<u> </u>		.07	20.0	<u> </u>	20.	, , ,	-	0.07	20.07	20.0	06		(88)
		II									`					l	. /
	ation fac	tor for ga		-	0.93 0.	ing, h 79		<u>`</u>	<u> </u>	14 0.74		.96		4		1	(89)
(89)m=			0.98		0.93 0.	19	0.57	7 0.39	0.4	++ 0.74		.90	1	1			(03)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m= 18.51 18.78 19.16 19.63 19.94 20.06 20.07 20.07 20.01 19.58 18.95 18.47 (9	
$fLA = Living area \div (4) = 0.31$ (9	91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 18.92 19.16 19.51 19.93 20.23 20.34 20.36 20.36 20.29 19.89 19.32 18.88 (9.	92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	
(93)m= 18.92 19.16 19.51 19.93 20.23 20.34 20.36 20.36 20.29 19.89 19.32 18.88 (9	93)
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate	
the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.93 0.8 0.6 0.42 0.47 0.76 0.96 0.99 1 (9)	(4)
Useful gains, hmGm , W = (94) m x (84) m	()
(95)m = 1433.03 1765.59 2051.15 2230.62 2084.14 1529.63 1023.79 1072.08 1557.33 1666.89 1442.77 1336.4 (9)	95)
Monthly average external temperature from Table 8)
$(96)m = 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 \qquad (9)$	96)
Heat loss rate for mean internal temperature, Lm , $W = [(39)m \times [(93)m - (96)m]$	-,
$ (97)m = \begin{array}{c} 4098.7 \\ 3989.52 \\ 3632.52 \\ 3050.16 \\ 2352.55 \\ 1571.01 \\ 1028.48 \\ 1081.17 \\ 1699.51 \\ 2563.31 \\ 3384.44 \\ 4082.45 \end{array} $)7)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$	<u> </u>
$(98)m = 1983.26 \ 1494.48 \ 1176.54 \ 590.07 \ 199.7 \ 0 \ 0 \ 0 \ 0 \ 666.93 \ 1398 \ 2043.06$	
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 9552.04 (94	98)
Space heating requirement in kWh/m²/year 35.25 (9)	99)
8c. Space cooling requirement	
Calculated for June, July and August. See Table 10b	
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)	00)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 2571.96 2024.73 2076.17 0 0 0 (14)	00)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0	
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m=$ 00002571.962024.732076.170000(1)Utilisation factor for loss hm $(101)m=$ 0000.850.920.88000(1)	00) 01)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m = 0$ 0002571.962024.732076.170000(10)Utilisation factor for loss hm $(101)m = 0$ 0000.850.920.88000(11)Useful loss, hmLm (Watts) = (100)m x (101)m	01)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m=$ 00002571.962024.732076.170000(100) $(100)m=$ 00000.850.920.88000(100)Utilisation factor for loss hm(101)m=0000.850.920.88000(100)Useful loss, hmLm (Watts) = (100)m x (101)m(101)m=00002176.11855.421832.83000(100)m	
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m = 0$ 0002571.962024.732076.170000(1) $(100)m = 0$ 0000.850.920.88000(1)Utilisation factor for loss hm $(101)m = 0$ 0000.850.920.88000(1)Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m = 0$ 0002176.11855.421832.83000(1)Gains (solar gains calculated for applicable weather region, see Table 10)	01) 02)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rateLm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m=$ 0002571.962024.732076.170000 $(100)m=$ 00000.850.920.880000(1)Utilisation factor for loss hm $(101)m=$ 0000.850.920.88000(1)Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m=$ 0002176.11855.421832.83000(1)Gains (solar gains calculated for applicable weather region, see Table 10) $(103)m=$ 0002559.542450.58265.78000(1)	01)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) $(100)m = 0$ 0002571.962024.732076.170000(1) $(100)m = 0$ 0000.850.920.88000(1)Utilisation factor for loss hm $(101)m = 0$ 0000.850.920.88000(1)Useful loss, hmLm (Watts) = (100)m x (101)m $(102)m = 0$ 0002176.11855.421832.83000(1)Gains (solar gains calculated for applicable weather region, see Table 10)	01) 02)
Calculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rateLm (calculated using 25°C internal temperature and external temperature from Table 10)(100)m=00002571.962024.732076.170000(11)(100)m=00000.850.920.88000(11)Utilisation factor for Ioss hm(101)m=0000.850.920.88000(11)Useful loss, hmLm (Watts) = (100)m x (101)m(102)m=0002176.11855.421832.83000(11)Gains (solar gains calculated for applicable weather region, see Table 10)(103)m=0002559.542450.582265.78000(11)Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$	01) 02)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td>01) 02)</td>	01) 02)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td>01) 02) 03)</td>	01) 02) 03)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td>01) 02) 03) 04)</td>	01) 02) 03) 04)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td>01) 02) 03) 04)</td>	01) 02) 03) 04)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td>01) 02) 03) 04)</td>	01) 02) 03) 04)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td>01) 02) 03) 04) 05)</td>	01) 02) 03) 04) 05)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Ju Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0	01) 02) 03) 04) 05) 06)
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Ju Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0	01) 02) 03) 04) 05)

9b. Energy requirements – Community heating sch This part is used for space heating, space cooling		rovided by a community scheme											
Fraction of space heat from secondary/supplemen			0	(301)									
Fraction of space heat from community system 1 -	- (301) =		1	(302)									
The community scheme may obtain heat from several sources includes boilers, heat pumps, geothermal and waste heat from			the latter										
Fraction of heat from Community heat pump			1	(303a)									
Fraction of total space heat from Community heat	pump	(302) x (303a) =	1	(304a)									
Factor for control and charging method (Table 4c(3)) for community I	neating system	1	(305)									
Distribution loss factor (Table 12c) for community I	heating system		1.05	(306)									
Space heating			kWh/year	_									
Annual space heating requirement			9552.04										
Space heat from Community heat pump		(98) x (304a) x (305) x (306) =	10029.65	(307a)									
Efficiency of secondary/supplementary heating sys	stem in % (from Ta	ble 4a or Appendix E)	0	(308									
Space heating requirement from secondary/supple	ementary system	(98) x (301) x 100 ÷ (308) =	0	(309)									
Water heating				-									
Annual water heating requirement If DHW from community scheme:			2003.92										
Water heat from Community heat pump		(64) x (303a) x (305) x (306) =	2104.12	(310a)									
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = 121.34$													
Cooling System Energy Efficiency Ratio													
Space cooling (if there is a fixed cooling system, if	not enter 0)	= (107) ÷ (314) =	77.11	(315)									
Electricity for pumps and fans within dwelling (Tab mechanical ventilation - balanced, extract or positi		de	0	(330a)									
warm air heating system fans			0	(330b)									
pump for solar water heating			0	(330g)									
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	0	(331)									
Energy for lighting (calculated in Appendix L)			741.87	(332)									
10b. Fuel costs – Community heating scheme													
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year										
Space heating from CHP	(307a) x	4.24 × 0.01 =	425.26	(340a)									
Water heating from CHP	(310a) x	4.24 x 0.01 =	89.21	(342a)									
		Fuel Price		-									
Space cooling (community cooling system)	(315)	13.19 × 0.01 =	10.17	(348)									
Pumps and fans	(331)	13.19 × 0.01 =	0	(349)									
Energy for lighting	(332)	13.19 × 0.01 =	97.85	(350)									
Additional standing charges (Table 12)			120	(351)									

Total energy cost	= (340a)(342e) + (345)	.(354) =			742.49	(355)
11b. SAP rating - Community heating	scheme					
Energy cost deflator (Table 12)				Г	0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0)] =		Ē	0.99	(357)
SAP rating (section12)					86.23	(358)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy kWh/year	Emission factor kg CO2/kWh		nissions J CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)) ing two fuels repeat (363) to	(366) for the second	fuel	350	(367a)
CO2 associated with heat source 1	[(307b])+(310b)] x 100 ÷ (367b) x	0	=	1799.26	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	62.97	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)(372	2)	=	1862.24	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instantar	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			1862.24	(376)
CO2 associated with space cooling		(315) x	0.52	=	40.02	(377)
CO2 associated with electricity for pump	os and fans within dwe	lling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	385.03	(379)
Total CO2, kg/year	sum of (376)(382) =			Г	2287.29	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				8.44	(384)
El rating (section 14)					90.3	(385)
13b. Primary Energy – Community heat	ing scheme					
		Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and		- HP)				_
Efficiency of heat source 1 (%)	If there is CHP us	ing two fuels repeat (363) to	(366) for the second	fuel	350	(367a)
Energy associated with heat source 1	[(307b))+(310b)] x 100 ÷ (367b) x	0	=	10643.04	(367)
Electrical energy for heat distribution		[(313) x		=	372.51	(372)
Total Energy associated with communit	y systems	(363)(366) + (368)(372	2)	=	11015.55	(373)
if it is negative set (373) to zero (unle	ss specified otherwise,	see C7 in Appendix C	<i>;</i>)		11015.55	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from imm	ersion heater or instan	taneous heater(312) x	3.07	=	0	(375)
Total Energy associated with space and	d water heating	(373) + (374) + (375) =			11015.55	(376)
Energy associated with space cooling		(315) x	3.07	=	236.73	(377)
Energy associated with electricity for pu	imps and fans within d	welling (331)) x	3.07	=	0	(378)
Energy associated with electricity for lig	hting	(332))) x	3.07	=	2277.53	(379)

Total Primary Energy, kWh/year

sum of (376)...(382) =

13529.81 (383)

				User D	etails:									
Assessor Name: Software Name:	Stroma I				Strom Softwa	are Vei			Versio	n: 1.0.3.11				
					Address	: Flat 8								
Address :		gton Road	, NW3 7I	RB										
1. Overall dwelling dime	ensions:				()									
Crown of floor					a(m²)		Av. Hei			Volume(m ³)	_			
Ground floor					19	(1a) x	2	2.9	(2a) =	55.1	(3a)			
First floor					134	(1b) x	2	2.9	(2b) =	388.6	(3b)			
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1r	n) 🔤	153	(4)								
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	443.7	(5)			
2. Ventilation rate:														
	main heatin		econdar neating	у	other		total			m ³ per hou	•			
Number of chimneys		<u>y</u> + [0	+	0] = [0	X 4	40 =	0	(6a)			
Number of open flues			0	」 」 + 厂	0	」] = 「	0	x	20 =	0	(6b)			
Number of intermittent fa							-		10 =					
						Ļ	3		10 =	30	(7a)			
Number of passive vents	0	(7b)												
Number of flueless gas f	o anges per ho	_												
If a pressurisation test has b	been ca <mark>rried o</mark> u	t or is intende				continue fr	30 om (9) to (÷ (5) =	0.07	(8)			
Number of storeys in t	he dw <mark>elling</mark>	(ns)								0	(9)			
Additional infiltration				0.05.6				[(9)·	-1]x0.1 =	0	(10)			
Structural infiltration: C if both types of wall are p deducting areas of openi	present, use the	value corres					uction			0	(11)			
If suspended wooden	floor, enter ().2 (unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)			
If no draught lobby, en										0	(13)			
Percentage of window	s and doors	draught st	ripped							0	(14)			
Window infiltration					0.25 - [0.2					0	(15)			
Infiltration rate					(8) + (10)					0	(16)			
Air permeability value,				•	•	•	etre of e	nvelope	area	4.5	(17)			
If based on air permeabi	-							1		0.29	(18)			
Air permeability value applie Number of sides sheltere		ation test has	s been aon	e or a deg	gree air pe	rmeability	is being us	sea		4	(19)			
Shelter factor	50				(20) = 1 -	[0.075 x (1	9)] =			1 0.92	(19)			
Infiltration rate incorpora	ting shelter t	actor			(21) = (18) x (20) =				0.27	(21)			
Infiltration rate modified for monthly wind speed														
Jan Feb	Mar Ap	- <u>i</u>	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind sp			•											
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7					

Wind F	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		
Adjuste	ed infiltra	ation rat	e (allowi	ing for sh	elter an	d wind s	speed) =	= (21a) x	(22a)m					
	0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.3	0.32		
			-	rate for t	he appli	cable ca	ise	•				·		
	echanica			ondiv NL (2	2h) _ (22		acuation (nuico (22h) _ (22a)		l	0	(23a)
								N5)) , othe) = (23a)			0	(23b)
			-	-	-			m Table 4h					0	(23c)
a) If ((24a)m=						at recove		HR) (24a	a = (2)	20)m + (0	23D) × [*	1 – (23c) 0	÷ 100]	(24a)
	-			_	-						-	0		(240)
(24b)m=								MV) (24b 0	0 1 1 1 1 1 1 1 1 1 1		230)	0		(24b)
i i L			-		-			on from c	-	0	0	Ū		(=)
					-	-		lc) = (22k		.5 x (23b	5)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural v	ventilatio	n or wh	lole hous	e positiv	ve input	ı ventilati	on from l	oft					
								0.5 + [(2		0.5]				
(24d) <mark>m=</mark>	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d)
Effec	ctiv <mark>e air</mark>	change	rate - er	nter (<mark>24a</mark>) or (24	o) or (24	c) or (24	ld) in bo	(25)					
(25)m=	<mark>0</mark> .56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
3 Hea	at losses	s and he	at loss i	paramete	er.									
ELEN		Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value	,	AXk
		area	(m²)	m	-	A ,r	m²	W/m2	K	(W/	K)	kJ/m²∙ł	(kJ/K
Doo <mark>rs</mark>						1.68	x	0.8	=	1.344				(26)
Window	ws Type	1				3.43	x1	/[1/(1.2)+	0.04] =	3.93				(27)
Window	ws Type	2				3.3	x1	/[1/(1.2)+	0.04] =	3.78				(27)
Window	ws Type	3				1.84	x1	/[1/(1.2)+	0.04] =	2.11				(27)
Window	ws Type	4				1.4	x1	/[1/(1.2)+	0.04] =	1.6				(27)
Rooflig	hts Typ	e 1				1	x1	/[1/(1.3) +	0.04] =	1.3				(27b)
Rooflig	hts Typ	e 2				1		/[1/(1.3) +	0.04] =	1.3				(27b)
Walls T	Type1	36.	7	0		36.7	x	0.12		4.4				(29)
Walls T	ype2	9.5	7	0		9.57	x	0.12	=	1.15			i –	(29)
Walls T	уре3	36.7	7	0		36.77	7 X	0.12		4.41			-	(29)
Walls T	vpe4	53.3	36	1.68		51.68	3 X	0.12		6.2			$\exists \vdash$	(29)
Walls T		98.		0		98.6		0.12		11.83			\dashv	(29)
Walls T		53.3		0		53.36		0.12		6.4			╡┝	(29)
Walls T		9.5		4.2		5.37		0.12		0.4	╡╏		\dashv	(29)
Walls T													\dashv	(29)
Roof	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	9.8		0		9.86		0.12	= 1	1.18			\dashv	
	roo of o	147		7		140	×	0.12	=	16.8				(30)
rotara	rea of e	iements	, 111-			466.7	9							(31)

	ndows and de the area						lated using	formula 1,	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	3.2	
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				81.57	(33)
Heat o	capacity	Cm = S((Axk)						0	(34)				
Therm	al mass	parame	ter (TMF	^o = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35)
	ign assess used inste				construct	ion are no	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	K						70.02	(36)
if detail	s of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			151.59	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y	-			(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	81.93	81.59	81.26	79.7	79.41	78.05	78.05	77.8	78.57	79.41	80	80.62		(38)
Heat t	ransfer o	coefficier	nt. W/K						(39)m	= (37) + (3	38)m			
(39)m=		233.18	232.85	231.29	231	229.64	229.64	229.39	230.17	231	231.59	232.21		
	Average = Sum(39) ₁₁₂ /12=											231.29	(39)	
Heat I	eat loss parameter (HLP), W/m ² K (40)m = (39)m \div (4)													
(40)m=	1.53	1.52	1.52	1.51	1.51	1.5	1.5	1.5	1.5	1.51	1.51	1.52		
	Average = Sum(40) ₁₁₂ /12=											1.51	(40)	
Numb	er of day	's in moi	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. W	ater heat	ing ener	rgy <mark>requ</mark>	irement:								kWh/ye	ear:	
if TF	ned occu FA > 13.9 FA £ 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	A -13.9)2)] + 0.(00 <mark>13 x (</mark>	TFA -13.		94		(42)
Annua	al averag	e hot wa						(25 x N) to achieve		se target o		04		(43)
	e that 125	-				-	-			-				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	114.4	110.24	106.08	101.92	97.76	93.6	93.6	97.76	101.92	106.08	110.24	114.4		
									-	Total = Su	m(44) ₁₁₂ =	=	1247.95	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	m x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	169.65	148.37	153.11	133.48	128.08	110.52	102.42	117.52	118.93	138.6	151.29	164.29		
lf instar	ntaneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1636.26	(45)
(46)m=	25.45	22.26	22.97	20.02	19.21	16.58	15.36	17.63	17.84	20.79	22.69	24.64		(46)
	storage						-							
-		. ,					-	within sa	ame ves	sel		1		(47)
	munity h	-			-									
			hot wate	er (this in	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	storage		aclarad I	oss fact	nr ie kno	wn /k\\/I	n/dav).					0	l	(40)
a) 11 1	If manufacturer's declared loss factor is known (kWh/day): 0										(48)			
Tom						,	,					0		(49)

Energy lost from water storage, kWh/year (48) x (49) = 1 b) If manufacturer's declared cylinder loss factor is not known: 1 Hot water storage loss factor from Table 2 (kWh/litre/day) 0.03														(50)
	munity h	-			ie z (kvv	n/iitie/ua	ly)				0.	.03		(51)
	e factor	-									4.	93		(52)
Tempe	erature f	actor fro	m Table	2b								.6		(53)
Energ	y lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	0	.1		(54)
Enter	(50) or ((54) in (5	55)								0	.1		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(56)
If cylind	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	3.03	2.74	3.03	2.93	3.03	2.93	3.03	3.03	2.93	3.03	2.93	3.03		(57)
Drimo			l nuol) fr	n Sm Table								0		(58)
	•	`	,		month (59)m = ((58) ÷ 36	5 x (41)	m			0		(00)
							. ,	. ,		r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi		lculated	for each	month ((61)m =	(60) <u>-</u> 36	5 v (11)	l						
(61)m=						$(00) \div 30$	0	0	0	0	0	0		(61)
		-			-	-	÷	l	-				(50)m (61)m	(0.)
	195.94	172.12	179.4	158.93	154.37	135.97	128.71	143.82	144.37	45)111 + 164.89	176.74	190.58	(59)m + (61)m	(62)
(62)m=														(02)
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)														
									0	0	0	0		(63)
(63)m=			-		0	0	0	0		0	0	0		(00)
-	t from wa			450.00	454.07	105.07	100 71	4 40 00	444.07	404.00	470.74	100 50		
(64)m=	195.94	172.12	179.4	158.93	154.37	135.97	128.71	143.82	144.37	164.89	176.74	190.58	4045.00	(64)
						_ / • • •	()			ater heater		I	1945.83	(04)
-							. ,		-		. ,	+ (59)m		(05)
												73.24		(65)
inclu	ude (57)ı	m in calo	culation	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	176.33	176.33	176.33	176.33	176.33	176.33	176.33	176.33	176.33	176.33	176.33	176.33		(66)
Lightir	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5					
(67)m=	72.19	64.12	52.15	39.48	29.51	24.91	26.92	34.99	46.97	59.64	69.6	74.2		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	483.23	488.25	475.61	448.71	414.75	382.84	361.52	356.5	369.14	396.04	430	461.91		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5				
(69)m=	55.57	55.57	55.57	55.57	55.57	55.57	55.57	55.57	55.57	55.57	55.57	55.57		(69)
	s and far	ns dains	(Table !	5a)	I			I	I				I	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
		aporatio	n (nega		es) (Tab			I	I		L	1	I	
(71)m=	<u> </u>	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55	-117.55		(71)
· · · · · ·			L	L				I	l					

Water heating gains (Table 5)							
(72)m= 100.83 98.43 93.44	86.66 82.25	76.05 70.78	77.54 79.93	86.95 94.88	98.44		(72)
Total internal gains =	• •	(66)m + (67)m	n + (68)m + (69)m + ((70)m + (71)m + (72)	m		
(73)m= 770.61 765.15 735.55	689.19 640.87	598.15 573.57	583.38 610.39	656.98 708.83	748.9		(73)
6. Solar gains:			•				
Solar gains are calculated using solar	flux from Table 6a ar	d associated equa	tions to convert to th	e applicable orientat	ion.		
Orientation: Access Factor	Area	Flux	g	FF		Gains	
Table 6d	m²	Table 6a	Table 6b	Table 6c		(W)	
North 0.9x 1 x	3.3 ×	10.63	× 0.9	× 0.9	=	25.58	(74)
North 0.9x 1 x	1.84 ×	10.63	× 0.9	× 0.9	=	14.26	(74)
North 0.9x 1 x	3.3 ×	20.32	× 0.9	× 0.9	=	48.89	(74)
North 0.9x 1 x	1.84 ×	20.32	× 0.9	× 0.9	=	27.26	(74)
North 0.9x 1 x	3.3 ×	34.53	× 0.9	× 0.9	=	83.07	(74)
North 0.9x 1 x	1.84 ×	34.53	× 0.9	× 0.9	=	46.32	(74)
North 0.9x 1 X	3.3 ×	55.46	× 0.9	× 0.9	=	133.43	(74)
North 0.9x 1 X	1.84 ×	55.46	× 0.9	× 0.9	=	74.4	(74)
North 0.9x 1 x	3.3 ×	74.72	× 0.9	x 0.9		179.74	(74)
North 0.9x 1 x	1.84 ×	74.72	X 0.9	x 0.9	=	100.22	(74)
North 0.9x 1 x	3.3 ×	79.99	X 0.9	× 0.9	=	192.42	(74)
North 0.9x 1 x	1.84 ×	79.99	× 0.9	× 0.9	=	107.29	(74)
North 0.9x 1 x	3.3 ×	74.68	× 0.9	× 0.9	=	179.65	(74)
North 0.9x 1 x	1.84 ×	74.68	x 0.9	× 0.9	=	100.17	(74)
North 0.9x 1 x	3.3 ×	59.25	× 0.9	× 0.9	=	142.53	(74)
North 0.9x 1 x	1.84 ×	59.25	× 0.9	× 0.9	=	79.47	(74)
North 0.9x 1 X	3.3 ×	41.52	× 0.9	× 0.9	=	99.88	(74)
North 0.9x 1 x	1.84 ×	41.52	× 0.9	× 0.9	=	55.69	(74)
North 0.9x 1 x	3.3 ×	24.19	× 0.9	× 0.9	=	58.19	(74)
North 0.9x 1 X	1.84 ×	24.19	× 0.9	× 0.9	=	32.45	(74)
North 0.9x 1 x	3.3 ×	13.12	× 0.9	× 0.9	=	31.56	(74)
North 0.9x 1 x	1.84 ×	13.12	× 0.9	× 0.9	=	17.6	(74)
North 0.9x 1 x	3.3 ×	8.86	× 0.9	× 0.9	=	21.33	(74)
North 0.9x 1 x	1.84 ×	8.86	x 0.9	x 0.9	=	11.89	(74)
East 0.9x 3 x	1.4 ×	19.64	× 0.9	× 0.9	=	60.13	(76)
East 0.9x 3 x	1.4 ×	38.42	× 0.9	× 0.9	=	117.64	(76)
East 0.9x 3 x	1.4 ×	63.27	× 0.9	× 0.9	=	193.73	(76)
East 0.9x 3 x	1.4 ×	92.28	x 0.9	× 0.9	=	282.54	(76)
East 0.9x 3 x	1.4 ×	113.09	× 0.9	× 0.9	=	346.27	(76)
East 0.9x 3 x	1.4 ×	115.77	x 0.9	× 0.9	=	354.47	(76)
East 0.9x 3 x	1.4 ×	110.22	× 0.9	× 0.9	=	337.47	(76)
East 0.9x 3 x	1.4 ×	94.68	× 0.9	× 0.9	=	289.88	(76)

East 0.9x	3	x	1.4	x	73.59	x	0.9	x	0.9	=	225.32	(76)
East 0.9x	3	x	1.4	x	45.59	x	0.9	x	0.9	=	139.58](76)
East 0.9x	3	x	1.4	x	24.49	x	0.9	x	0.9	=	74.98](76)](76)
East 0.9x	3	x	1.4	x	16.15	x	0.9	x	0.9	_	49.45](76)
South 0.9x	1	x				x		x		=](78)
South 0.9x		x	3.43	x	46.75	x	0.9	x	0.9	-	233.8	(78)
South 0.9x	1	x	3.43 3.43	x x	76.57	x	0.9	x	0.9	-	382.91	_(78)
South 0.9x	1	x	3.43	x	97.53 110.23	x	0.9	x	0.9	-	487.76 551.28](78)
South 0.9x	1	x	3.43	×	114.87	x	0.9	x	0.9	-	574.46	(78)
South 0.9x	1	x	3.43	x	114.67	x	0.9	x	0.9	-	552.84](78)
South 0.9x		x		x		x		x		=](78)
South 0.9x	1	x	3.43 3.43	×	108.01 104.89	x	0.9	x	0.9	-	540.16 524.57	(78)
South 0.9x	1	x	3.43	x	104.89	x	0.9	x	0.9	-	509.52](78)
South 0.9x		x										(78)
South 0.9x	1		3.43	x	82.59	x	0.9	x	0.9	=	413.01	(78)
South 0.9x	1	X	3.43	X	55.42	X	0.9	x	0.9	=	277.14	4
Rooflights 0.9x	1	X	3.43	X	40.4	X	0.9	x	0.9	=	202.03	(78)
Rooflights 0.9x	1	X	1	X	26	X	0.7	X	0.7	=	22.93	(82)
Rooflights 0.9x	1	X	1		26	X	0.7	x	0.7	=	57.33	(82)
Rooflights 0.9x	1	X	1	X	54	×	0.7	X	0.7	=	47.63	(82)
Rooflights 0.9x	1	X	1	X	54	×	0.7	X	0.7	=	119.07	(82) (82)
Rooflights 0.9x	1	X	1		96	X	0.7	x	0.7	=	84.67	4
Rooflights 0.9x		X	1	X	96	X	0.7	x	0.7	=	211.68	(82)
Rooflights 0.9x	1	x x	1	X	150	X	0.7	X	0.7	=	132.3	(82)
Rooflights 0.9x	1		1	X	150	X	0.7	X	0.7	=	3 <mark>30.75</mark>	4
Rooflights 0.9x	1	x	1	x	192	X	0.7	x	0.7	=	169.34	(82) (82)
Rooflights 0.9x	1	x x	1	x	192	x x	0.7	x x	0.7	=	423.36	(82)
Rooflights 0.9x		x	1	x x	200	x	0.7	x	0.7	=	176.4	(82)
Rooflights 0.9x	1	x	1	x	200	x	0.7	x	0.7	=	441 166.7	(82)
Rooflights 0.9x	1	x	1	x	189 189	x	0.7	x	0.7	-	416.74	(82)
Rooflights 0.9x	1	x	1	x	157	x	0.7	x	0.7	=		(82)
Rooflights 0.9x		x		x		x	0.7	x	0.7	=	138.47	(82)
Rooflights 0.9x	1	x	1	x	157 115	x	0.7	x	0.7	-	346.18 101.43	(82)
Rooflights 0.9x	1	x	1	x	115	x	0.7	x	0.7	-	253.57	(82)
Rooflights 0.9x	1	x		x	66	x	0.7	x	0.7	=		(82)
Rooflights 0.9x	1	x	1	x	66	x	0.7	x	0.7	-	58.21	(82)
Rooflights 0.9x		x	1	x		x		x		=	145.53	(82)
Rooflights 0.9x	1	x	1	x	33	x	0.7	x	0.7	=	29.11	(82)
Rooflights 0.9x			1		33		0.7		0.7		72.76	(82)
Rooflights 0.9x	1	x x	1	x	21	x	0.7	x		=	18.52	(82)
	1	^	1	X	21	X	0.7	x	0.7	-	46.3	

Solar gains in watts, calculated for each month							(83)m = Sum(74)m(82)m						_
(83)m=	414.04	743.39	1107.23	1504.7	1793.4	1824.42	1740.89	1521.11	1245.41	846.97	503.14	349.52	(83)

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Total g	ains – ir	nternal a	and solar	⁻ (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	1184.65	1508.53	1842.78	2193.89	2434.26	2422.57	2314.46	2104.49	1855.8	1503.95	1211.97	1098.42		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	neating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	living are	ea, h1,m	(see Ta	ble 9a)					I		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.96	0.89	0.75	0.57	0.43	0.49	0.74	0.94	0.99	1		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)														
(87)m=	19.44	19.7	20.07	20.51	20.81	20.95	20.99	20.98	, 20.87	20.43	19.84	19.38		(87)
Temp		durina h	neating p	eriods ir	n rest of	dwelling	from Ta		h2 (°C)					
(88)m=	19.67	19.67	19.67	19.68	19.68	19.69	19.69	19.69	19.68	19.68	19.68	19.67		(88)
	tion fac	tor for a	ains for I	rest of d	welling	h2 m (sc	L Do Tablo	() ()						
(89)m=	0.99	0.98	0.94	0.85	0.68	0.47	0.3	0.35	0.64	0.91	0.98	0.99		(89)
(90)m=	17.64	18.01	ature in 18.55	the rest 19.15	of dwelli 19.52	ng 12 (fo 19.66	19.68	19.68	19.6	e 9C) 19.07	18.23	17.57		(90)
(90)11=	17.04	10.01	10.00	19.10	19.52	19.00	19.00	19.00		LA = Livin			0.20	(91)
											g arca ÷ (-		0.39	(91)
Mean	_		ature (fo					+ (1 – fL	A) × T2					
(92)m=	18.34	18.67	19.15	19.68	20.03	2 <mark>0.17</mark>	20.2	20.19	20.1	19.6	18.86	18.28		(92)
			he mear	interna	temper				ere appro	opriate				
(93)m=	18.34	18.67	19.15	19.68	20.03	20.17	20.2	20.19	20.1	19.6	18.86	18.28		(93)
		ting requ												
			ernal ter or gains			ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(7	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Juli	Jui	Aug	Oep	001	INOV	Dec		
(94)m=	0.99	0.97	0.94	0.85	0.7	0.51	0.35	0.41	0.67	0.91	0.98	0.99		(94)
· · ·	l gains.	hmGm	, W = (94		1 4)m									
(95)m=	<u> </u>		1728.43	, <u>`</u>	ŕ	1232.3	817.72	855.8	1244.16	1365.64	1186.37	1089.59		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m·	– (96)m]				
(97)m=	3279.31	3211.87	2945.76	2493.83	1923.44	1278.46	825.64	869.73	1380.15	2079.05	2722.9	3269.43		(97)
Space	e heating	g require	ement fo	r each n	nonth, k\	Nh/mont	h = 0.02	24 x [(97))m – (95)m] x (4′	1)m			
(98)m=	1567.75	1170.64	905.69	452.46	165.39	0	0	0	0	530.78	1106.3	1621.8		
			-					Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	7520.83	(98)
Space	e heating	g require	ement in	kWh/m²	/year								49.16	(99)
8c. Sp	bace co	oling rec	quiremen	it										
Calcu	lated fo	r June, .	July and	August.	See Tal	ole 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	oss rate	e Lm (ca	lculated	using 25	5°C inter	· · ·		i	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	2158.64	1699.35	1743.37	0	0	0	0		(100)

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Utilisa	ation fac	tor for lo	oss hm											
(101)m=	0	0	0	0	0	0.85	0.91	0.87	0	0	0	0]	(101)
Usefu	l loss, h	mLm (V	Vatts) =	(100)m >	(101)m								-	
(102)m=	0	0	0	0	0	1827.77	1537.92	1518.51	0	0	0	0		(102)
1		I	I	İ		1	i	e Table					1	(100)
(103)m=	0	0	0	0	0		2314.46		0	0	0	0		(103)
				or month, < 3 × (98		lwelling,	continue	ous (kW	(h) = 0.02	24 x [(10	03)m –	(102)m]:	x (41)m	
(104)m=	0	0	0	0	0	428.26	577.74	435.97	0	0	0	0]	
							1		Total	= Sum((104)	=	1441.97	(104)
	I fractio								f C =	cooled	area ÷	(4) =	1	(105)
1		actor (Ta	r	í		0.05	0.05	0.05	0				1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0 Toto	0 1 = Sum	0	0		(106)
Space	coolina	require	ment for	month =	: (104)m	x (105)	× (106)r	n	TOLA	i = Sum	(1604)	=	0	(106)
(107)m=	0	0	0	0	0	107.06	144.44	108.99	0	0	0	0]	
I		Į	ļ	!	!	!	Į		Total	= Sum((107)	=	360.49	(107)
Space	cooling	require	ment in l	×Wh/m²/	year				(107)) ÷ (4) =			2.36	(108)
9b. En	ergy red	quiremer	nts – Co	mmunity	heating	scheme)		. ,	.,				
								ting prov	ided by a	a c <mark>omm</mark>	unity so	cheme.		
Fractio	n of spa	ace heat	from se	condary	/suppler	nentary I	heating ((Table 1	1) '0' if n	one			0	(301)
Frac <mark>tio</mark>	<mark>n o</mark> f spa	ace he <mark>at</mark>	from co	<mark>mmu</mark> nity	v system	1 – (301	1) =						1	(302)
The com	n <mark>mu</mark> nity se	cheme ma	y obtain h	eat from se	everal sou	ces. The p	procedure	allows for	CHP and נ	up to four	other hea	at sources; t	the latter	
			-			rom powel	r stations.	See Apper	ndix C.					
				ity heat									1	(303a)
Fractio	n of tota	al space	heat fro	m Comr	nunity he	eat pump	0			(3	802) x (30	3a) =	1	(304a)
Factor	for con	trol and	charging	g method	(Table	4c(3)) fo	r commu	unity hea	ting syst	tem			1	(305)
Distrib	ution los	ss factor	(Table '	12c) for (commun	ity heatii	ng syste	m					1.05	(306)
Space	heating	g											kWh/yea	•
Annual	space	heating	requiren	nent									7520.83	
Space	heat fro	om Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)) =	7896.87	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	idary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Wator	heating	4												
		a heating i	equirem	nent									1945.83	7
		ommuni m Comr		ne: eat pum	0				(64) x (30	03a) x (30	5) x (306)) =	2043.12	 (310a)
		d for hea						0.01	× [(307a).	(307e) +	+ (310a)	.(310e)] =	99.4	(313)
				ncy Rati	0					. /	· · · /	. 14	3.38	(314)
		•	-	ed coolin		n, if not e	enter ()		= (107) ÷	· (314) =			106.81	(315)
	•						,		()	<u> </u>			100.01	
				within dw ced, extra			e put from	outside					0	(330a)

warm air heating system fans				[0	(330b)
pump for solar water heating				Ī	0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	0b) + (330g) =	Ī	0	(331)
Energy for lighting (calculated in Appendix L)				ĺ	509.99	(332)
10b. Fuel costs – Community heating scheme						
	Fuel kWh/year		el Price Ible 12)		Fuel Cost £/year	
Space heating from CHP	(307a) x		4.24	x 0.01 =	334.83	(340a)
Water heating from CHP	(310a) x		4.24	x 0.01 =	86.63	(342a)
Space cooling (community cooling system)	(315)	Fu	el Price	x 0.01 =	14.09	(348)
Pumps and fans	(331)		13.19	x 0.01 =	0	(349)
Energy for lighting	(332)		13.19	x 0.01 =	67.27	(350)
Additional standing charges (Table 12)				[120	(351)
Total energy cost = (340a)	(342e) + (345)(354) =]	622.81	(355)
11b. SAP rating - Community heating scheme						
SAP rating (section12)	56)] ÷ [(4) + 45.0] =] [[0.42 1.32 81.57	(356) (357) (358)
12b. CO2 Emissions – Community heating schem	E	iner <mark>gy</mark> Wh/year	Emission kg CO2/k		Emiss <mark>ions</mark> ‹g CO2/year	
CO2 from other sources of space and water heati Efficiency of heat source 1 (%)	ng (not CHP) here is CHP using two fu	uels repeat (363) to	o (366) for the s	econd fuel	350	(367a)
CO2 associated with heat source 1	[(307b)+(310b)]	x 100 ÷ (367b) x	0	=	1473.96	(367)
Electrical energy for heat distribution	[(313) :	(0.52	=	51.59	(372)
Total CO2 associated with community systems	(363)	.(366) + (368)(37	72)	=	1525.55	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater	r or instantaneous h	eater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	ng (373) +	(374) + (375) =			1525.55	(376)
CO2 associated with space cooling	(315) x		0.52	=	55.44	(377)
CO2 associated with electricity for pumps and fan	s within dwelling (331)) x	0.52	=	0	(378)
CO2 associated with electricity for lighting	(332)))	x	0.52	=	264.69	(379)
Total CO2, kg/year sum of (370	6)(382) =			[1845.67	(383)
Dwelling CO2 Emission Rate (383) ÷ (4)	=			[12.06	(384)
El rating (section 14)				[87.51	(385)
13b. Primary Energy – Community heating schem	E	inergy Wh/year	Primary factor		P.Energy ‹Wh/year	

Energy from other sources of space and water Efficiency of heat source 1 (%)	heating (not CHP) If there is CHP using tw		eat (363) to (3	66) for the seco	nd fuel	350	(367a)
Energy associated with heat source 1	[(307b)+(31	10b)] x 100 ÷	(367b) x	0] = [8718.79	(367)
Electrical energy for heat distribution	[(3	13) x	[] = [305.16	(372)
Total Energy associated with community system	ms (36	63)(366) +	(368)(372)		= [9023.95	(373)
if it is negative set (373) to zero (unless spec	cified otherwise, see	e C7 in Ap	pendix C)		[9023.95	(373)
Energy associated with space heating (second	ary) (30	09) x	[0] = [0	(374)
Energy associated with water from immersion I	heater or instantane	eous heate	er(312) x	3.07] = [0	(375)
Total Energy associated with space and water	heating (37	73) + (374) +	(375) =		[9023.95	(376)
Energy associated with space cooling	(31	15) x	[3.07] = [327.91	(377)
Energy associated with electricity for pumps ar	nd fans within dwell	ling	(331)) x	3.07] = [0	(378)
Energy associated with electricity for lighting	(33	32))) x	[3.07] = [1565.67	(379)
Total Primary Energy, kWh/year	sum of (376)(3	382) =				10917.53	(383)

